

**Minister for Planning,
The Hon. John Robert Rau, LLB, MP
Attention: Robert Kleeman, Manager
Development Assessment (Investment Management)
Department of Planning, Transport and Infrastructure
GPO Box 1815 ADELAIDE SA 5000
DEVELOPMENT ACT 1993
PROPOSED KANGAROO ISLAND GOLF COURSE RESORT**

**Submission from David Ball.
PO Box 161
Penneshaw 5222.
dmba@kin.net.au; 0412 180 644**

Dear sirs,

when first told about this project I considered it so ridiculous as to not be worth any serious response. However when learning that it had been given Major Development Status I felt that some response was called for. I am a resident of Kangaroo Island and have lived on a block of land a kilometre east of the proposed development since 1982. I therefore have a lot of local knowledge about this area.

This project is a long dormant fantasy that has since been resurrected after nearly thirty years. The land upon which it is to be placed was part of an original 1400 acres purchased at the height of the golfing mania that had thousands of Japanese holiday makers going first to Hawaii and then north Qld in order to play golf on courses that were far less costly than the few that existed within Japan where the severe limits on available land forced costs up to a level that few could afford. As Japan has now been in a state of economic stagnation for two decades I can only presume that the Chinese market is what this is aimed at. One obvious point needs to be made. The original purchase was almost certainly made sight unseen and after it was revealed that a number of golf courses were planned to be built, the realisation that there was no water on the property led the new owners to suggest that some dams would need to be built. When they were told that there was no clay on the property and no reliable catchment the original fantasy was finally shelved; at least up until 2014. In the interim the previous owner carried on running sheep as before on leased land. This should by itself indicate the level of foresight and expertise behind this whole project and not surprisingly this latest reincarnation is every bit as ridiculous as the first.

To begin with this is a 350-400mm rainfall area in a rain shadow area on an otherwise reasonably well watered island. Its soils are poorer and more non water retaining than anywhere else on the island. To maintain a grassed fairway in this area would require an irrigation season of six to eight months. In addition the main water demand coincides with the summer when an almost continuous 10 - 15knot SE wind blows off the sea which would make very substantial evaporation losses inevitable if applied through above ground sprinklers.

Most of the original purchased land was cut up into 40ha allotments in the past ten years and most likely the owners now retain only the coastal strip. This land is on a high saddle with sheer coastal cliffs along the southern side and undulating limestone sand and rock hills sloping down to the north which contain very little of the original wooded vegetation. In terms of a visual display adjacent to the coast this creates a natural asset with distant views that are quite appealing although not spectacular. However a view is one thing; a golf course is quite another. That which gives this site the asset of a visual appeal is also that which creates its most obvious fault. This area being so prominent is subject to extreme wind conditions for much of the year from every available direction. Only the eastern side is protected and no significant wind comes from that direction. It is likely that in excess of 60 days in any given year will be either impossible or very uncomfortable to play golf on due to the wind; in particular the north wind, which is capable of blowing a person off balance and gusts erratically. Cape Willoughby Light House meteorological data will confirm this. Following most north winds a strong to gale force southerly or sou'wester comes in lasting one to two days. This site is literally battered by that wind as there is nothing between it and the Southern Ocean. In winter the wind chill factor from southerly winds is close to freezing. In the summer, a constant SE wind off the sea will blow across the cliffs at 10-15knots and sometimes much higher; which effectively means that the summer on the south coast of the island is only a summer according to the calendar and not the thermometer.

The entire golf course will need to be a wildlife exclusion zone as the huge number of kangaroos that now frequent this area since the sheep have now gone will flock to irrigated grass even in winter. Their faeces will litter the fairways and greens with black nodules slightly smaller than a golf ball. Seasonal mating combat by males will gouge holes in whatever surface their fight takes place on. In addition, echidnas dig 25cm deep holes in

searching for ants, while goannas burrow for spiders and skinks. None of them can be allowed to roam free on a golf course even if just because of the chance of being hit by a high speed golf ball.

While there are few issues with environmental matters in the area dedicated to the fairways themselves as it is mainly long cleared, the intention of building a housing precinct adjacent to the only remaining portion of native vegetation, which is not only in quite good condition but is of extreme importance in this section of heavily cleared coastline, is an act of environmental vandalism. This area is all that remains of the original vegetation for many kilometres along the coast. Much of the surrounding remnant coastal vegetation is regrowth over formerly cleared land whereas this block is highly significant by virtue of its shrub density and diversity. Placing housing alongside it effectively means that no meaningful fire regime can ever again apply to this vegetation as all fires must be totally suppressed to protect the built assets. That guarantees the steady decline of this vegetation over time. In effect this goes completely against the Biodiversity Plan of South Australia which places great importance upon preserving corridors for species migration. In addition the subdivision of this whole area raises the question as to how these boundaries are to be instituted. If fencing is envisaged then the integrity of this entire block will be compromised by clearing and animal movements will be necessarily impeded. Placing a semi-urban development here will inevitably lead to the introduction of exotic garden plants and pet animals such as cats and dogs. Cats will have a negative impact upon Purple Gaped Honeyeaters which have been declining in this general area for many years but are common in this vegetation. There are also a number of rare Western Whip Birds that were not recorded by either environmental consultants and this is an island population largely cut off from suitable habitat for kilometres around. Being birds that spend most of their time on or near the ground they are particularly vulnerable to cats and dogs. There is also a Fairy Penguin colony at the base of the cliffs; again not observed by the environmental consultants, and these are highly vulnerable to roaming dogs.

This development of clustered housing is in total opposition to the local government zoning regulations and leaves the residents with a long way to travel in order to obtain food and other supplies with its inherent cost in fossil fuel usage compared to that in the existing township areas. This is necessarily a high carbon footprint development. To say nothing of the electricity needed to pump such huge volumes of water.

One other major environmental issue with this entire project is the water pipe between the Kangaroo Island Race Course and the project. This is close to 30kms long and is proposed to deliver 50ML per month for three months only, which also is dependent upon the Middle River Dam having reached capacity in that time space. Every so often this situation will not apply and the golf course will then have to go without water for that year. SA Water have those figures in their data base. This will need to be a huge diameter pipe as it has to lift and descend over three major rises and falls in elevation and must deliver 6000 litres per hour or more at its end. This project must be submitted to SA Water for an engineering assessment of its actual feasibility. There is probably no three phase power between the beginning of the connection and the American River Road if auxiliary pumping is required. The current plan is to use the roadside verge along the entire route to dig a substantial channel to lay the pipe in and Transport SA rates this road as its highest priority environmental asset in South Australia. This is because this three chain road is vegetated over the greater part of its length by an association of plants that contain at least three declared endangered species in a Narrow Leaf Mallee community that has just recently declared to be threatened under the EPBC Act. It is highly unlikely the proponents will be able to disturb this under the EPBC Act. The pipeline will need to pass underneath 8 public roads if kept to the western side of Hog Bay road; two of which are sealed. Using the eastern side will also require digging up five public roads with one sealed, plus having to pass under the Hog Bay road in two places. If this pipeline connects to the mains on the north side of the Playford Highway it will need to be cut across a recently realigned and resurfaced major intersection on this highway which was only upgraded in 2015.

There is to my knowledge no environmental impact statement dealing with what is the biggest and most damaging environmental process required in getting water to this project. That alone indicates the shoddy nature of this proposal and the lack of any real environmental concern that extends beyond soothing words. This pipe will have to be run through private property from start to finish to avoid major environmental damage as well as being bridged over the Cygnet river and then the Bugga Bugga creek in two separate places. It will also need to be laid across a samphire swamp at Nepean Bay in which access will depend entirely upon whether or not it is sufficiently dried out at the time of channelling. In addition there is an optic fibre cable running all along this road that must also be avoided.

To make matters worse, the people of American River have been crying out for SA Water to take such a pipeline to them for decades but the cost has always made the economics debatable. This pipeline is designed to pass by this township and have the capacity to deliver to one private company as much water as the whole town itself would use. This is guaranteed to create social tension.

The economics of this project beggar belief. The cost of managing it will be substantial, thus requiring high green fees. This automatically means that no local participation is likely as golf courses already exist at all the major centres and they are all run by volunteers and the local golfers have a strong sense of community togetherness. Its entire catchment must come from off the island and taking a holiday of a few days to play golf on Kangaroo Island will not only be very expensive in relation to more well established mainland courses but the experience may not turn out to be what they want given the vagaries of the weather. Once this is known then the internet will make it very clear to any and all future travelling golfers. Added to which, even if this project were economically viable it would contribute very little to the island economy as all profits made would be taken interstate and most travel arrangements would be made within the company running the golf course. If the flow of golfers turns out to be anything like the tourist population, it will crash in the winter time when anybody with either money or brains would necessarily choose to go somewhere to the warmer north rather than down to the chilly south.

This project is so ill-conceived and so poorly planned that it makes the motives worth speculating about. If the proponents are to cream off a management fee after floating a prospectus that will then raise the finance from unsuspecting investors, after which, should it fail, they can then pull out with the retained ownership of five valuable subdivisions which themselves would not be permissible under the Kangaroo Island Council's own planning regulations, then there might be some point to this proposal. The investors would lose everything and the proponents would be left holding the management fee and the only tangible assets. This project requires intense scrutiny; otherwise giving it approval is tantamount to exposing unwary investors to a white elephant in the making; none of which however would apply if the proponents fund the entire project from their own resources. It is highly likely that the overarching intention to build a golf course is simply a way to get around the local government planning regulations which discourage such semi urban developments outside of the existing township areas.

Ultimately what makes this even more absurd is that there is a lot of land on Kangaroo Island that would make a perfectly reasonable golf course with good quality and relatively cheap water that was locally accessible as well as having an adequate rainfall and on decent soils that would need little modification. Such land would cost less to purchase than the pipeline for this project will cost to construct. The fact that this land was bought dirt cheap thirty years ago is all that makes this appear even remotely tenable to the current proponents.

Economic reality appears to elude the proponents as they seek to justify an earlier and quite daft business move made many years back. If this land were near to the major tourist attractions on the island then it might make sense as just another tourist accommodation feature with a golf course thrown in for good measure. The golf course would therefore be a minor consideration and not need to be of world standing. This whole venture is however stuck in the middle of nowhere on land that, since the clearing of the native vegetation over a hundred years ago, now looks almost like a lunar landscape strewn with a vast assemblage of prominent limestone gibber, boulder and reef rock; albeit covered in lichen. While that does make it a unique landscape by looking so positively strange, it is more likely to evoke mirth or horror at the abuse that this area has already endured rather than awe. From an environmental aesthetic point of view this area is not a patch on what the rest of the island offers. Additionally it represents an Eastern Australian view of what Kangaroo Island should look like; not from making a collaborative involvement integrated into local needs, but by imposing an outsiders interpretation of what the island itself should be to suit their own pecuniary needs. Festooning the coast with millionaires mansions is now seen as a blight upon the east coast of Australia and should be avoided here on Kangaroo Island.

Yours faithfully

David Ball.

Mackenzie, Alex (DPTI)

From: Chris Baxter [cbaxterki@gmail.com]
Sent: Tuesday, 23 June 2015 12:51 PM
To: DPTI:KI Golf Course
Subject: Proposed KI golf course

To whom it may concern

I am writing to comment on proposed KI golf course development at Pennington Bay area; Please be aware that there are shortcomings in the references to threatened bird species listed in the report; I have personal knowledge of this area and have observed/recorded the additional threatened species listed below within the proposed golf course site- they need to be taken into serious account. I believe the report is sadly lacking in careful research and consideration of these threatened bird species and is a sad indictment on the supposedly professional assessment of the avifauna of this area.

Please be aware that I am available and more than willing to provide additional information to council on these threatened species- none of which can afford to have additional habitat loss/human pressures brought to bear on their already tenuous populations.

Kind Regards

Chris Baxter
KI Ornithologist/Naturalist

All threatened bird species recorded from the proposed golf course site are listed here:

Western Whipbird (*Psophodes nigrogularis* – endemic KI race *lashmari*)

Painted Buttonquail (*Turnix varia*)

Shy Heathwren (*Calamanthus cautus* - endemic KI race *halmaturina*)

Eastern Reef Egret (*Egretta sacra*)

Bush Stone Curlew (*Burhinus grallarius*)

Restless Flycatcher (*Myiagra inquieta*)

Beautiful Firetail (*Stagonopleura bella*)

Peregrine Falcon (*Falco peregrinus*)

Eastern Osprey (*Pandion cristatus*)

White-bellied Sea Eagle (*Haliaeetus leucogaster*)

Southern Emu-wren (*Stipiturus malachurus* – endemic KI race *halmaturinus*)

Bassian Thrush (*Zoothera lunulata*)

Elegant Parrot (*Neophema elegans*)

Rock Parrot (*Neophema petrophila*)

Major Development Application Kangaroo Island Golf Course Resort Submissions

Tell us what you think about the following aspects of the Public Environment Report.

Submissions may be made available for public inspection and would be included in the proponent's Response Document (that will be released for public information at a later date). Please indicate below if you object to your submission being made available in this way.

Name J. Bell Address Box 89 Kingscote SA 5223
Telephone 0839 863 527 Email jndenroel@hotmail.com

Overall, what do you think about the proposed Kangaroo Island Golf Course development?

This project is a wonderful investment for KI.
The degraded site would be restored.

Do you have any specific comments on the following?

Tourism and economy (Tourist visitation, job creation, value adding to local business etc)

This project will bring a specific group of people who would stay longer than one day and would visit other parts of our Island. There would be a significant number of jobs created directly, and goods & services associated with the running of the business means a great flow on effect.

Environmental (native vegetation and animals, landscape, cultural heritage etc)

The site is degraded and neglected and this project would mean native veg. being managed and the greening of the area would prevent any ~~cliff~~ cliff. The buildings design has low impact visually.



Government of South Australia

Department of Planning,
Transport and Infrastructure

Infrastructure and services (Power and water use, delivery of services to the site etc)

The proposed pipeline will mean other business can benefit along its length. To be taking water ~~out~~ & storing it when Middle River is flowing is a brilliant idea. The electricity lines will have low impact

Buildings and design (Building location, design and architecture, landscaping etc)

Looking at the proposed plans the structure has been carefully designed to blend with the environment and have little impact.

Traffic and access (safety and access, car parking etc)

This shouldn't be a problem

Are there any other matters you would like to raise?

This proposal is a winner for both the environment and economy of KTI!

Please indicate your preference below:

Please make my submission public

Please do not make my submission public

Written submissions commenting on the PER are invited until 5pm, Tuesday 30 June 2015 addressed to:

Minister for Planning c/-
Robert Kleeman, Manager
Development Assessment (Investment Management)
Department of Planning, Transport and Infrastructure
GPO Box 1815
ADELAIDE SA 5000

or via email to: dpti.kigolfcourse@sa.gov.au

Further information

Call – 1800 PLANNING – press option 1

Visit – sa.gov.au/planning/majordevelopments

Email – dpti.kigolfcourse@sa.gov.au



Government of South Australia

Department of Planning,
Transport and Infrastructure

Major Development Application Kangaroo Island Golf Course Resort Submissions



Tell us what you think about the following aspects of the Public Environment Report.

Submissions may be made available for public inspection and would be included in the proponent's Response Document (that will be released for public information at a later date). Please indicate below if you object to your submission being made available in this way.

Name Kodrey Bell Address 1 B Seaview Road Kingscote
Telephone 0407 399 347 Email belle.vista@kin.net.au

Overall, what do you think about the proposed Kangaroo Island Golf Course development?

Fantastic for Kangaroo Island.
Will restore an area badly degraded & neglected.

Do you have any specific comments on the following?

Tourism and economy (Tourist visitation, job creation, value adding to local business etc)

Any job created will be good for Kangaroo Island and the State. Every dollar spent will have a compounding effect for local business. Will be a higher class tourist which will target another group that wouldn't normally come to KI

Environmental (native vegetation and animals, landscape, cultural heritage etc)

Its a very degraded area with the proposed management plan. Native Veg will return. Onion weed Lincoln weed - bottom depress native plants. Well managed greens will stabilise areas of drift. The well designed buildings will have a very low visual impact.



Government of South Australia

Department of Planning,
Transport and Infrastructure

Infrastructure and services (Power and water use, delivery of services to the site etc)

By storing water when middle River is flowing is a great idea. The proposed Pipe line will bring benefits to business along its route. Power lines will have little impact.

Buildings and design (Building location, design and architecture, landscaping etc)

By plans care has been taken in making sure that they blend into environment.

Traffic and access (safety and access, car parking etc)

Don't believe that there is any issue.

Are there any other matters you would like to raise?

There are 5 titles in the total site. If Golf Course didn't go ahead. There could be 5 houses, 5 roads, 5 tracks into coast. No management of sites. I believe the proposed Golf Course is a big winner Not only for the environment but for the prosperity of Kangaroo Island.

Please indicate your preference below:

Please make my submission public

Please do not make my submission public

Written submissions commenting on the PER are invited until 5pm, Tuesday 30 June 2015 addressed to:

Minister for Planning c/-
Robert Kleeman, Manager
Development Assessment (Investment Management)
Department of Planning, Transport and Infrastructure
GPO Box 1815
ADELAIDE SA 5000

or via email to: dpti.kigolfcourse@sa.gov.au

Further information

Call – 1800 PLANNING – press option 1

Visit – sa.gov.au/planning/majordevelopments

Email – dpti.kigolfcourse@sa.gov.au



Government of South Australia

Department of Planning,
Transport and Infrastructure

W. Boone Law
83 Simpson Road
PO Box 673
Dudley West, SA 5222

26 June 2015

TO:
Minister for Planning
Attn: Robert Kleeman, Manager, Development Assessment
Department of Planning, Transport and Infrastructure (DPTI)
GPO Box 1815
ADELAIDE SA 5000

RE: PUBLIC SUBMISSION - PUBLIC ENVIRONMENTAL REPORT (PER) FOR THE
PROPOSED KANGAROO ISLAND GOLF COURSE RESORT

Dear Minister, DPTI Staff, and Stakeholders:

I am writing in regards to the public environmental report (PER) for the proposed Kangaroo Island Golf Course Resort. I have considerable experience with documents of this nature, and I am concerned that the PER lacks sufficient detail to make a fully informed decision on the approval of the proposed development. In the following sections, I will highlight areas where the document lacks substantive information on Aboriginal heritage, ecology and the environment, water resources, and traffic/bushfire management. I believe it is important that the Minister is advised of these missing or incomplete details so the full impacts of this development may be thoroughly considered in the Minister's decision. However, before I outline my concerns, I wish to disclose my professional background and my position as a residential stakeholder in this project.

BACKGROUND:

I am a professional archaeologist, with 15 years experience working as a full-time heritage consultant. My undergraduate qualifications include a bachelor degree in Anthropology from Texas Tech University, which I was awarded in 1996. My postgraduate qualifications include a Graduate Diploma in Prehistory and Archaeology (1998) and a Master of Philosophy (2004) in Archaeology and Palaeoanthropology (2004) from the Australian National University. More recently, I have enrolled as a PhD candidate in the School of Biological Sciences/Ecology and Environmental Science Unit at the University of Adelaide, where I am specialising in Geographic Information Systems (GIS) and related spatial sciences.

In my career, I have worked for a number of environmental and archaeological consulting firms, both in the United States and Australia. My experience is diverse, and I

have published a number of peer-review publications on topics related to Australian Aboriginal archaeology. I have authored more than 100 consulting reports, and I have provided professional advice to clients submitting Environmental Impact Statements, PERs, mine permits, and similar regulatory documents. It is through this professional experience, that I wish to highlight my concerns with the PER to the Minister and the Department of Planning, Transport and Infrastructure.

Additionally, my family and I are full-time residents of Kangaroo Island. We live on Simpson Road, which intersects Davies Road, the main access road to the proposed golf course resort. We have owned the land at this location since 2009, and we have resided at this location full-time since 2012. I am well-versed with the geography, ecology, and archaeology of area, and I am very familiar with the land that the proposed development will occupy. Our home is approximately 1.6km from the proposed golf course, which makes us a residential stakeholder in the safety and traffic management of Davies Road, the primary road used to access the proposed resort.

The following sections of this submission outline my principal areas of concern with the PER and document where I believe sufficient details are lacking in matters concerning Aboriginal heritage, ecology and the environment, water resources, and traffic management. Further details on these matters have the potential to affect the Minister's final decision on the development, and/or they may influence Ministerial conditions attached to the project's development.

ABORIGINAL HERITAGE

Appendix L of the PER contains the ecology and heritage assessment of the proposed Kangaroo Island Golf Course Resort. In regards to Aboriginal heritage, I am concerned that there are a number of significant details that have not been presented, and these particulars could affect the Minister's decision on the proposed development. The Appendix L study also highlights a major concern in the development of the golf course on coastal Crown land, which has 'very high' to 'high risk' to contain Aboriginal heritage. I have outlined these concerns below:

Heritage Concern 1 - Coastal Reserve with Extremely High and High Risk Landforms: The coastal reserve of Kangaroo Island is public Crown land, containing environmental and heritage resources managed by the state government. Coastal reserves were created to preserve coastal habitat and heritage, and the study commissioned by the proponent's heritage consultant suggests that there is an 'extremely high risk' of impacting sites of Aboriginal heritage in the coastal reserve. **I am concerned that Aboriginal archaeological sites will be adversely impacted by the development if approval is granted to construct golf course fairways and greens in the public coastal reserve.**

Figure 1 offers a screenshot of the proposed development (PER Appendix L-Map 2, Page 3) and illustrates its location in relation to the coastal reserve. I have highlighted the approximate location of the coastal reserve south of the freehold land title area, as the pink text markup in Figure 1.



Map 2. Kangaroo Island Golf Course proposed development footprint.

Figure 1 Screenshot of the PER Appendix L-Map 2 (page 3) and proposed development area. I have highlighted (pink) the approximate location of the coastal reserve. The map has been reproduced for internal discussion purposes only.

The coastal reserve adjacent to the proposed development is entirely occupied by sand dunes of an undetermined age. Some coastal dune areas have been eroded by wind, but many inland dune areas are stabilised by grasses and weeds. Buried Aboriginal archaeological sites are most likely to be present in the sand dunes, and it the best preserved archaeological deposits are most likely to be preserved stable sand dune areas. Incidentally, stable dune areas are also an attractive landform for golf course fairways and greens, and the proponent wishes to landscape and mechanically modify many of the stable dune areas in the proposed golf course resort. These landscaping activities have the potential disturb or destroy buried archaeological sites, if present in the area. Unauthorised disturbance to Aboriginal archaeological sites may result in a breach of the *Aboriginal Heritage Act 1988 (SA)*.

The commissioned heritage consultant has assessed the coastal reserve as having 'extremely high risk' and 'high risk' areas for containing Aboriginal archaeological sites. The risk results of the heritage study are summarized in Appendix L-Map 13, Page 62. For the sake of discussion, a screenshot of the Appendix L-Map 13 is presented in Figure 2 below.

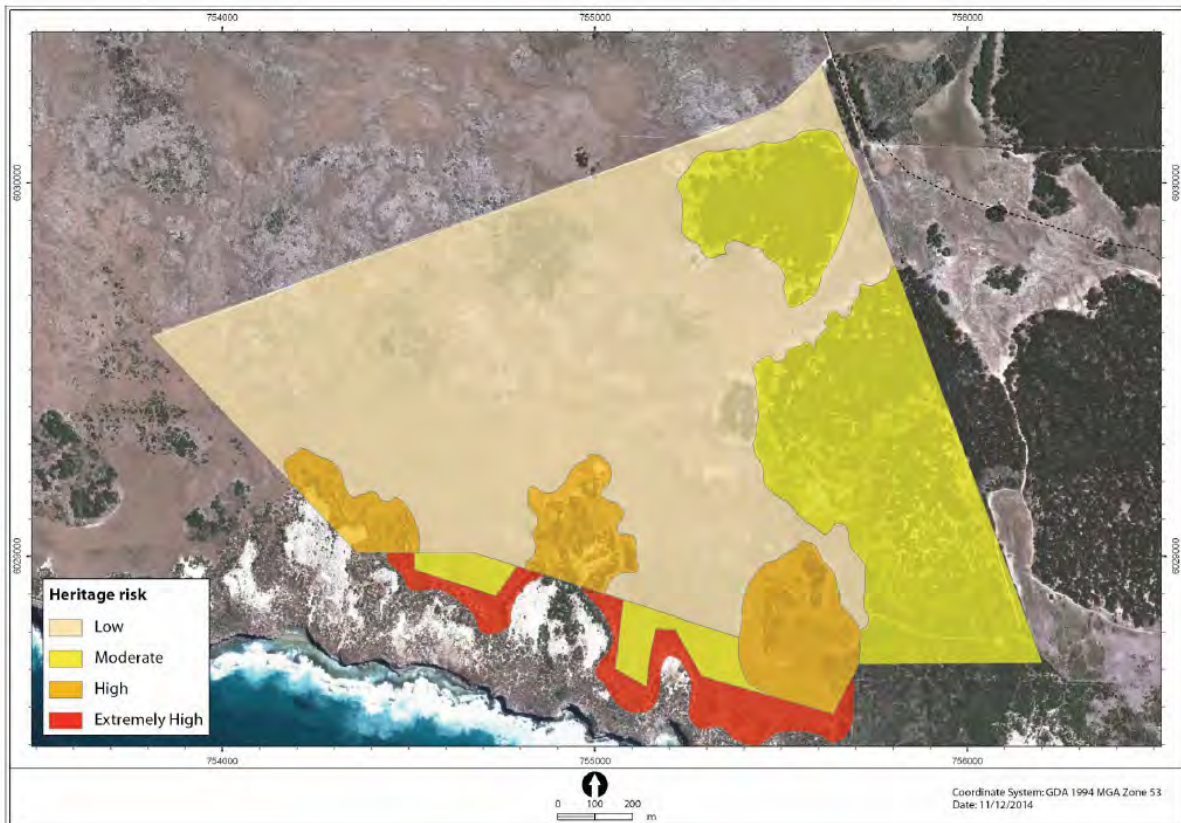


Figure 2 Screenshot of the PER Appendix L-Map 13 (page 61). Areas of 'high' and 'extremely high risk' for potentially impacting Aboriginal heritage sites are confined to the coastal reserve. Reproduced for internal discussion purposes only.

It is proposed that these 'extremely high risk' and 'high risk' areas will be impacted by at least six fairways (compare with Figure 1). The report also suggests that there are 'moderate' risk areas along the border of the coastal reserve. However, it is important to note that these 'moderate risk' sand dune areas are an extension of the same dune system that occupies the coastal reserve. It is erroneous to consider these more stable dunes as 'moderate risk' since they occupy the same sand dune system that extends throughout the coastal reserve. In this context, it is not possible for the boundaries between 'extremely high risk' and 'moderate risk' areas to be distinguished as clearly as they are illustrated in Map 13, as it is the same sand dune landform that drapes across the entire southern project area (compare Figure 1 and Figure 2). Furthermore, **I am concerned that it is remarkable coincidence the boundaries of the coastal 'moderate risk' areas roughly align with the freehold title boundaries and ungazetted road that overlap the project area. Could it be that the demarcation of 'risk areas' are partially based on the land title features, not the landform or geological unit? In my experience, heritage risk does not change at a fenceline or the edge of a fairway, it continues throughout the landform. Six fairways are proposed for construction in the coastal sand dune areas currently deemed 'moderate risk.'**

In conclusion, I am concerned that the 'moderate risk' assessment of the areas bordering the coastal reserve misrepresents the real heritage risk for the proposed project. In my opinion, the entire sand dune landform that occupies the coastal reserve and the inner southern margin of the project area should be a landform considered of 'high or extremely high risk' for containing Aboriginal archaeological sites.

Heritage Concern 2- Aboriginal Burials: On page 32 of Appendix L, the authors report that the SA Museum contains Aboriginal human remains recovered from Kangaroo Island; however, the report does not pinpoint the precise location and geomorphic context of the recovered skull and partial skeleton. **I am concerned that the due diligence of determining the provenance and context of the skeletal remains has not been completed.** Further research should be required in this matter, as the location and landform from which skeleton was discovered may prove significant in the overall assessment of Aboriginal heritage for the proposed site.

With the exception of the human remains recorded at the SA Museum, there have not been any other reported Aboriginal burials from Kangaroo Island. In the ancient past, Aboriginal peoples occupied the island for tens of thousands of years, so there is a good likelihood that Aboriginal human remains will eventually be discovered on the island.

If the proposed development unearthed human remains, the discovery would be of national archaeological significance, as it would potentially provide extremely valuable scientific information on the ancient peoples of Kangaroo Island. The remains would also be of important cultural significance to the many Aboriginal groups that mythologically and spiritually identify with Kangaroo Island as 'Karta,' or the 'Isle of the Dead.'

In the Coorong, human remains and cemetery complexes are typically found in sand dunes (Moffat et al. 2010). The case is similar for human remains found at the Black Point windfarm on the Yorke Peninsula (Raynor 2007). Therefore, it is likely that if burials are present on Kangaroo Island, they would likely occur in sand dunes, and as discussed, much of the development proposes to impact upon sand dunes in the public lands of the coastal reserve.

Heritage Concern 3 - Neighbouring Archaeological Sites: In Appendix L, Map 7-Page 31, the map identifies a reported Aboriginal archaeological site known as 'Site 6426 5073' as occurring in the Crown's coastal reserve, within a few hundred metres of the development and Fairway 6 (see Figure 1 and Figure 3). The Appendix L report provides no basic descriptive information on this archaeological site, including the site type, when it was reported, and who reported the site. With the exception of Map 12, the 'Site 6426 5073' is not mentioned in the report at all, and it does not appear to have been revisited by the heritage consultant. This information is fundamental for assessing heritage risk, and **I am concerned that the Minister has not been advised of the full details of 'Site 6426 5073'.** The site exists and is known to local residents. It is likely that this site was reported before the advent of GPS, so the precise site boundaries are not defined. The boundaries of the site extend for considerable distance along the coastal reserve, and the current map does not reflect the accurate expanse of the site. **The presence of this site in eroded sand dunes indicates that there are Aboriginal archaeological sites in the coastal reserve, which adds to my concern that there is an increased risk of buried Aboriginal sites in the stable sand dunes of the coastal reserve and southern project area.**



Map 7. Reported Heritage Sites AAR Register.

Figure 3 Screenshot of Appendix L-Map 7 (page 31) and the location of Site 6426 5073 in coastal reserve. Reproduced for internal discussion purposes only.

Heritage Concern 4 - Aboriginal Consultation: The authors of Appendix L have identified the Ramindjeri as Aboriginal stakeholders for this development on Kangaroo Island; however, I express to the minister that **I am concerned that the Ramindjeri and other Aboriginal stakeholders have not been consulted in regards to this major development.** Moreover, there are other Aboriginal mainland groups, including the Kurna (Adelaide Region), Ngarrindjeri (Coorong), and Narunnga/Adjahdura (Yorke Peninsula) that have not been consulted on this major development. Kangaroo Island has significant mythological and spiritual significance to all of these Aboriginal Peoples. All of these groups have organised heritage committees available to discuss major developments that may affect their cultural heritage. Consultation with these Aboriginal stakeholders would be in accordance with Section 13 (1e) and (1f) of the *Aboriginal Heritage Act 1988* (SA).

ECOLOGY AND ENVIRONMENT

Environmental Concern 1 – Water Pollution of Pelican Lagoon Fish Reserve: I recently returned from the Hawaiian Island of Kauai where I observed excessive marine algae growth that has overrun the marine environment and killed coral reefs along the north coast of the island. It is clear that nitrogen from fertilisers run-off are promoting the excessive algae growth, and one of the proposed sources for the excessive fertiliser run-off are coastal golf courses (Derse et al. 2007). The nitrogen contained in the nutrient rich fertilisers have encouraged excessive macroalgae growth, known as eutrophication, and the explosive growth of algae has destroyed much of the coral reef that is important to Kauai tourism. The authors of the study conclude macroalgae might be growing as fast as the fertiliser nutrients can be supplied, which suggest an ominous future for the norther Kauai coastline (Derse et al. 2007:5222).

Although Kangaroo Island is climatically and environmentally different to tropical islands, it has a unique and fragile marine ecosystem. **I am concerned about the potential for excessive fertiliser, grey water, herbicide, and other chemical run-off to pollute the Pelican Lagoon fish reserve and areas of the south coast of the island.** The Pelican Lagoon catchment is poorly understood, but it is clear that proposed golf course site covers a significant area of the water catchment for Pelican Lagoon and the south coast of the island. The south coast is a relatively exposed and open marine environment; however, Pelican Lagoon is a semi-enclosed aquatic system that does not experience the same high energy (and cleansing) ocean currents of the south coast. Pelican Lagoon is a slow and steady tidal system, sheltered from the open sea. There are no farms immediately surrounding Pelican Lagoon, so fertiliser run-off from agricultural activity is not presently an issue for the lagoon. The lagoon is an aquatic fish reserve, and a highly important fish breeding location. It is also an important resource to residents, the fishing industry, and tourism. It a pristine marine environment that has not been adversely affected by chemical pollutants. The PER briefly addresses the issue of potential contaminant run-off into the lagoon, but it does not attempt to estimate or calculate the amount of surface water and potential contaminant run-off that annually washes into by the lagoon. The PER makes an effort to describe pollutant containment techniques, but it does not address the issue of fertiliser run-off into the marine environment. This issue is easily studied through hydrological mapping with software such as ArcGIS, and there are many government agencies and consultants available the can conduct such studies. A considerable investigation of the water catchment area surrounding Pelican Lagoon is warranted to ensure that this vital marine resource is protected from the affects of excessive fertiliser, herbicide, sewage grey-water, and other unwanted pollutants. PIRSA or SA Water may be able to provide substantive advice in assessing the affects of possible contaminant run-off into the lagoon, and it is a worthwhile exercise for the government to obtain independent professional advice on maintaining the health of the fragile lagoon system.

Environmental Concern 2 – Kangaroo Culling: The PER and Appendix L provide options for the management of kangaroos at the proposed development site. It is well known that kangaroos occur in high numbers in the proposed development area, and as a local resident I have observed road traffic on Davies Road increase substantially as tourists and tour buses travel to view the kangaroos on a daily basis. These animals are valued by local residents and tourists alike, and they are the icon of the island. The proposed

development outlines that one option for managing kangaroos numbers is by culling the animals. This option is an unacceptable management choice for managing the island's most iconic animal. There are other best practice methods available for managing the kangaroo population that do not involve culling the animals. These methods include translocation, contraceptive darts, and a dedicated wildlife management team to assist with managing numbers. It is true that kangaroo numbers are high in the area, but the elevated population has subsisted and managed itself without human intervention for decades. **Moreover, I am concerned that the proposed culling of kangaroos opens the island to negative publicity and may have a detrimental affect on tourism.**

WATER RESOURCES

Water is the key to this project, and it is ambitious proposal put forth by the proponent to pipeline water from Middle River Dam and store it in a large 100 megalitre dam on site.

Water Concern 1 – Pipeline: Water is a precious resource to the Kangaroo Island Community. **I am highly concerned that it is not in the best interest of the community to have its limited water resources pumped across the island to water golf course greens.** The island just experienced the driest spring in years, and global warming is likely to affect rainfall in the future. Future extreme climate events will undoubtedly put stress on island water resources. The PER is unclear on the details of the water agreement with SA Water, and offers only a memorandum of understanding to supply the golf course with water from Middle River Dam, under specific conditions (e.g., winter run-off, only when spilling, and no change to the size of the storage dam). In my opinion, further details of this agreement should be canvassed for public consultation, as it significantly affects the island community. How will water be managed in times of drought? What affect will removing winter water overflow from Middle River Dam have on the ecosystem downstream from the dam? Will farmers and townships have priority over the golf course? What is the contingency plan if the golf course cannot be supplied enough water during the winter run-off from Middle River Dam?

At a public meeting in August 2014 last year, Justin Trott suggested that SA Water was considering the option of storing the majority of the water used by the golf course in +200 megalitre dam near the racecourse. In this proposal, water would then be accessible to Kingscote and the greater island community. The proposed golf course could then access the water as required and store it in a small 10 megalitre dam on site.

This optional water proposal, although discussed at a public meeting in Kingscote last year, is not presented in the PER. Is it no longer an option? If the project proceeds, it is a better outcome for the Kangaroo Island community.

Water Concern 2 – Storage Dam: A considerable area of land will be impacted to construct a holding dam for water on the golf course. It is proposed that a 100 megalitre dam will be constructed on a karst limestone landscape. **I am concerned that if the dam is not constructed properly, water may escape (and thus be wasted) through the cracks and sinkholes of the underlying karst geology.**

Moreover, a large area of land will be permanently scarred from earthworks to construct a +100 megalitre holding dam. A smaller holding dam would offer less impact on the landscape and mitigate the possibility of losing a massive amount of water if the dam fails. Moreover, the water stored in the dam will be chlorinated, and the PER does not address what affect a large supply of chlorinated water may have on the environment if a large amount of water leaked into the ground water supply and Pelican Lagoon catchment.

TRAFFIC AND BUSHFIRE MANAGEMENT

It is proposed that Davies Road will be the major arterial to access the proposed golf course. In my opinion, the Traffic Management Plan (Appendix M) does not provide many critical details in the assessment of traffic on this gravel road.

Traffic Management Concern 1 – Road Safety: **I am concerned that the authors of the Traffic Management Plan (Appendix M) have not visited the project area because the plan does not accurately reflect the traffic hazards along Davies Road, Cathers Road, and Simpson Road (where I reside) (Figure 4).** There are a number blind hill crests, sharp turns, and overgrown vegetation along Davies Road that are potentially hazardous to drivers. None of these hazards are discussed in the report.

Of upmost concern is a blind curve and intersection at the junction of Davies Road and Simpson Road, which I drive daily to access my property (Figure 4). **There is no mention or consideration of the Simpson Road intersection in the Traffic Management Plan (Appendix M), suggesting to me that the management plan is not based on a ground-truthed field inspection of Davies Road.** It is puzzling that the Simpson Road intersection has been ignored in the management plan, and it leads me to question if the traffic management plan is based solely on a desktop study. There are no photos of Davies Road or Cathers Road in the Traffic Management Plan (Appendix M), which implies that the authors may not have physically inspected either road for traffic hazards. If this is the case, it is highly concerning that the Traffic Management Plan is not based on any real world inspection of the hazards along Davies Road, Cathers Road, or Simpson Road.



Figure 2: Existing Traffic Counts

Figure 4 Screenshot from Appendix M traffic management report. Note that Simpson Road intersection (where I reside) is not included in the report.

Traffic Management Concern 2 – Road Upgrade and Future Maintenance: If the proposed development is granted approval, Davies Road will require a significant upgrade to safely access the golf course resort. If the traffic numbers are as predicted, the road will become heavily used by visitors to the island. Much of the road is single lane, and it will need to be widened. Hillcrests will need to be removed and graded, and native vegetation (including large trees) will need to be cleared to improve traffic visibility and provide access for large trucks. **I am concerned that the upgrade will be a costly process for the local taxpayer, and I am concerned that the gravel road will quickly deteriorate from elevated visitor traffic and residents will bear the burden of driving potentially hazardous and loose gravel roads.** I question whose responsibility it will be to maintain the road? Will the golf course resort pay for the future maintenance of Davies Road and intersections, or will the Kangaroo Island Council and taxpayer be responsible for upgrading and maintenance of Davies Road? What road maintenance agreements are there with the local council?

Traffic Management Concern 3 – Fire Safety and Evacuation: The major residences, clubhouse, and buildings of the proposed development are in a high bushfire risk area. I have read the proposed fire and evacuation management system (Section 12.2 PER) and **I am concerned that the fire safety and evacuation plan does not provide an alternative evacuation route to Davies Road.** This means that there is only a single road into and out of the proposed resort. The fire safety plan intends to encourage

visitors to find safe refuge in the clubhouse facility, but offers no specifics on the fire resistant design of the building. This is concerning to me as it is very difficult and impractical to make a fire-proof facility to accommodate several hundred visitors (if the facility is booked to capacity). It is proposed fire fighting foams may be used to protect the property and visitors; however, the safest option would be for visitors to evacuate and not be there at all. There is no alternative evacuation plan in the PER.

If the development is affected by a bushfire, it will more than likely come from the north, when extreme or catastrophic fire conditions coincide with hot northerlies. This means that the bushfire will come from the main access along Davies Road, towards the proposed footprint of the major buildings. As a local resident, I am very concerned that the Fire Safety and Evacuation Plan are inadequate for this major development and it requires an on-site evaluation and plan endorsed by the state authority on bushfire management, the South Australian Country Fire Service.

SUMMARY

I offer this submission to the Minister for Planning and DPTI because I believe that the PER does not provide the Minister and DPTI sufficient details on matters of Aboriginal heritage, ecology and environment, water resources, and traffic/bushfire management. Much of the project extends into the sand dunes of the Crown's coastal reserve, where there is 'extremely high risk' for the development to impact upon ancient Aboriginal heritage sites (e.g., burials, shell middens, and artefact scatters). Details in the PER are also lacking in regards to the potential run-off effect of fertilisers, gray water, herbicides, and other pollutants into Pelican Lagoon. Additionally, the PER (page 144) proposes "Despite any plans to install peripheral fencing it is expected that effective kangaroo control and management will be achieved by culling to control numbers and the use of specific planting to reduce the attraction of the site." The kangaroos are a tourism asset and icon on the island. The local kangaroo population is visited regularly by tour groups, and kangaroo viewing is the principal reason for most of the current road traffic on Davies Road. As a local resident, I am concerned that a mass culling of these animals in the name of development is likely to be very unpopular and may adversely affect Kangaroo Island brand and the island's international image.

The PER document is also unclear on the detailed terms of the water agreement with SA Water, where the plan is to construct a 35km water pipeline to the proposed development. The current PER proposes to excavate and construct a +100 megalitre dam, which will permanently impact the landscape and create a larger animal management issue due to the increased availability of water. Moreover, there is some risk that the irrigation dam may leak due to the underlying karst geology, and precious water resources may be wasted.

The submitted PER traffic management plan does not contain details on the specific hazards and required upgrade of Davies Road. Information on blind hill crests, corners, and significant intersections (Simpson Road/Davies Road) are not discussed in the document, and the lack of photographs and intersection specifics of Davies Road imply that the road was not subject to a field inspection, which may explain the insufficient details on the road's hazards and safety issues. Moreover, the document does not clarify

who will be financially responsible for the upgrade and future maintenance of the road (e.g., local taxpayer vs. proponent). I am also concerned that the proposed fire management plan does not provide ample safety for visitors during extreme and catastrophic fire alerts, as Davies Road is the only access and exit point from the proposed golf course clubhouse, and in all likelihood, Davies Road is the direction from which the bushfire front will derive on windy and hot northerly summer days.

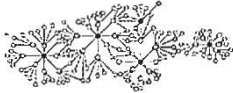
Based on the lack of details in the current PER submitted for public consultation, I do not believe approval should be granted for the Kangaroo Island Golf Course Resort. In my opinion, a more detailed and thorough PER should be required before the Minister can make any decision in regards to this 'Major Development.' I appeal to the Minister and DPTI that the current PER is insufficient and development approval should not be granted for this project.

REFERENCES

Derse, E., Knee, K. L., Wankel, S. D., Kendall, C., Berg, C. J., & Paytan, A. (2007). Identifying sources of nitrogen to Hanalei Bay, Kauai, utilizing the nitrogen isotope signature of macroalgae. *Environmental science & technology*, 41(15), 5217-5223.

Moffat, I., Wallis, L. A., Hounslow, M. W., Niland, K., Domett, K., & Trevorrow, G. (2010). Geophysical prospection for late Holocene burials in coastal environments: Possibilities and problems from a pilot study in South Australia. *Geoarchaeology*, 25(5), 645-665.

Raynor, K. (2007) *Sacred ground, in the lucky country, 40,000 years of ancient heritage and culture is being swept away: a study guide*. ebook, accessed 26 June 2015.
<https://www.abccommercial.com/librarysales/sites/abccommercial.com.librarysales/files/studyguides/sg_sacredground.pdf>



BUSINESS

KANGAROO ISLAND

PO Box 896
KINGSCOTE SA 5223
www.businesskangarooisland.com.au
info@businesskangarooisland.com.au

Minister for Planning
Attention: Mr Robert Kleeman,
Manager, Development Assessment (Investment Management)
Department of Planning, Transport and Infrastructure (DPTI)
GPO Box 1815
ADELAIDE SA 5000

RECEIVED
26 JUN 2015
DPTI
PLANNING DIVISION

dpti.kigolfcourse@sa.gov.au

18th June, 2015

Dear Mr Kleeman,

Please find attached a report from **Business Kangaroo Island and its 97 members** in support of the Kangaroo Island Golf Resort.

We have spent considerable time going through the detailed PER and attending the public consultations to ensure that our consideration is thorough and informed.

It is the belief of the wider business community on Kangaroo Island that this proposal will result in long-term positive economic development on Kangaroo Island without adversely affecting our social ideals and it will enhance our environmental credentials in offering both a new and a wonderful experiential tourism opportunity.

Thank you in consideration of our report.

Kind regards

Sharon Kauppila
Chairperson

Attachment – KI Golf Resort Study Report BKI

KANGAROO ISLAND GOLF RESORT

Business Kangaroo Island (BKI) supports the proposal of the Kangaroo Island Golf Resort at Pennington Bay, Kangaroo Island.

BKI is an organisation who, as dictated in its charter, seeks to advocate for and on behalf of all businesses on Kangaroo Island and to publicly support investigated development, improving outcomes for existing and new operators. Our support is based on the following explanations provided in the executive summary of the Public Environmental Report:

Part A - Background

1.0 & 2.0 Introduction & Background of the Project

- It is made very clear under the heading of expected local, regional and state benefits and costs that the project will create a range of employments opportunities, directly in the employment of local tradespeople during the construction phase and also indirectly through the provision (where possible) of local materials. BKI support these proposals.
- Up to 60 people will be employed in the construction phase with 25 jobs available afterwards. Very importantly the recognition of possible apprenticeships on the turf farm, providing the opportunity for skill development of young people and investing in our future. On an island with a population as small as Kangaroo Island, these numbers are significant.

Part B - The Project

3.0 Description of the Proposal

- The site chosen is significant, the views are stunning – giving this course the wow factor required for success.
- The site is neglected and overrun with invasive weeds (Onion and Lincoln weeds and African Boxthorn). The proposed management plan will reverse this degradation; this is strongly supported by the Natural Resource Management Board in their strategic plan and endorsed by BKI.
- Design of the building using local stone will blend with the surrounds and will have very little visual impact off site, therefore not impinging on views from Pennington Bay and Pelican Lagoon
- Management control proposed utilising quality local contractors with a recognised environmental management plan will, we believe, minimize environmental threat

(i.e. contamination with phytophthora and dust and noise escaping the site) especially in the construction phase. Another reason to ensure that local contractors are extensively used.

Part C - Environmental, Social & Economic Assessment

4.0 Planning and environmental legislation and policies

- As noted it is zoned primary production. The claim that this was last burnt in 1954 is incorrect as the locals can tell you that it was burned frequently since then up to the late 70's. The reason was to manage and sweeten pasture for grazing of livestock.
- It is noted that fairways that intrude into the coastal conservation areas have been planned to minimize both physical and visual impact.
- Under KI Natural Resource plan there is a strong desire to restore degraded areas. The proposed management of feral weeds will sit well within these ideals
- As noted in the plan a 10% increase in tourism numbers has a huge impact on local economies not only in employment but also in monetary flow-on.

5.0 Need for the proposal

- As stated above; employment is of a premium concern – growth in the tourism industry is welcome, which will in turn bring more people to the island and increase number of nights stay and money invested back into our community and essentially the state.
- Money that flows in to the Island economy will multiply through the community by 2-2.5 times.
- Degraded areas will be restored. Management programs will ensure that overgrazed, weed ridden and eroded areas will be carefully restored utilising indigenous species.
- The proposal of a golf resort opens up a whole new tourism experience on Kangaroo Island and therefore brings a different type of tourist to the market place. They will stay more than one day, and most often travel as a family or in groups; and will visit and taste what Kangaroo Island has to offer pumping money into our economy.
- The proposed water pipe line, has the potential (in the future) to benefit those living along the route as well as possibly serving American River. While water is being taken out only in the wet season (in times of excess) very little impact will occur at Middle River.
- The benefits of a world class golf resort on KI will benefit not only KI but will encourage increases in tourism locations throughout the State. Golf brings a different type of tourism experience.

- It would be a great loss not only to KI but to whole state if this proposal fails to go ahead.
- The degraded site has the potential to be restored to not only a pristine area again but also to become very attractive.

6.0 Environmental Issues

- Flora – when the site is overrun with weeds the native flora has little hope of returning. Control the weeds and re-veg is proposed. We note fire is to be used. We encourage this. Our local flora in most cases needs fire to be restored.
- Fauna – There certainly will need to be a management program for kangaroos. We suspect that this will have to be extended to wallabies and the brush tail possum. As noted, wallabies and possums are more nocturnal than kangaroos therefore very hard to determine numbers. This site as noted will certainly have to be fenced.
- We suspect that the proposal will result in an increase in the numbers of heath goannas and bandicoots as habitats are restored and the environment is better cared for and promoted.
- We certainly would not hold this project back on the assumption made that it could be a site for bandicoots and possible fly over of Osprey and white bellied sea eagle.
- We note that the proponents have made amendments (changed the layout of the holes) to the areas of vegetation to be cleared to reduce visual impact. A positive and commendable change.

7.0 Economic Issues

- This project details sound economic performance and returns with many opportunities for locals for employment and flow on industries and services (i.e. local transport/shops/tour operators etc). A stated multiplier effect of 2.0-2.5.
- An area of concern is that there is no mention of the tender process and any indication that principal contractors from Kangaroo Island will be invited to tender. It is our strong belief that every effort should be made to ensure that suitably qualified local builders are invited and encouraged to tender. Major projects such as the proposed golf course need to ensure that the local building and construction industry are considered as valuable assets to the project and that they have the ability to tender for works (not just sub-contractors).
- The opportunity that this project brings to extend lengths of stays and the multiplier effect is commendable.

8.0 Social issues

- Ferry and especially airport schedules may need to be adjusted to cater for increases in numbers. The proposed Kangaroo Island Airport upgrade, which will enable larger planes to fly direct to Kangaroo Island, is essential to the success of this project.
- Programmed Turnpoint and the State Government should ensure that the airport upgrade (and subsequent funding applications) are strongly supported.
- The increases to visitation (directly attributable to the growth in the market from the development of the Golf Resort) especially through the airport has the capacity to increase employment at the airport (The KI Council is able to provide details of economic analysis which demonstrates that every additional 10,000 passengers will add \$5.6M Gross Regional Product and 56 FTE jobs!)

Summary

In summary Business Kangaroo Island (and our members) support the proposed Kangaroo Island Golf Resort development based on the following comments.

Being a degraded area, restoration will have a long-term positive outcome for this site. The development and management proposed has the very real possibility of restoring balance to native flora and fauna.

Employment opportunities for KI residents (and off island contractors) not only during the construction phase but on-going, provides a very strong case for the approval of this development.

We suspect the multiplying effect of each dollar could be as high as 6 (rather than the conservative figures of 2.0-2.5 indicated). This would have a very positive outcome to many businesses on KI.

The project will ensure that local builders, including earth workers, plumbers and electricians are able to grow in experience and skills in being given the opportunity to tender and work on such a major project. These opportunities are not taken lightly but are essential the future growth and development of the building and construction industry and allied trades and services on Kangaroo Island.

We welcome the opportunity for our young people to gain high levels of skills in the hospitality and horticultural industries and have the chance to work with people from all over the world.

The Kangaroo Island Golf Resort fits in with current local, state and federal environmental legislation.

And finally the coming together of the State Government, Kangaroo Island Futures Authority, Kangaroo Island Council and many islanders working together to identify and unlock opportunities for Kangaroo Island's future, in the production of the;

- **The Kangaroo Island Plan Addendum** which provides the strategic directions for the Island's future economic and social sustainability.
- **Kangaroo Island Structure Plan** which will assist the delivery of the strategies in the *Kangaroo Island Plan* by providing a framework for a sustainable economic future based on tourism and agricultural growth, balanced with the protection of the Island's natural resources. And the
- **Sustainable Futures Development Plan Amendment (DPA)** which will amend the Kangaroo Island Council Development Plan in order to implement the Structure Plan through zoning and new policies. The Development Plan will be used to assess proposals for new developments.

-

The Kangaroo Island Golf Resort is well supported by the above documents as it;

- Will encourage sustainable growth in Kingscote, Penneshaw, Parndana and American River and make the best use of their existing and expanded infrastructure.
- Maintains a balance between supporting KI's growth, competitiveness and productivity and protecting the Island's natural resources.
- Reinforces the expanded role of Kingscote and Penneshaw as the main passenger and freight gateways to the Island.
- Provides opportunities for tourism accommodation in the Coastal Conservation, Conservation, Primary Production and Water Protection Zones.
- Incorporate high-quality design to protect coastal landscapes.

Mackenzie, Alex (DPTI)

From: Graham Churchett [natbase@senet.com.au]
Sent: Wednesday, 24 June 2015 4:25 PM
To: DPTI:KI Golf Course
Subject: PROPOSED KANGAROO ISLAND GOLF COURSE RESORT

Minister for Planning, The Hon. John Rau, LLB, MP

Robert Kleeman, Manager

Development Assessment (Investment Management) Department of Planning, Transport and Infrastructure (DPTI)

GPO Box 1815 ADELAIDE SA 5000

DEVELOPMENT ACT 1993

PROPOSED KANGAROO ISLAND GOLF COURSE RESORT

RELEASE OF PUBLIC ENVIRONMENTAL REPORT (PER) FOR PUBLIC COMMENT

Dear Sirs

I write to express concerns regarding the proposal to establish the Kangaroo Island Golf Course Resort. I am not against development but have serious misgivings regarding this proposal. There are many areas where costings have not been divulged and am therefore suspicious that their omission has been intentional.

There are numerous golf courses easily accessed and well provisioned in the State and I contend that we have enough of such facilities.

One needs to take into consideration that there have been a number of significant golf course failures too. eg Warinna, Greg Norman's York Peninsula scheme went into receivership, The Links at Lady Bay, all failures. There was also the white elephant event at Vivonne Bay not all that many years ago that had to be bailed out with tax Payers money and local businesses so why does Kangaroo Island have to have another chancy development to contend with where rate payers will no doubt have to make good the outcomes of this folly.

Costs

The proposal cost stated is 14 Million dollars and provides for design costs, 35 units, a two story club house, restruant, spa, pro-shop, 70 guest lodges, 40 private villas and 9 staff units and a golf course superintendent's dwelling.

It is also noted that the building height exceeds the 6.5 metre provision.

Then there are the major earth works, dam construction, water storage, vegetation removal, effluent system, reticulated water, 80 car park to be constructed, weed control, fencing, solar provisions, generator plants, road construction, irrigation installation, and a

35 km pipeline. Another point re dam construction, there is no clay here and this would have to be imported and with it, an assortment of weed species.

There is also the potential to introduce Phytophthora sp, an uncontrollable plant pathogen that is rife on Kangaroo Island and spreading rapidly.

The serious nature of this plant pathogen has been well described. Clearly, the movement of soil and plant material by heavy machinery and past fire and roadside vegetation management practices have been instrumental in the spread of PC.”

Power

Quotation for power alone is \$1.9 million and Kangaroo Island residents have had costly supply failures in the past so how will this impact on the grid and then there are costs relating to installations and other associated works.

And all this for \$14 million?

Not possible.

Water

I can not believe that the 35 Km pipeline costs are provided for in the \$14 Million quoted so who is paying for this and what is the total area of native vegetation to be cleared to facilitate its installation and what threatened/endangered species are found here?

It is also worth mentioning that American River residents have been lobbying for years for a pipeline for their domestic needs but have been ignored.

It is significantly obvious that we are experiencing dramatic changes in weather patterns and rainfall reliability.

For 28 years I have been researching on the island and have noted dramatic changes in bushland understory and wildlife number decline of some species in some areas. This has been caused by irregular rainfall and long drying out of soil moisture that has not sustained plant regeneration.

Consequently, water on the island is a precious resource and it would be a precarious decision to allow it to be used to water and sustain this proposal. Again, so far this winter we have experienced record low rainfall.

Even if the site builds the holding capacity, there is no reliable formula that will guarantee sufficient water when needed and considering the significant water uptake of the island sands, much of what is used will quickly pass by the turf root zone. In summer the island's water capacity to supply domestic needs is running at its maximum and it is irresponsible to threaten this supply for an ill conceived development. It also begs the question, has SA Water carried out a feasibility study to justify the construction of this pipe line?

Fire fighting requirement and Provisions

There is also the requirement of a reliable water storage and reticulated system for fire fighting purposes and equipment to consider and as high fire risks and heavy greens water usage will both occur in summer months, fire fighting water will need to take precedence over turf.

Weather

My experience is that there are many days that are quite unpleasant out doors, especially near the South Coast due to the strong and gusty wind conditions that prevail here. This will impact and not enhance the idyllic “golfing experience” as the site location has no protection from the vagaries of weather. In winter the chill winds would preclude activity.

Coastal Conservation Zone.

The development is too close to the Coastal Conservation Zone and will be detrimental to the vegetation and endemic fauna.

This is a site of immense flora and fauna wealth and intrusions into its delicate fabric will certainly bring about environmental issues. The natural Integrity of its unique wildlife and natural places is the prime essence of Kangaroo Island's message to attract international and local tourism.

Dune systems.

The fragile dunes will be prone to blow out problems, with vegetation clearance and damage. Impact by tourists walking over the site will in time create problems that will be extremely difficult to remedy.

There is a conflict of interest here. To potentially destroy aspects of the natural values of this area makes no sense.

Fauna of conservation significance

Western Whipbird (*Psophodes nigrogularis*)

The Western Whipbird favours heaths, mallee and is found on coastal sites. The bird is common in protected sites but generally rare. No mention of this or the

Fairy Penguin colony in the report and the threats to them by dogs and cats that may be brought onto the site by patrons. What controls will be put in place to prevent dogs or cats roaming?

Osprey (*Pandion haliaetus*) and **White Bellied Sea eagle** (*Haliaeetus leucogaster*)

The Osprey, a threatened species, has a breeding population on Kangaroo Island that has declined to 11% over the past 18 years (Dennis et al. 2005).

Now we only have 8 breeding pairs. Sensitive to human activity and Dennis (2011) recommended a 2K buffer around such nest sites.

There could also be other fauna of significance. eg

Kangaroo Island Dunnart (*Sminthopsis aitkeni*)

The Kangaroo Island Dunnart is the only endemic dunnart on the island and only eight individuals are known from five sites.

Southern Brown Bandicoot (*Isodon obesulus*)

The Southern Brown Bandicoot is considered to be a South Australian species that is vulnerable to extinction.

Heath Rat (*Rattus shortridgei*)

The Heath Rat was only collected on Kangaroo Island in 1967 and the establishment of a recovery plan is a high priority.

Note - The above mammals are Nationally Listed under the Commonwealth Government's "15 National Biodiversity Hotspots" for Kangaroo Island and live in the habitat type proposed for development.

Introduced grasses.

My experience as a landscape consultant is that Couch grass (*Cynodon dactylon*) is a fast colonizing specie that if allowed to escape into bushland it is quite impossible to control without considerable damage to native species. It has the ability to not only set seed, it can reproduce from small stem segments and rhizomes. It is an aggressive colonizer and will not be able to be prevented from seeding. The concept that couch will not be allowed to set seed is just wishful thinking.

Microclimates will occur, seed will set, and it will only take one wallaby or kangaroo to graze on the site, then pass scats in the Coastal or other neighboring areas of native bushland to bring about the establishment of a Couch infestation.

Will the entire property be fenced off from grazing fauna and those that dig? Introduced grasses and water will irresponsibly increase wallaby and kangaroo numbers – unnecessary culling will no doubt be called for as scats on putting greens will not be acceptable. Culling here will put an ugly face to the island's International and local image.

The sandy soils will absorb huge quantities of water and Middle River will not always have a so called surplus to water grass. Our climate is already changing, we have an unreliable rainfall pattern and there is no certainty that sufficient can be captured and stored. Industries on the island are low water based for good reason and to use this precious limited resource on irrigating golf links would be grossly irresponsible.

Aboriginal sites

What surveys have been undertaken to identify and protect Aboriginal sites?

Refuse collection/disposal

Storage and disposal systems are not clearly defined.

(1)How will contamination of the coastal/local environment by leachate/other pollutants, be prevented?

(2) Prevention of food waste being accessed by fauna having the potential to create undesirable population build up.

Note - eg, Grey currawong, population explosions on the island that have shown to be predators of young goannas and other fauna.

Conclusion

Clearly this proposal begs more questions and responses than it provides and it is somewhat of a surprise that the government has again chosen to override the Kangaroo Island Development Plan by making it a Major Development. It appears that the strict criteria for making such an assessment has been bypassed and regards the Kangaroo Island Development Plan is a farce.

I am therefore of the opinion that for the reasons outlined, the development application should be refused and that assessment criteria for proclaiming Major Development Status be substantially raised.



Graham Churchett

NATURE BASED SERVICES

extravagant, wasteful use of the island's limited water resources

high chemical use development is not "clean & green"

severe intrusion onto the delicate **Coastal Conservation Zone** and would have a detrimental impact on its biodiversity, particularly endangered coastal birds.

The chances of it becoming another white elephant are extremely high (the \$14M budget is fanciful to start with).

public relations disaster could effect the whole island economy.

The proposal is clearly not in keeping with the wild, untamed, unique, natural characteristics of Kangaroo Island, which underpins its international reputation.

4. Kangaroo Management and control – in terms of population control and ongoing management. Will shooting kangaroos be acceptable to tourists, particularly Asian tourists?

travelcost effective. This challenge should not be underestimated.

Economic Sustainability

degree of scrutiny and cost of process.

Considering past failed attempts to establish resort facilities in this region we have no data demonstrating that the proposed development will be economically

viable.

why have the proponents not been directed to show data supporting economic sustainability?

there are too many unanswered questions and this development must be subjected to an Environmental Impact Statement.

has been taken up as a Major Development by the Minister and as previously stated, we repeat in the strongest possible terms, that we feel betrayed by a government which preaches environmental integrity but in fact is acting in a manner that renders the Kangaroo Island Development

plan utterly worthless and the government's action has had the potential to set an unacceptable precedent for developments in sensitive areas.

Andrew Collis
PO Box 909
Penneshaw, SA 5222
andrewcollis@yahoo.com

29 June 2015

Minister for Planning C/-
Robert Kleeman, Manager, Development Assessment
Department of Planning, Transport and Infrastructure (DPTI)
GPO Box 1815
ADELAIDE SA 5000

dpti.kigolfcourse@sa.gov.au

Re: Submission on the Public Environmental Report (PER) for the proposed Kangaroo Island golf course resort

This letter outlines my response to the Public Environmental Report (PER) for the proposed Kangaroo Island golf course resort. My comments are limited to environment and heritage matters and are informed by my local knowledge (I own a property on Cathers Road, immediately north of the proposed development area), and my experience as a heritage professional (I am an archaeologist with experience in Aboriginal heritage assessment and management). The letter is organised into five sections: the first summarises my key findings and recommendations, the second outlines my concerns regarding potential impacts to cultural heritage, the third provides comments on the proposed Kangaroo management strategy (and potential environmental benefits), the fourth outlines concerns regarding the contamination of ground water and the fifth presents concluding remarks.

1.0 KEY FINDINGS AND RECOMMENDATIONS

I do not regard the PER as adequate or sufficiently detailed to inform a proper assessment of either the proposed developments potential benefits or negative impacts in regard to heritage and the environment. I provide the following comments and recommendations:

The proposed development has significant potential to impact archaeological sites. The proposed measures to prevent or substantially minimise these impacts are inadequate. The heritage assessment report used to support the PER is inadequate and misleading. **It is recommended that the applicant engage a heritage professional to undertake a heritage assessment (to replace the existing assessment) in order to provide the minister sufficient information to properly understand the potential impacts to cultural heritage and the effectiveness of any proposed cultural heritage management strategies.**

The proposed development will have a significant impact on the large kangaroo population in the local area. The PER recognises the need for a 'kangaroo management plan', however it does not provide sufficient details of this strategy and consequently the exact nature and extent of the impact to kangaroos (and any associated impacts or benefits to the local environment) cannot be assessed. **It is recommended that the applicant provide details of the proposed kangaroo management plan to enable the minister to properly assess potential impacts to the kangaroo population and the local environment.**

The proposed development will require the use of fertilisers to establish and maintain fairways and greens; it will also involve the treatment of sewage and grey water. The risk of groundwater contamination is not sufficiently addressed by the PER. **It is recommended that the applicant commit to specific strategies for the use of fertilisers, and the treatment of sewage and waste water, and engage a consultant to model potential groundwater contamination scenarios.** Without this information the risk of groundwater contamination and potential impacts to the Pelican Lagoon ecosystem cannot be properly assessed.

2.0 CULTURAL HERITAGE

As an archaeologist I have an interest in the prehistory of the island and I am particularly concerned about the potential impacts to Aboriginal cultural heritage. I have found many stone artefacts within the proposed development area and on the surrounding lands, and also a large site (artefact scatter) in the coastal reserve adjacent to (and possibly within) the boundaries of the proposed development area.

The heritage report used to inform the PER, provides misleading information and reflects a very poor understanding of the archaeology of the proposed development area. I do not consider it to be of sufficient quality to be used in the PER and suggest another consultant be engaged to undertake another independent assessment.

There are many concerning aspects to the report, but two are particularly alarming:

- The report assigns risk levels to areas within the proposed development area (risk here largely refers to the likelihood of 'encountering heritage items') and identifies areas of 'moderate risk' and 'extremely high risk' on the same landform unit/dune. The boundary between areas of 'moderate risk' and 'extremely high risk' has no archaeological rationale and coincides exactly with the boundary of the general project area.
- The construction of six of the 18 holes will directly impact areas of 'extremely high risk', however the report does not stipulate the requirement for archaeological investigations in these areas. Monitoring construction, without having first undertaken an archaeological survey, test excavation or salvage excavation, is not an appropriate cultural

heritage management strategy within areas considered to be 'extremely high risk'.

Other significant failings of the heritage assessment:

- The heritage consultant did not look for (or find, or report the finding of) the recorded (known) site (64265073) during a site inspection. The site confirms the potential of the dunes to contain archaeological material and the archaeologist should have made an effort to locate it. The site is recorded as occurring very close to the proposed development area and, from my own observations, stone artefacts occur over a large area around this location. A part of this site (or site complex) is likely to fall within the development area and may be impacted by construction.
- The report does not consider the potential age of the dunes and the potential for stratification and relic (buried) soil profiles. These are important considerations in assessing the significance of the archaeology (beyond simply commenting on the likelihood of 'encountering heritage items').
- The report describes the location of the 'project area' as 'a relatively flat area behind a series of large coastal dunes' (and states that 'these dunes have a very high likelihood of containing cultural material'). However this is an inaccurate and misleading description: the proposed development area is undulating and much of it is comprised of coastal dunes.

The heritage report also considers historical (non-Aboriginal) heritage and refers to s27 of the Heritage Places Act 1993 (SA). This section protects land where there is 'reasonable cause to suspect that the excavation or disturbance will or is likely to result in an archaeological artefact of heritage significance being discovered, exposed, moved, damaged or destroyed'. However the report does not refer to any of the historical heritage within the proposed development area. A number of old ruins, most of which have associated underground cisterns, occur in the area (and are clearly visible on aerial photography). Two of these ruins appear to be old stone farmhouses and may be quite significant. They contain various historical surface artefacts and associated archaeological deposit, and are likely to date to a time when this land was first cleared. An historical archaeologist should assess these ruins and their associated archaeological deposit.

3.0 THE KANGAROO MANAGEMENT PLAN

The PER correctly identifies the need to manage kangaroos and wallabies in order to establish and maintain fairways and greens, however no specific details are provided regarding an intended 'kangaroo management plan'. Culling and exclusion of macropods (both of which are referred to in the PER) present significant ethical issues, and the extent that these measures may be used should

be quantified and considered prior to the approval of the proposed development. It is not appropriate or sufficient to simply state that a plan will be developed.

The proposed development has significant potential to provide positive environmental outcomes for the local area (eg improving habitat and enhancing biodiversity values), however this is largely dependent on the extent and type of fencing that will be used to exclude kangaroos, wallabies and other animals, and the type and extent of revegetation and plantings.

In order to assess potential environmental benefits of the proposed development and the ethical issues involved with killing, removing or excluding macropods, the following elements of the plan must be considered:

- the type, location, and extent of fencing;
- an estimate of the number of macropods that might be culled or excluded;
- the intent, and capacity of the fencing, to exclude other animals from the proposed development, such as cats and possums; and
- the species of trees/shrubs/herbs/grasses that will be planted, the extent of the plantings and the source of the seeds/seedlings .

4.0 GROUNDWATER CONTAMINATION

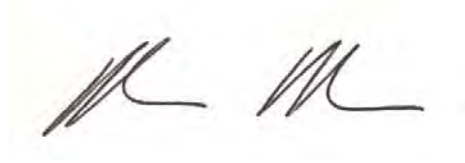
The proposed development falls entirely within the catchment area of Pelican Lagoon, an important and protected ecosystem. The extent to which fertilisers and pesticides, required to establish and maintain greens and fairways, and grey water and sewage associated with the proposed development might contaminate groundwater and infiltrate into the lagoon has not been adequately assessed. Of particular concern are nitrates, which might easily leach through the sandy soils (and dunes) and through the karst landscape (underlying calcarenite). The PER does not commit to specific and detailed strategies to minimise the risk of groundwater contamination or provide modelling incorporating estimates of fertiliser use (types and amounts) water use and the porosity of skeletal sandy soils, dunes and the underlying calcarenite.

5.0 CONCLUDING REMARKS

The proposed development has the potential to provide benefits and opportunities to the island community and also enhance the natural values of the local area, however it also has the potential to do considerable harm. If the PER is meant to assure the residents of Kangaroo Island (and other interested stakeholders) that the potential impacts of the proposed development are well understood and considered, then it falls short of its aim. In regard to the environmental and heritage issues highlighted in this submission the PER does not provide sufficient detail to assess potential impacts and, in the case of heritage, proposes inadequate management strategies. I sincerely hope that more information will be requested of the applicant prior to any decision being

made regarding its approval, to ensure that potential impacts are well understood and that effective management strategies are implemented.

Regards

A handwritten signature in black ink, consisting of a stylized 'A' followed by a horizontal line and a small flourish.

Andrew Collis

Major Development Application Kangaroo Island Golf Course Resort Submissions



Tell us what you think about the following aspects of the Public Environment Report.

Submissions may be made available for public inspection and would be included in the proponent's Response Document (that will be released for public information at a later date). Please indicate below if you object to your submission being made available in this way.

Name GRAEME CONNELL Address 33 ESPLANADE KINGSCOTE 5223
Telephone 0409806272 Email g.c.connell@bigpond.com

Overall, what do you think about the proposed Kangaroo Island Golf Course development?

GREAT IT WILL LIFT KANGAROO ISLAND INTERNATIONALLY
AND AS A PLACE TO SEE

Do you have any specific comments on the following?

Tourism and economy (Tourist visitation, job creation, value adding to local business etc)

I BELIEVE IT WILL BRING A DIFFERENT TYPE OF
TOURIST. PEOPLE WITH MORE MONEY.
GOOD FOR THE LOCAL ECONOMY ESPECIALLY
IF LOCAL PEOPLE ARE EMPLOYED & LOCAL PRODUCTS
USED

Environmental (native vegetation and animals, landscape, cultural heritage etc)

I DO NOT SEE THIS AS A PROBLEM AS THERE
WERE SEVERAL HOUSES WITH FAMILIES FARMING
THIS AREA IN THE LATE 18HUNDRED TO THE 19HUNDREDS
IT IS VERY DEGRADED & COVERED WITH IMPORTED
WEEDS. THERE ARE MORE ANIMALS IN THE AREA THAN
IN THE 1970S AS I WORKED IN THE AREA



Government of South Australia
Department of Planning,
Transport and Infrastructure

Infrastructure and services (Power and water use, delivery of services to the site etc)

GOOD AS IT WILL BE A BENEFIT TO OTHERS
ALONG THE COURSE THE POWER LINE TAKES &
ALSO THE WATER.

Buildings and design (Building location, design and architecture, landscaping etc)

GREAT SUITS THERE AREA

Traffic and access (safety and access, car parking etc)

DO NOT SEE A PROBLEM

Are there any other matters you would like to raise?

IT HAS BEEN CLAIMED THE AREA HAS NOT BEEN BURNT
SINCE THE 1950S THIS IS NOT TRUE AS I WAS INVOLVED
WITH BURNING THE AREA STARTING AT PENNINGTON BAY
TO THE YMCA CORNER EVERY 2 TO 3 YEARS IN THE 1960S
TO THE MID 1970S.

Please indicate your preference below:

Please make my submission public

Please *do not* make my submission public

Written submissions commenting on the PER are invited until 5pm, Tuesday 30 June 2015 addressed to:

Minister for Planning c/-
Robert Kleeman, Manager
Development Assessment (Investment Management)
Department of Planning, Transport and Infrastructure
GPO Box 1815
ADELAIDE SA 5000

or via email to: dpti.kigolfcourse@sa.gov.au

Further information

Call – 1800 PLANNING – press option 1

Visit – sa.gov.au/planning/majordevelopments

Email –



Government of South Australia

Department of Planning,
Transport and Infrastructure

29/06/15

1

29th June, 2015

Lisa Crago
11 Davies Road
Pelican Lagoon SA 5222

Minister for Planning,
Attention: Mr Robert Kleeman
Manager Development Assessment
Department of Planning Transport and Infrastructure
GPO Box 1815
ADELAIDE SA 5000

sent via email :- dpti.kigolfcourse@sa.gov.au

Dear Minister/Sir,

As the owner of section 306, at 11 Davies Road Pelican Lagoon, I am the only resident of Davies Road, and one of only two permanent residences in the access area of this proposed development. As such, I forward this submission in response to the: PUBLIC ENVIRONMENTAL REPORT FOR KANGAROO ISLAND GOLF RESORT LOCATED AT PENNINGTON BAY, KI.
For consideration by the Developer, relevant Government Departments, the Minister for Planning, the Development Assessment Commission (DAC), and Governor.

Economic & Social Issues

Re: It is not envisaged that the proposal will have any conflict with adjoining primary production activities.

Section 306 has been a property involved in primary production since 1884. It has a rich history and is known as YMCA corner. It is currently being developed as an organic fruit orchard and vegetable farm. The small amount of good quality unpolluted ground water located here is essential to this production, as well as obtaining and maintaining organic certification. This is in keeping with KI's 'clean green image' and the promotion by Tourism SA of a farm gate locally grown food experience, for visitors and residents alike.

This report clearly states there will be no pumping up of groundwater for use by the resort.

There is currently no cropping or large scale use of chemicals in this area. Growing grass for a golf course will require large amounts of chemicals (herbicides and fertilisers). On a porous limestone base with little to no topsoil, it is probable that run off from these chemicals will enter the aquifer. As such, there is a high risk that the ground water supply

will be affected. This would be in direct conflict with my primary production activities. Organic certification for my produce may be denied. This would be to my economic detriment.

This aquifer also drains into the highly sensitive protected waterway of Pelican Lagoon.

Water is our most valuable resource. This development is being built on the driest section of land on KI, in the driest State, on the driest continent on earth.

This ground water is vital to landholders and must be protected.

The report (4.5 - page 54) states wells will be sunk to monitor ground water for pollution. Clearly the potential for this pollution is not denied. Polluted ground water can not be 'remediated'.

6.10 Groundwater and Site Contamination (page 108)

In view of the known history of the site and its use for broad acre grazing and its subsequent retirement from active agriculture some 20 years ago, there is no evidence of contamination sources and therefore a preliminary site investigation conducted by a site contamination consultant in accordance with the National Environment Protection (Assessment of Site Contamination) Measure 1999, was not undertaken.

Given the potential and probability that future wide scale use of chemicals may pollute the environment and groundwater, it would seem essential that a site contamination consultant undertake a full investigation as per the *National Environment Protection (Assessment of Site Contamination) Measure 1999*. This would provide a base level of possible contamination levels, enabling a full and accurate establishment of causation, if and when any contamination of groundwater occurs.

This investigation absolutely must be carried out.

All safeguards, regulations and protections must be stringently adhered to. There can be no corners cut, nor shortcuts taken, where our sensitive natural environment is concerned.

I shall undertake testing of my own wells for a base level reading of any contamination, and should this development proceed, I shall continue with this testing at regular intervals.

Power - Appendix J

The two options given in the SA Power Networks letter (*28 July 2014, SA Power Networks, Andrew Haines, att. Sally Smith*) create some confusion and appears to be inconsistent with the map supplied with 'Appendix J'.

Will this development source power from a substation at Davies Road/Hog Bay Road, via a new overhead powerline to be constructed along 1.7km of Davies Road (as per the SA Power letter); or, via the 'Proposed Mod 3 substation' at Government Unnamed Road/Hog Bay Road, at 'transmission pole 130' on the existing 33Kv overhead mains, as per the map supplied in 'Appendix J' ?

The map provided, and some statements in the report appear in conflict with the documentation in Appendix J.

The risk of bushfire from overhead power-lines is a known and provable risk. Running overhead power-lines along Davies Road in a densely wooded High Bushfire Zone creates a bushfire risk. Best practice in new developments in High Bushfires Zones areas is for underground power-lines.

If a new power-line is to run down Davies Road, as per the SA Power letter, I request a detailed map and plan of this proposed power-line so that a true and proper assessment of risks and proposed easements may be considered by the adjoining land holders.

Re: Appendix O - ENVIRONMENTAL MANAGEMENT PLAN- EMP

It is disappointing to see this document is a form plan with no specific details relating to this exact site, or a rural development in a sensitive area. It could be an EMP for a shopping centre in a CBD.

Access – Traffic

Appendix M - Infraplan Traffic Consultant

This Infraplan traffic study is limited, containing errors of fact, and serious omissions. It is manifestly inadequate and should not be relied upon.

The report relies on a DPTI traffic count taken in 2012. Tourist traffic is seasonal, as is heavy vehicle with the transportation of seasonal livestock, therefore, which month was the data this report relies upon taken?

2.5 Crash Analysis

*re: Five years of crash data was sourced from DPTI and reviewed to determine if there are any safety issues at Davies Road junction with Hog Bay Road.
No crashes have been reported at the subject junction during past five year period from 2009 to 2013.*

YMCA Corner, as this place is known, possibly has more single vehicle accidents than any place on Kangaroo Island. If you walk 100 meters in either direction from this corner, to observe the broken pieces of car body parts, glass and large dead roos, it is self evident there are indeed safety issues at this junction.

Kangaroos cross this section of road, many move from the wooded areas around Dudley Conservation Park and New Salt Lake, to access fresh springs at Pelican Lagoon, and the Pelican Lagoon Conservation Park. This population can never be fully removed by culling, the risk will always remain. The risk must be managed, or at the very least acknowledged, by any traffic safety study, not simply ignored!

The Davies Road / Mitchell Drive intersection at Hog Bay Road, is a well known road safety hazard.

This dangerous intersection is known and subsequently acknowledged by the Kangaroo Island Council and the Kangaroo Island Road Safety Group as a traffic hazard. As the only land holder at this place, I have been working with both these groups in an effort to seek a solution. I was recently advised by the Kangaroo Island Council CEO Andrew Boardman, that he has contacted the State Government in an effort to pursue this. I have been concerned about this intersection since purchasing the property. I regularly hear the near misses, and trucks beeping horns as tourists traffic pulls out of Mitchell Drive, into Davies Road or Hog Bay Road. The previous owners of section 306 have advised they also made several complaints over 35 years about this dangerous intersection.

Omitting accepted facts regarding this intersection being a safety hazard, displays a lack of research undermining the validity of this report and the conclusions that it draws.

The Public Environment Report states this traffic report is a desk top study, but this does not excuse the lack of research which negates the reports findings. If Infraplan had at the very least, spoken with Kangaroo Island Council, they would have been provided with more useful information than a Google Earth map.

5.3 Site Access off Hog Bay Road

Re: Davies Road and Cathers Road would be upgraded to meet applicable Australian Standards for carriageway width and other requirements.

Cathers Road is a new two lane road which requires no upgrading.

Davies Road is in two sections. The first section from Hog Bay Road to Simpson Road is a flat and predominantly unfenced solid gypsum road. The northern side is lined with wells that have been dug over 130 years. The current working well, the only roadside well to supply water for fire-fighting anywhere in this area, will be lost if the road is widened here. This water is essential to residents bush fire action plans.

There is no mention of this roadside well in this traffic study, despite it being visible on maps, including Google Earth.

The second section of Davies Road heading south west from Simpson Road, joining Cathers Road, is a narrow 'one chain road', with two dangerous crests atop hills with significant gradients. It is also lined in places with thick bushland in a High Fire Danger Zone.

To build this second section into a safe road for two way traffic, will involve a complete rebuild. It must be made as wide as possible, wide enough for two buses to pass. The fences of adjoining properties are at the immediate edge of this narrow road.

How can this section of road be made into a wide two lane road?

Will land have to be purchased from private land holders?

If so, will these landholders agree and be adequately compensated for loss of land and fencing?

The vital question to be considered here is can Davies Road be made into a safe road for this volume of high end tourist traffic, plus, how much will such a new road end up costing?

Roadside Kangaroos.

The Kangaroo population on Davies Road is excessive, with hundreds of large animals crossing the fenced and unfenced sections of road daily. With "an additional approximate 250 - 260 daily trips generated by the proposed golf course facility" there will undoubtedly be regular accidents caused by tourists hitting roos along this road.

As a resident on Davies Road, and one who knows it well, even I regularly hit roos on this dirt road. It does not matter if you drive at 20 km per hour or 60 km, they still jump in front of your car to cross the road. At night time this road is teeming with roos and simply not

safe to drive on. My vehicle has the largest custom made roo bar available for a passenger vehicle, but I avoid driving down Davies Road at night.

No consideration on the impact on Davies Road, nor any possible road safety issues for road users, are actually addressed in this Infraplan report that this approval is relying upon.

Re: Sufficient sight distance (in excess of 210m) is deemed to be available at the junction of Davies Road with Hog Bay Road.

Incorrect.

This intersection has an obscured road (Mitchell Drive) opposite Davies Road, which according to this report does not exist.

This intersection junction is not being accurately nor honestly considered by this report.

Re: No turn lanes (right/left) were deemed to be warranted due to traffic likely to be generated from the proposed development.

The right turn into Davies Road, from the Kingscote direction, offers no room to go to the left of the turning vehicle. This is due to the embankment dropping away into the edge of the lagoon swamp. If not made wider, with a higher volume of turning traffic, it shall create backed up traffic.

From the Penneshaw direction, Davies Road is very close to the blind corner. The volume of heavy vehicle traffic at 100km, with up to 50 trucks and cars coming from the ferry all at one time, plus turning traffic of 250 – 260 tourists per day, may back up traffic on a blind corner. This is potentially a fatal accident just waiting to happen.

Depending on the amount and speed of vehicles behind me, I regularly have to pull off into the dirt to safely turn left off Hog Bay Road into Davies Road. With a higher volume of traffic using Davies Road, it is essential that turn lanes on both sides of Hog Bay are made.

70%+ fatal accidents happen on country roads in South Australia. Road safety must be a primary consideration when planing a potential world class development. Using the figures supplied, this development is aiming to encourage approximate 91 520 road using visitors a year, with Davies Road as the only access road.

Davies Road is a known dangerous intersection (Davies Road/Mitchell Drive/Hog Bay Road).

Davies Road is a narrow road with crests.

It has such a prolific kangaroo population, it is a known safety hazard.

There are not hundreds of kangaroos inhabiting this area, there are thousands.

Davies Road runs through bushland zoned High Bushfire Danger. The main report states a desire to keep the rustic look of Davies Road with minimal vegetation removal. As a resident and member of our local CFS I am well aware that an increase in tourist traffic to almost 300 trips per day, increases the risk of an accidental bushfire starting by the road

side in this bushland area. I am also aware of the estimated time it would take for a fire truck and volunteers to get to this remote area. Should a fire break out, it is unlikely to be controlled.

Possible solutions.

A world class golf resort, and the 'Pelican Heights' housing development (of up to 40 houses) deserves a good quality safe access road. Safety must be the primary concern.

At the western end of Cathers Road is a gazetted Government Road / Unnamed Road which us locals have named 'Tigers Lane' after the infamous local Anzac *Stamford 'Tiger' Simpson*.

This road could provide safe access to Hog Bay Road. This road offers direct access into the heart of the resort area and housing development. It does not boarder bushland of a High Fire Danger Zone. It would be a preferred access, as stated in the main report, in any bushfire access plan where evacuation must be considered.

A bushfire would come towards this area from Dudley Conservation Park through the High Fire Danger Zone making it impossible to evacuate using Davies Road. Without a good safe access road, residents and resort users could be trapped.

This Government Road, 'Tigers Lane' will need to be made to facilitate the construction of the utility infrastructure and large vehicles. It could be easily made into a wide safe road. It may be more affordable to make and maintain this new Government Road to a high standard, than attempt to completely remake a road which has the obstacles and safety issues raised above.

The entrance point of this Government Road onto Hog Bay Road is not ideal, but neither is the Davies Road/Mitchell Drive/Hog Bay Road junction. However, there does appear to be ample land on either side of the Government Road junction to build slipways, which arguably should be built to facilitate access by large utility and emergency service vehicles. The opportunity exists to redesign this junction to a high standard and create a new high quality access road providing completely safe access to the resort, at any time of year, in any weather condition.

As a majority of car hire companies have strict restriction prohibiting the use of hire cars on KI's dirt roads, a sealed road may be considered an intelligent option.

As a ratepayer, I shall be calling for a cost benefit analysis on the actual difference in cost of making these two roads, as well as the costs of upkeep and maintenance of said roads. I also submit that a full risk and benefit analysis be conducted to ensure the best access road is constructed.

I would also like a plain English answer to the basic question ; why is the safest access option not being actively considered from the outset?

Road safety must be a primary concern for any new development, and certainly one that has been deemed important enough to be granted 'Major Project Status' by this State Government.

This Infraplan traffic report is lacking in addressing the most basic issues pertaining to road safety in this area, as such, it must be considered manifestly inadequate.

Government planners, developers and councils have a high duty of care when altering roads and their uses.

I submit that a better researched, more detailed, and accurate traffic study be conducted, considering both access road options, before any approval is granted.

6.5 Existing Conditions - Fauna

There is a healthy population of the Tammar Wallaby (*Macropus eugenii decres*) residing in the area of Davies Road/Simpson Road. The Tammar Wallaby is considered extinct on mainland Australia. The population that inhabits section 306 and the New Salt Lake area may be considered unique. The proposed increased traffic flows on Davies Road may have a detrimental affect on this particular group.

Re: *Western Grey Kangaroo (Macropus fuliginosus) - observed in high abundance (estimated approximately 400 individuals) across the project area.*

400 is a worrying underestimation of actual numbers of roos that feed in the project area. On a good evening you are more likely to see two thousand (2 000) kangaroos feeding and travelling over that section of land.

This is why the area is a tourist attraction in its own right, and as many as twelve guided tourist groups per day visit this site.

Re: **6.6.12 Fauna access around and through the project** - *However the introduction of extensive revegetation works in combination with an overall property management plan including a rigorous golf course maintenance regime will provide fauna linkages throughout the site.*

This initiative will possibly result in a significant increase in kangaroo numbers on abutting properties and roads.

This is a grave concern.

The bushland section of section 306 along Davies Road is mostly unfenced. If more roos are pushed into this area, combined with the increased traffic, a moderately unsafe section of road looks set to become a potentially fatal road safety hazard.

Birds

This survey may be considered as incomplete, as it makes no mention of the Wedge-tailed Eagles regularly sited in this area. An active search should be undertaken to locate the nest/s.

On a positive note, I am happy to see the design include solar panels and the use of local white limestone. This local stone may soften the look of what could otherwise look like a glass and metal construction. This limestone country is a unique area of rugged natural beauty, quintessentially South Australian, and I hope the proposed clubhouse can showcase this.

The project is an ambitious one. This golf course could earn the title of the driest international golf course on Earth. Should approval be granted, and this development progress, I wish all involved good luck. While I support sensible sustainable development on the Island, I do sincerely hope that our new neighbours will take residents reasonable concerns seriously, to manage a positive relationship.

In Conclusion

This submission primarily outlines safety concerns regarding water security, road safety and bushfire safety. As a primary affected resident, I sincerely hope my reasonable concerns will be seriously considered and adequately addressed.

Thank you for the opportunity to provide input into this process.

I look forward to a response from the Developer and/or Minister.

Regards

Lisa Crago

sent via email.

Mackenzie, Alex (DPTI)

From: Louisa Daveriadams [thebrownlowshop@gmail.com]
Sent: Tuesday, 30 June 2015 6:10 PM
To: DPTI:KI Golf Course
Subject: DAVERIADAMS SUBMISSION re KI GOLF COURSE DEVELOPMENT

Dear Mr Kleeman,

Sorry I am a little bit late, but we had no power for most of the day at our farm at Haines (as confirmed by SA Power Networks), which meant no satellite connectivity.

Mrs. Louisa Daveriadams
RSD 117c FCS
Via KINGSCOTE SA 5223
June 30th 2015

Please find my SUBMISSION re KI GOLF COURSE DEVELOPMENT

My overall impression is positive, and in general, I support the proposal with caution. I have a hard copy of the PER, and I can see that Programmed Turnpoint has had to jump through hoops, and answer to all sorts of agencies and quangos. Whilst I have not read every word, I have visually scanned and used Ctrl F to find terms of most interest to me. Much of the document reads like an advertorial, with liberal use of emotionally attractive adjectives, rendering parts of it somewhat waffly, with appropriate reassuring motherhood statements to placate some critics. There is a tenuous note to much of it.

My greatest wish is that you hold another public information session about the proposal before proceeding, in order to fill out much of the document with more substance, and less cut-and-paste.

One of my concerns is JOB CREATION. P.T. promotes the use of its experienced FIFO workforce, and you need to expand your ideas of where truly local employment will be sourced. Given the fragile nature of certain major building contractors who have gone into receivership just this week, I want you to secure your contract with a monetary bond. KI contractors remain unpaid for road works. We are wary.

I am not truly happy with the off-handed attention to road works at what you conceive as your entry port which occurs at a major strategic kangaroo crossing. You do mention of roo control throughout the document, and I feel you are dismissive of the roos, and blaming them for land degradation, as a reason to control them. Not a good interpretation for me to make.

I don't think your assessment of the bend at Davies Road indicates that you have any real experience of the current dangers for motorists, and for you to admit that your plans will increase roo and motorist interaction on the most dangerous stretch of road kill strikes, is almost dismissive of the consequences, not only to the wildlife, but also to vehicles. You must re-look at this, and maybe camp out on the corner to see what I mean.

Feral Cat management: Don't be scared of this. You've really pussy-footed around their control. You can be assured of positive encouragement from the community, and at American River, lives renounced feral cat trapper, Barry Green, who has trapped over 2000 feral cats, and maintained a written record of each cat. I commend his services to you. You just get on quietly with this in conjunction with volunteers and KINRM. No need to shout if from the rooftops.

Water – the really Big Issue as far as the majority of the majority of locals are concerned about. This subject alone, needs more public discussion, as there are too many versions of the status of Middle River Dam.

My concern is to be assured that if any government funds or grants are put towards water supply infrastructure; that access to the water be made available at road points at properties along the route, from Middle River Dam to the Golf Course.

Traffic – For me, I need you to be more concrete about your plans for what is one of worst corner on a main road, on the island, with regard to it being a major access point for roos, wallabies, possums etc. I trust you will liaise with the local KI Road Safety Group.

Summary – KI has a lot of NIMBYs among its population, and we are very protective of our place in space, but this island is destined for high-end tourism, and given the number of golf courses featuring ocean fronts (many in Sydney) and/or Aussie wild life (Merimbula NSW, Sanctuary Cove Qld), which attract much high-end traffic, and given the choice of a golf course before a theme park, I'll vote for the golf course.

I have scanned and analytically read sections of the PER, attended public meetings and consultation sessions, and discussed the development with friends and associates in craft groups and supermarket aisles, so I know I am part of a positive if cautious voice of approval.

I look forward to a response.

With thanks,

Louisa Daveriadams

0497-804-300

-FIN-

Minister for Planning, The Hon. John Robert Rau, LLB, MP
Attention: Robert Kleeman, Manager
Development Assessment (Investment Management)
Department of Planning, Transport and Infrastructure (DPTI)
GPO Box 1815 ADELAIDE SA 5000

DEVELOPMENT ACT 1993

PROPOSED KANGAROO ISLAND GOLF COURSE RESORT

RELEASE OF PUBLIC ENVIRONMENTAL REPORT (PER) FOR PUBLIC COMMENT

Summary

Kangaroo Island Eco-Action has the following concerns, and has previously addressed some of these in our submission to the EPBC. We consider this to be an inappropriate development, with much hyperbole about unsubstantiated job creation and benefits to KI.

In particular;

1. Water usage
2. Impact on fauna and flora by both the on ground development and possible helicopter intrusion.
3. Indigenous heritage values
4. Pelican Lagoon catchment area
5. Use of coastal zone and crown land for commercial development

Water

In the memorandum of understanding by the proponent with SA Water to supply 150ML of water per annum from the Middle River Dam, water will only be taken when the dam is subject to overflows during mid-May to mid-October and importantly, 'adequate environmental flows are maintained downstream.'(P. 130)

Such environmental flows are crucial for the endangered Glossy Black-Cockatoos. Downstream of the Middle River Dam is their prime feeding and breeding habitat. Approximately 20% of the total KI population of the species breeds and feeds in this area. There are 3 pools which are considered essential to contain water during late summer and autumn when the birds are incubating eggs or raising young chicks, as they are close to trees with nest hollows (natural and artificial). If these pools become dry or stagnant, breeding is likely to fail as the females, which are the exclusive

incubators, will then be required to fly further to obtain water, leaving eggs or young chicks for too long.

When the Middle River Dam wall was increased in height, the EPBC Act (Environment Protection and Biodiversity Conservation) was invoked due to the potential negative implications on this endangered species. SA Water agreed to do a release of water from the dam whenever the levels of the 3 critical pools fell below 50% capacity during this time of year. Since then, water releases have been made on a number of occasions due to low water levels in the pools.

The golf course proposal will require 'a significant demand for water'. (P.20) This must in no way be allowed to jeopardise frequent environmental releases of water during late summer and autumn to maintain an adequate water supply for the Glossy-Black Cockatoos during their breeding season. The proponent claims to not have any impact by harvesting water when 'surplus water would otherwise flow straight out to sea' (P.13) and this must be strictly followed.

Preservation of the Glossy-Black Cockatoos needs to be taken into account in any discussions around such significant extraction of water from Middle River Dam with its current capacity of 540 ML. However, under the EPBC Significant Impact Guidelines, there is 'a real chance or possibility that it will

- lead to a long term decrease in the population and
- disrupt breeding cycles (P.74 - 75)

This is especially so, as current climate change predictions from the Australian Bureau of Meteorology and CSIRO suggest there will be an overall reduction in rainfall across Kangaroo Island.

In relation to the 34km water pipeline from the tapping point, no mention is made by the proponent of measures being taken to preserve roadside vegetation along Hog Bay Road during the construction and burying of the pipeline.

Power

'Power levels that are challenging logistically and financially' are required for this proposal. (P. 13). The developer-funded substation will not create any additional power for the island. It will convert the island's available power from SA Power Network's 33kV line to 11kV and then to 200kVA for pumping and maintenance and 315kVA for the clubhouse, spa, accommodation and villas. While power for hot water heating and lighting will be provided by 80KW on-site solar cells, base load power will rely totally on SA Power Network.

Helipad

Emergency evacuation by air is understandably a part of the developer's planning. However, any expansion of helicopter activities would need to be investigated carefully because of the potential impact on endangered wildlife, especially the raptors. There is a discrepancy between proponent's EPBC documents and the SA *Government's Gazette* notification in relation to a helipad. In the EPBC document, it states emergency use only of helicopters. Compare this with the SA Government's Major Projects Status notification in the Gazette with a helipad included.

In the proponent's submission to the EPBC, it is stated that after discussions with DEWNR concerning helicopter flights and their effects on raptors, that:

'This is noted and as a result it is proposed that helicopter flights to the property are now no longer proposed apart from possible emergency as required.'

It is our contention that a helipad and associated infrastructure should be specifically excluded.

Coastal Zone

We commend the developer's plans to stabilise the dunes and coastal zones of the property by planting endemic species in conjunction with DENWR. However, we object to the practice of crown land in coastal reserves being 'handed over' to companies for commercial use, in this case for greens and tees.

The proponent states that walking track along the coastline has been deleted from the project on the advice of both environmental consultants. This was 'due to the potential erosion and habitat destruction that could arise from its existence.' (P.20). Yet, the proponent could have planned to undertake revegetation and stabilisation of this fragile coastal area and left it as a 'key environmental asset' (P.20) rather than developing it with introduced grasses for the greens and tees. This would have been in keeping with the aim 'to provide a golf resort that is commensurate with Programmed Pty Ltd's adopted motto – 'Zero Harm' and is entirely eco-friendly.' (P. 17)

The KI Development Plan for coastal conservation zone states that:

'development should be located away from fragile coastal environments'
(P.39)

Tees and greens constitute development, and yet these are planned for such zones.

And elsewhere the proponent is inconsistent. At one stage, it is stated that 'the proposal will maintain and enhance public access to the coastal areas...' (P.42) Yet, elsewhere, it states that only golfers and staff will have access to these areas. (P.139)

Consequence of not proceeding

In the DAC's document, Guidelines, Kangaroo Island Golf Course Resort, it is stated:

'Five freehold residential allotments, which could be used for limited unit/villa development and leased back to the golf course when not in use by the private owners. The residential component would be developed during stage 1, to be sold to assist the financing of later stages of the development.'

Yet at a public meeting in Kingscote on 25/8/14, when asked the question, which would be developed first, the unit/villa development or the golf course, the proponent stated the golf course would be first.

This contradiction raises a real development issue, which needs to be addressed by the DAC.

It does not follow that 'it is difficult to envisage any alternative use other than low intensity grazing being pursued.'(P.72) A low impact tourist accommodation or similar development could replace a failed golf course proposal with its high power and water usage. The proponent admits that the site is 'intrinsically attractive as a physical tract of land with its spectacular scenery, wildlife and strong sense of being entrenched in a natural, isolated environment' (P.72). It is highly contentious that it needs a 'singular stimulus', namely 'championship level, links golf' to warrant its development. (P.72)

This does definitely fit with Kangaroo Island's wildlife and wilderness image with international tourists, who frequently comment that it should resist being developed. TOMM, in their surveys, consistently show this is the main reason tourists visit KI.

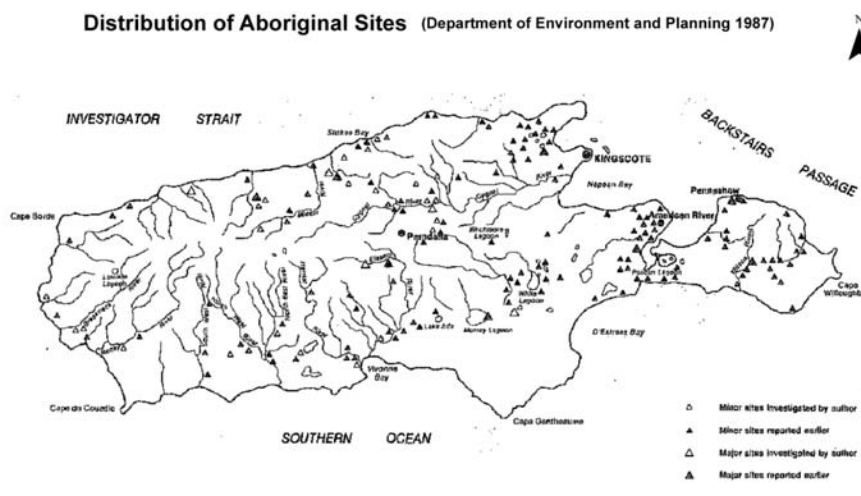
Kangaroos

Culling of kangaroos, one of the management options, will have widespread ramifications for Kangaroo Island's international reputation and its tourist numbers. Koala culling on Kangaroo Island met a similar fate and condemnation by the international press, with the resulting backdown by the SA government.

Indigenous Heritage Values.

The proponent states that these are unknown at this point.

Eco-Action contends that there are Aboriginal sites either on the proposed development site, or in very close proximity. See map below.



Recent anecdotal evidence from 2 archaeologists point to definitely one and possibly two sites of significance, having found quite a number of flakes and large stone tools

throughout all of the site. Because there has been no research done there, they do not know how important the sites are.

Pelican Lagoon.

This area, where the proposed development is being considered, is a catchment area for Pelican Lagoon. See map below. One of the major threats enunciated in the draft Pelican Lagoon Management Plan is subdivision and the consequent developments, leading to nutrient runoff into the lagoon. The land is limestone, and so drainage is a problem to Pelican Lagoon.

Eco-Action is concerned with the potential impact of nutrient run off from this development and its effect on the habitat of Pelican Lagoon and its diverse birdlife.

Any nutrient run off will almost certainly run into the lagoon and threaten the sea grass and other marine life, affecting not only the habitat quality of the migratory waders but the highly diverse sea grass habitat, important for whiting and other marine life. The seagrass meadows within the lagoon are the most diverse in the region.

A large, permanently shallow, partially enclosed marine lagoon, Pelican Lagoon is subject to minimal wave action and so is unable to flush out any nutrient runoff.

The Pelican Lagoon-American River ecosystem, a nationally significant wetland, is included in *A Directory of Important Wetlands in Australia* and is deemed to be a high ecological value ecosystem by the Federal Government.

This marine reserve, a part of the American River Aquatic Reserve, is known for its shore bird habitat, with 160 ha of salt marsh habitat and large areas of tidal mudflats for migratory waders. The lagoon provides foraging grounds and roosting habitat for migratory and resident wading birds, including several protected species listed in the Japan–Australia Migratory Bird Agreement and the China–Australia Migratory Bird Agreement, such as the eastern curlew and the red-necked stint.



On behalf of Kangaroo Island Eco-Action Inc.



Bob Huxtable

30 June 2015



PO Box 481,
Kingscote, 5223.

PO Box 906
KENT TOWN 5071

June 29 2015

The Minister for Planning
Attention: Robert Kleeman, Manager, Development Assessment (Investment
Management)
Department of Planning, Transport and Infrastructure (DPTI)

Re: Golf Course Development Kangaroo Island

Mr Kleeman -

I do not approve of this development in any way or form.

As a long time visitor & resident I can assure you that this is NOT why visitors come to Kangaroo Island.

They come to see natural unspoilt beauty, native animals in their natural environment and the pristine surrounds which all the tourist brochures and bureaux promote endlessly.

They don't come to play golf. Or for that matter to swim with tuna or sand board down fragile sand dunes etc. etc. This can ALL be done on the mainland where the coastal townships have already been ruined.

Kangaroo Island is one of the last places left unspoilt, where visitors can step back in time almost and see an island as it used to be.

Kangaroo Island is not a fun park - although developers are keen to turn it in to such a place and to destroy the amazing environment.

KI Council should be protecting this precious resource and not welcoming developers and those others who wish to turn every magnificent bay, beach & lagoon into a fun park!

Already the coastline is dotted with developments, so that the once unspoilt & stunning scenery will end up like any other coastline in the world.

All these beautiful & amazing areas now have developments ranging from exclusive resorts to drifts of holiday shacks built on them – Snellings Beach, Stokes Bay, Hansen Bay, D'Estrees Bay with its shoe box house development, plus sand boarding & dirt biking in pristine & unique areas of bushland.

The area where the golf course is proposed is a paradise for kangaroos. When we have visitors we always take them to this area just so they can be amazed to see these animals in their abundance just right there! This is the sort of tourism that should be promoted – not a golf resort with an eyesore of a building – terrible!

There are others I am sure who will offer very solid reasons why this development should not be approved – I do not offer those reasons, but speak from the heart when I ask that this development be refused – for the love of Kangaroo Island.

Yours sincerely,

Cathy Fowler.

Major Development Application Kangaroo Island Golf Course Resort Submissions



Tell us what you think about the following aspects of the Public Environment Report.

Submissions may be made available for public inspection and would be included in the proponent's Response Document (that will be released for public information at a later date). Please indicate below if you object to your submission being made available in this way.

Name Tom + Fiona FRYAR Address Po Box 330, KINGS COTE, SA. 5223
Telephone 08 8553 9097 Email kifre@bigpond.com

Overall, what do you think about the proposed Kangaroo Island Golf Course development?

Great benefit to KI - employment during construction & ongoing
- positive management of the degraded land.
- increased visitor numbers to KI
- flow on economic benefits to KI businesses & community as a whole.

Do you have any specific comments on the following?

Tourism and economy (Tourist visitation, job creation, value adding to local business etc)

Will encourage more tourist to KI which flows on to local businesses as growth & job creation.
A different type of tourist will be attracted, staying more than one day & experience what KI has to offer.

Environmental (native vegetation and animals, landscape, cultural heritage etc)

Being a degraded area, the proposed development & management has a very real possibility of restoring balance to the native flora & fauna & making the area more attractive.



Government of South Australia

Department of Planning,
Transport and Infrastructure

Infrastructure and services (Power and water use, delivery of services to the site etc)

Water service from Middle River Dam line would be a great benefit to farms along the way to connect to mains water if they desire. Our farm is situated 1537 Hog Bay Rd & we are extremely interested in gaining access to mains water supply for our business.
Kangaroo Island Free Range Eggs.

Buildings and design (Building location, design and architecture, landscaping etc)

Design of the building using local stone will blend with the surrounds & have very little visual impact.

Traffic and access (safety and access, car parking etc)

The proposal seems to address any issues of roads, carparks etc, favorably.

Are there any other matters you would like to raise?

KI needs projects like this to help build a strong, positive economic future for KI. We are in favor of the proposal.

Please indicate your preference below:

Please make my submission public

Please do not make my submission public

Written submissions commenting on the PER are invited until 5pm, Tuesday 30 June 2015 addressed to:

Minister for Planning c/-
Robert Kleeman, Manager
Development Assessment (Investment Management)
Department of Planning, Transport and Infrastructure
GPO Box 1815
ADELAIDE SA 5000

or via email to: dpti.kigolfcourse@sa.gov.au

Further information

Call – 1800 PLANNING – press option 1

Visit – sa.gov.au/planning/majordevelopments

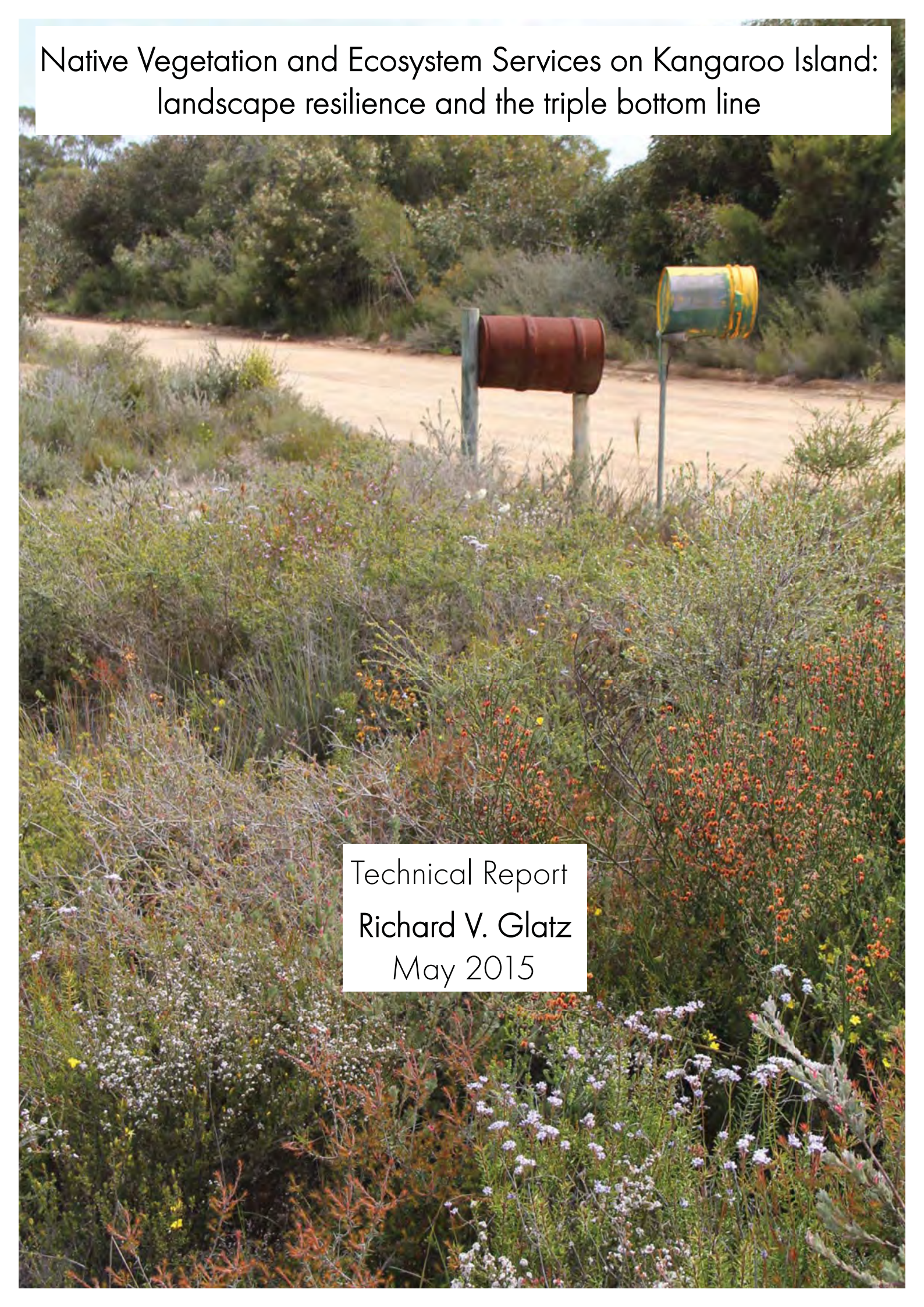
Email – dpti.kigolfcourse@sa.gov.au



Government of South Australia

Department of Planning,
Transport and Infrastructure

Native Vegetation and Ecosystem Services on Kangaroo Island: landscape resilience and the triple bottom line



Technical Report
Richard V. Glatz
May 2015



D'Estrees
ENTOMOLOGY
Science Services

Dr Richard Glatz
PO Box 17
Kingscote SA 5223
richard@dess.net.au

Acknowledgements

Sincere thanks to Phillipa Holden van Zyl and Grant Flanagan (SA Department of Environment, Water & Natural Resources Kangaroo Island) for useful comments and editing at various stages of report production.

Cover

Kangaroo Island is renowned for some of the most diverse and intact roadside vegetation in Australia, shown here on Three Chain Road, MacGillivray. It plays an important role in supporting biodiversity and leaves an immediate and lasting impression on many visitors. It also supports well-being of residents and is key to contributing to the 'clean & green' image of the island so valued by the primary industries, food and wine, and tourism sectors. When occurring adjacent agricultural production, quality vegetation like this can provide weed/pest management and biosecurity benefits at local and regional scales.

All photographs © Richard V Glatz unless otherwise acknowledged.

D'Estrees Entomology & Science Services Disclaimer

Although all reasonable care has been taken in preparing the information contained in this publication, neither DESS nor the other contributing authors accept any responsibility or liability for any losses of whatever kind arising from the interpretation or use of the information set out in this publication. Where products and/or their trade names are mentioned, no endorsement of these products is intended, nor is any criticism implied of similar products not mentioned.

CONTENTS

Abbreviations	1
Non-technical Summary	2
Abstract	7
Report Framework & Aims	8
Conceptualising and valuing ecosystem services from native vegetation: a global debate with local implications	10
Ecosystems Services from Native Vegetation	15
Agricultural Pest, Weed and Disease Management	15
Agricultural Biosecurity	23
Pollination	24
Salinity	26
Biodiversity	27
Tourism & marketing	30
Social and Community Benefits	30
Contributions to landscape adaptive capacity and resilience	32
Threats to ecosystem services provided by native vegetation on KI	34
Disturbance Mechanisms	34
<i>Clearance/Fragmentation</i>	37
<i>Off-target effects of agrichemical use</i>	39
<i>Inappropriate Fire</i>	40
<i>Physiochemical changes</i>	42
Weeds, pests and diseases	43
Rapid climate change	43
Non-recognition of benefits	44
Increasing economy-of-scale in agricultural production	45
Inappropriate resourcing and legislative framework for research and/or best-practice management	46
Increasing combined stakeholder benefits of ecosystem services from native vegetation	48
Identifying management priorities	49
Maximising beneficial outcomes	55
Knowledge Gaps and Future Research	58
Conclusions & Recommendations	61
References	63

LIST OF FIGURES AND TABLES

Table 1. Categorisation of ecosystem services	11
Figure 1. Simplified model of provision of ecosystem services	12
Figure 2. Simplified flow diagram of linkage between basic ecosystem elements, the processes they underpin, and the services they provide	13
Table 2. Contrast of (theoretical) economic metrics, spatial scales of calculation, and precision, required to economically value ecosystem services for a range of applications	15
Figure 3. Red-legged earth mite (<i>Halotydeus destructor</i>) feeding on bridal creeper (<i>Asparagus asparagoides</i>) adjacent pasture	17
Table 4. Key agriculturally beneficial arthropods commonly associated with native vegetation on Kangaroo Island and their beneficial roles	18
Figure 4. Generic delayed density dependent relationship between a pest species (white circles) and a beneficial species attacking the pest	20
Figure 5. Breakdown of named and unnamed species residing in various taxonomic groups	29
Table 5. The importance of biodiversity (variability) at various biological levels	33
Figure 6. Model of genetic bottlenecks produced by fragmentation of plant communities and climate change	36
Figure 7. Theoretical relationship between disturbance and pest management ES provided by native vegetation	37
Figure 8. Loss of total economic benefits from conversion of ecosystems from natural or sustainably managed to simplified or unsustainable ecosystems	38
Figure 9. Vegetation coverage on KI at selected time-points between 1945 and 1989	41
Figure 10. Theoretical global biodiversity conservation scenarios based on consideration of under-exploited utilitarian values and non-utilitarian values producing changes to current biodiversity trade-offs	49
Figure 12. Agricultural landscape wheel for temperate Australia	52
Table 7. Summary of broad research areas and related research questions in the field of ES science	59

Abbreviations

BWYV: beet western yellows virus

CaCV: capsicum chlorosis virus

CMV: cucumber mosaic virus

CRC: cooperative research centre

DAFF: Federal Department of Agriculture, Fisheries and Forestry

DEWNR: South Australian Department of Environment, Water and Natural Resources

EPP: emergency plant pest

ES: ecosystem service(s)

ESP: ecosystems services partnership

GM: genetically modified

GRDC: Grains Research and Development Corporation

ha: hectare(s)

INSV: impatiens necrotic spot virus

KI: Kangaroo Island

KINRM: Kangaroo Island Natural Resource Management

NAP: Northern Adelaide Plains

NCCARF: National Climate Change Adaptation Research Facility

NRM: natural resources management

NSW: state of New South Wales

PHA: Plant Health Australia

PLRV: potato leaf roll virus

PMMV: pepper mild mottle virus

PVS: potato virus S

PVX: potato virus X

PVY: potato virus Y

Qld: state of Queensland

SA: state of South Australia

SARDI: South Australian Research and Development Institute

TLCV: tomato leaf curl virus

TMV: tomato mosaic virus

TSWV: tomato spotted wilt virus

TuMV: turnip mosaic virus

TYLCV: tomato yellow leaf curl virus

UK: United Kingdom

WoNS: weed of national significance

WPA: Wilderness Protection Area

Non-technical Summary

Understanding the ecosystem services (ES) provided by natural systems is part of a global trend towards 'complete accounting' of human benefits in order to enhance the beneficial value and the efficiency of ES use so as to mitigate challenges to human health. A primary driver of this trend is the unprecedented rate of increase in global temperatures and the associated difficulties this poses to a range of human activities. This report aims to provide a scientifically informed discussion of ES associated with native vegetation on Kangaroo Island (KI). It is designed to inform the development of the next NRM Plan (2015-2025) which will be characterised by landscape management approaches aimed at maximising the resilience and adaptive capacity of human activity, and the natural systems supporting it.

Conceptualising and valuing ES

The conceptualisation and valuation of ES, as well as mechanisms to directly link them to beneficial outcomes, are key challenges for ES research and the subject of current debate (see Burkhard et al. (2012) for a summary by leading practitioners). Currently ES are generally characterised as complex interactions between:

- basic structural and compositional elements of an ecosystem (e.g., soils, minerals, water, air, biodiversity, human infrastructure, cultural diversity etc.)
- ecosystem processes (e.g., water cycle, photosynthesis, disease epidemiology, carbon cycle, social processes, economic processes etc.)
- human values (e.g. health, adequate resources, recreation, philosophy etc.)

In reality, these three interacting partners may overlap, and may have to be redefined (as well as their interactions) depending upon the ES being considered, the operational scale, the application being undertaken, and/or the stakeholder viewpoint. This presents obvious challenges to land managers wishing to design landscape management principles based on ES provision. However, significant resources are being invested in this regard globally and there is a range of collaborative networks involved in these endeavours.

ES provided by native vegetation

On Kangaroo Island, ES from the endemic vegetation make three important, but undervalued, contributions to agricultural production.

1. *Agricultural pest management*: native plant species generally support less crop/pasture diseases and invertebrate pests than exotic weeds, which are suppressed by healthy native vegetation. Native plants are also associated with high numbers of invertebrates beneficial to primary production and help support biological control agents. These principles are the subject of recent advice to primary producers from the Grains Research & Development Corporation (GRDC 2014).
2. *Agricultural biosecurity*: good quality native vegetation (with an intact seed-bank) has the capacity to buffer against introduction of new species that pose biosecurity threats. Therefore, it has potential to reduce the area and number of host organisms that can aid the establishment, build-up and spread of a pest/disease; both of these parameters are key influences of the severity and persistence of outbreaks. Native vegetation also supports native biocontrol agents of important pests that are yet to establish
3. *Pollination*: native vegetation plays an important role in providing forage for honeybees (hence also supports the apiary industry), as well as broader habitat requirements of numerous species of native pollinators, which are crucial to native plant species as well as contributing to primary production.

4. *'Clean & green' image*: the impressive native vegetation and rare species contained in numerous public/private conservation regions and in roadside vegetation, are the key contributors to the 'green' image enjoyed by KI producers. In most cases, current production methods are not different to elsewhere.

These four benefits suggest:

- native vegetation is already providing a significant ES to primary production on KI (given a relatively native vegetation coverage of $\approx 40\%$)
- there is opportunity to manage the vegetation at a landscape scale to maintain ecosystem resilience and provide co-benefits to primary production to improve economic resilience

Further ES from native vegetation includes:

- *Contributions to landscape adaptive capacity & resilience* - crucial for maximising four levels of diversity (genes, populations, species, ecosystems) that provide ability to adapt and maintain ES under significant change (i.e. resilience). By improving the quality and coverage of native vegetation there is the potential to maximising agricultural flexibility at landscape level and thereby increase production options and resilience of production as a whole.
- *Prevention or mitigation of dryland salinity* - this is one of the most serious forms of landscape degradation as it reduces productive capacity and value of land, as well as causing long-term and significant changes to biodiversity. The primary cause is large-scale removal of deep-rooted perennial vegetation from water-catchments and low-lying areas.
- *Habitat provision*: directly or indirectly supports much of KI's terrestrial biodiversity, which is still relatively poorly understood and of significant commercial value.
- *Tourist/marketing appeal* - KI's natural environment is the key focus for tourists and is the key point of differentiation with other regions. Having abundant native vegetation that contains plants unique to KI gives a 'wild' feel to KI and some locally-common species contribute to a unique KI aesthetic (e.g. KI narrow-leaf mallee arbours, KI conesticks, KI gland flower, round-leaved *Bertya*, KI riceflower, *tateana* subspecies of yacca).
- *Direct social and community benefits* - many obvious benefits associated with physical attributes such as wind-breaks and dust suppression. Mental health and physical well-being is also associated with good quality natural environments. Contributions also to maintaining community structure and producer numbers through providing opportunities for agricultural diversification and adaptive capacity.

Threats to ES associated with native vegetation

1. *Disturbance mechanisms* - these have the capacity to rapidly or incrementally reduce the integrity of the existing native vegetation or its ability to regenerate without species loss or exotic introductions. Includes, clearance, fragmentation, off-target agrichemical impacts, physiochemical changes, inappropriate fire etc.
2. *Weeds/pests/diseases* - one of the main causes of species loss (particularly on islands) and with relevance for current vegetation management and biosecurity. Current resources to tackle these issues are largely insufficient.
3. *Rapid climate change* - well recognised as problematic for species with a low adaption threshold or an inability to migrate (may be exacerbated for an island with a small latitudinal range).

4. *Non-recognition of benefits* - there is currently a significant undervaluing of the broad ES provided by native vegetation, partly because on KI some the problems associated with broad-scale vegetation loss have not impacted as heavily as elsewhere. The full value of ES need to be realised in order to be preserved and extracted through land management.
5. *Increasing economy of scale in agriculture* - requires increasingly large areas for production and increasing mechanisation, therefore usually a trade-off with ability to derive pest management/biodiversity benefits from native vegetation, and with landscape ES more broadly. Also often associated with reduced numbers of resident primary producers.
6. *Insufficient resources for research and/or best practice management* - many areas regarding ES and landscape vegetation management need research to facilitate sound policy and management approaches. Policy itself can be seen as part of this resourcing and should be designed to facilitate research and stakeholder engagement to drive on-ground adaptive management of vegetation delivering targeted ES.

Increasing combined stakeholder ES from native vegetation

The key consideration here is to obtain co-benefits from native vegetation and the associated biota, by actively implementing approaches that maximise ES and thereby leverage stakeholder input either through land area, effort, modified management or funds. This makes economic sense for the island because it has been shown across a range of comparisons that land areas under natural or sustainably managed systems, have greater total ES value than developed or non-sustainable counterparts.

Currently, NRM issues pertaining to conservation and biodiversity are often treated separately from other management issues including those in primary production. A key priority should be the meaningful integration of shared biodiversity and primary production/tourism benefits. One obvious management approach is to aim to produce biodiversity or ecosystems health/functionality outcomes combined with targeted ES delivery to adjacent production systems or niche producers (e.g. pest/weed management, pollination, bee forage).

Maximising beneficial outcomes

A large part of maximising beneficial outcomes of landscape management is taking a scientific approach to dealing with uncertainty regarding how ES are characterised, how ES are provided, the magnitude of benefits, and how human activities modulate their provision. This uncertainty will always be present to some degree and there are four priorities that should be addressed to deal with this:

1. moving to a full adaptive management approach that can engage broad stakeholders and where each step of the iterative process is properly resourced
2. developing mechanisms to integrate with researchers to derive landscape-specific data sets regarding delivery of key ES
3. developing means for tighter integration of Council, State Government and industry, to obtaining funding for research and delivery of on-ground works
4. restructuring of relevant state government departments to tackle adaptive landscape management and ES delivery/accounting

Knowledge gaps and future research

Many knowledge gaps are discussed in the report, ranging from biological questions such as the nature of interactions between organisms and the use of indicator species for monitoring, to the best regulatory mechanisms to facilitate a landscape level ES approach. Additionally, much of the available information is general in nature and KI-specific data are limited. Broad priority areas for future consideration and research are:

- developing integrated quantification, modelling and valuation of ES
- accounting of ES at a landscape scale
- development of a scientifically-based adaptive management approach to ES
- social and economic trade-offs on KI
- interactions between native biota on KI and primary production systems
- determining key biosecurity threats to native vegetation and primary production on KI and developing prophylactic and response plans
- defining a range of biological and physical metrics (including indicator species) that can be used for ongoing and standardised assessment of ES delivery and ecosystems function on KI

Recommendations

Moving towards significant accounting of ES in NRM

- apply latest thinking regarding full accounting of ES to develop adaptive land management models because ES accounting will be a major future driver of economies. This requires an explicit understanding of both individual (land owner) and broadly applicable ES, as well an explicit definition of the associated costs and benefits of native vegetation to these groups.
- develop multi-benefit revegetation models for KI that are designed to deliver biodiversity and production-specific ES
- engage innovative producers to deliver biodiversity- and production-based pilot projects, highlight ES benefits and promote value of current ES delivery
- biosecurity, pest management and other ES should be considered in all matters involving vegetation (e.g. roadside maintenance, construction approval) particularly adjacent agriculture or conservation land
- examine marketing/tourism opportunities based on rare, iconic and endemic KI taxa

Research and data

- leverage scientific expertise: use KI natural systems and iconic status to actively engage researchers to develop proposals and facilitate subsequent projects generating relevant KI-specific data sets.
- develop mechanism to continually develop joint research proposals between the state departments, KI council and KI industry which exploit KI's iconic status and improve leveraging of external NRM funding
- establishment of a KI rainfall transect project to provide long term monitoring of key biological and environmental variables across the gradient
- production of a database of current weed and invertebrate pests, and diseases for key crops
- assessment of beneficial and pest invertebrates on KI's native plant species
- develop a database of pollinating invertebrates and their relationship to crops
- assessment of the impact of various management practices (especially fire) on diverse groups such as invertebrates and microorganisms that effect plant establishment, growth and reproduction (e.g. mycorrhizal fungi, seed-germination fungi, pollinators)
- assessment of areas of greatest risk for incursion and spread of new organisms
- continued assessment of fire for regeneration purposes
- means to improve DEWNR data sets (e.g. access other national and state databases such as SA museum, Australian Faunal Directory)

- assessment of new primary industries for which KI will have a natural advantage under increasingly warm and arid conditions
- examining means by which KI biota can be used in marketing of agricultural produce
- establishing meaningful thresholds for a range of disturbance processes impacting key ecological communities

Land management

- incorporate weed management into activities that disturb vegetation and/or seed-bank at high frequency (e.g. roadside maintenance, fuel reduction burning) – examine joint funding proposals for this based on ES provision
- refine roadside vegetation management practices to provide removal of encroaching mallee branches (with little biodiversity risk) while leaving the shrub layer and soil undisturbed (to give biodiversity and biosecurity gains)
- similarly, refrain from disturbing roadside vegetation where there is no clear safety, functional or management benefit from doing so (identify such areas to provide cost-savings and improved ecological management)
- examine joint-benefit revegetation/regeneration projects to deliver biodiversity and production benefits
- develop monitoring and response strategies for key pests and diseases threatening KI
- highlight and promote awareness of KI's rare plants (e.g. utilise in marketing and tourism)
- protect diversity across the full range of biological "levels" (e.g. genetic, species, population and community)
- fully investigate use of technologies designed to increase sustainability or input use-efficiency of primary production systems and/or minimise ES-tradeoffs
- set 30% native vegetation target on Dudley and Eastern Plains (currently at $\approx 27\%$). Because much of the current coverage is contained in large conserved blocks on limestone, the focus of the increased coverage should be ironstone habitats in multi-use (fragmented) areas. This is designed to not only increase the ES values of the primary production landscape in these degraded regions, but to examine research questions and multi-benefit revegetation/regeneration models, and to drive debate regarding uptake of broader ES accounting on KI.
- examine targeted incentive schemes to deliver vegetation management aimed at tackling key biosecurity and biodiversity challenges
- promote ES benefits by highlighting the costs (lost ES) of poor management of native vegetation in other regions, rather than the poorly defined benefits that are currently received on KI through having maintained the native vegetation. For example, grains and horticultural industry advice about the usefulness of native vegetation has been driven by loss of vegetation in other agricultural regions (e.g. west coast of SA and northern Adelaide plains) and the resultant production problems this has produced.
- investigate innovative methods/models of harnessing volunteers for management of feral plants and animals e.g. streamlined environmental volunteer legislation, tourism opportunities, progress associations

Non-technical Summary References

Burkhard, B., R. de Groot, R. Costanza, R. Seppelt, S. E. Jorgensen and M. Potschin (2012). "Solutions for sustaining natural capital and ecosystem services." *Ecological Indicators* **21**: 1-6.

GRDC (2014). Pest suppressive landscapes fact sheet. Grains Research and Development Council, Canberra. 4pp.

Abstract

In recent years there has been a global move towards recognition of services provided to mankind by ecological systems (i.e. ecosystem services; ES), partly driven by the threat to these services posed by a global climate that is now clearly warming at an unprecedented rate (IPCC 2014). Another associated trend is to undertake landscape management to maximise provision of these ES and to maintain adaptive capacity and resilience in natural and farming systems such that their integrity is largely maintained as temperatures increase. Kangaroo Island (KI) is no exception with the new NRM plan (2015-2025) aiming to provide the basis for such an approach on KI.

One of the most obvious and renowned features of KI is the relatively high coverage and quality of its native vegetation, which provides many ES to all sectors of the community. Indeed, the management of native vegetation has long been an important (sometimes controversial) issue for KI, and the current trends towards landscape management and ES accounting, are likely to focus more attention and effort towards management of KI's native vegetation, which displays about 5% endemism.

This report aims to provide information to stakeholders and NRM planners regarding landscape management of native vegetation on KI, in the context of ES delivery and landscape resilience, and from biological, economic and social viewpoints. This information includes discussion relating to:

- conceptualisation and valuation of ES, particularly those associated with native vegetation
- explicit ES types provided by native vegetation
- explicit threats to native vegetation and their resultant effect on ES
- identification of management priorities
- maximising beneficial outcomes
- knowledge gaps and further research

The key ES from native vegetation on KI derive relate to, pest management, biosecurity, biodiversity protection, tourism, marketing, social well-being, physical benefits (e.g. water quality and wind mitigation benefits), and landscape adaptive capacity and resilience to threatening processes.

The main threats to these ES on KI are a range of disturbance processes, climate change, weeds/pests/diseases, non-recognition of benefits, increasing economy of scale of agricultural production (especially broad acre cropping), and inappropriate resourcing and/or legislative framework for research and management.

Based on these discussions, a series of recommendations are presented to facilitate the move towards improved accounting of ES in a landscape management context on KI. Given current approaches, significant effort will likely be required to achieve this and it will require further research, perhaps a refined departmental structure, innovation in conservation and primary production, and an adequately resourced and scientifically validated adaptive management process that can make refinements to on-ground management practices.

Report Framework & Aims

In recent years, mounting scientific evidence regarding the unprecedented rate of climate change (IPCC 2014) has led scientists, regulatory authorities and some industry groups to investigate mechanisms to not only assess the potential for change and related impacts, but to examine means by which landscape-level adaptation/resilience can be achieved. A good example of this is the National Climate Change Adaptation Research Facility at Griffith University, which was established in 2008 (NCCARF 2014). Assessments are often couched in terms of the 'triple bottom line', which focuses on maintaining integrity of economic, social and environmental systems; these systems are overlapping and intrinsically linked in a complex way.

Kangaroo Island (KI) is no exception, with climate change adaptation at the forefront of the next generation of natural resources management (NRM) planning. However, KI has a range of unique challenges and advantages, which require that information developed in a broader (sometimes national) context needs to be synthesised into a context relevant to KI and its specific needs. Indeed, there is little KI-specific information with regards to the adaptive capacity of the landscape in terms of supporting current and future industries, or the significant biodiversity values of KI.

In an NRM plan that seeks to provide economic, social and environmental resilience for KI, the unique challenges/advantages for KI need to be at the forefront of considerations. These include:

- small population (spread over a relatively large area); i.e. low population density
- corresponding small economic base for local government and NRM board
- limited social services and infrastructure
- high economic reliance on few industries (primary production and tourism)
- relatively high export costs
- high number of visiting tourists and corresponding impacts on infrastructure
- very high reliance on agricultural industries common elsewhere (i.e. grain, wool, lamb/beef production, honey)
- need for innovation in agricultural and conservation management practices
- relatively limited value-adding to primary produce (or relevant infrastructure)
- freedom (or reduced incidence) of serious agricultural and environmental pests, most notably rabbits, hares, foxes, European wasp, American and European foulbrood, etc.
- highest level of remnant vegetation of any agricultural region in South Australia (SA) combined with significant native vegetation coexisting with agricultural production
- high biodiversity values and large intact blocks of remnant vegetation (including five Wilderness Protection Areas; WPAs)
- iconic status within Australia and internationally

The specific purpose of this report is to inform the 'climate change ready' NRM Plan 2015-2025 (otherwise referred to as the 'new NRM Plan'), with regard to the value and management of native vegetation on KI. Native vegetation has implications for the main industries on the island, has significant biodiversity values due to its preservation, and is subject to a range of threatening processes.

A key deliverable of the new NRM Plan is that *Principle One* is addressed. This requires stakeholders to:

- *identify priority landscapes for carbon and biodiversity plantings and strategies to build landscape integrity, and*
- *guide adaptation and mitigation actions to address climate change impacts on natural ecosystems.*

Key guiding principles include:

- *adopt a whole of landscape approach to planning and implementation with the aim of restoring and maintaining ecosystem structure and function at various spatial and temporal scales.*
- *build the resilience and adaptive capacity of natural systems to deal with shocks such as climate change.*
- *avoid perverse outcomes such as increased fire risk and negative impacts on water resources or productive agricultural land.*

Therefore, this report aims to investigate ways that native vegetation on KI can be managed such that social, economic and ecological values are maximised whilst augmenting landscape adaptive capacity and resilience. While the ecological, social and tourism-related advantages of the significant island remnant vegetation have been recognised for some time, its value to primary production has largely been overlooked beyond the significant government and private investments made to improve degraded land in agricultural systems (e.g. Landcare programs). Additionally, there has been little assessment of how native vegetation should best be managed with regard to providing pest management and biosecurity benefits to primary production systems. However, this is currently the focus of increasing scientific research elsewhere (supported by some industry groups), particularly in areas where vegetation has largely been removed from landscapes under significant primary production, resulting in obvious management/economic issues for production systems. These include the cotton-growing regions of NSW and Qld, and grain production on the west coast of SA.

In this report, I aim to make initial assessments of:

- qualitative impacts/contributions of KI's native vegetation to the triple bottom line
- ways in which native vegetation on KI contributes to resilience of biodiversity, primary production and related industries
- key threats to broad ecosystem services provided by KI's native vegetation
- mechanisms by which resilience of KI's native vegetation can be maintained to provide combined benefits to economic and environmental (and thereby social) networks on KI, under a rapidly changing climate or other significant challenges

Scientific and regulatory communities are still grappling with these extremely complex issues, and detailed solutions do not yet exist. However, this report makes broad management recommendations on maximising the combined benefits of native vegetation for various stakeholders. It is also intended to highlight issues of importance to KI and principles/evidence regarding ecosystem services related to native vegetation, and to inform the subsequent development of specific NRM recommendations.

Conceptualising and valuing ecosystem services from native vegetation: a global debate with local implications

The concept of the environment supporting human populations is ancient, however, in recent years, there have been increasing attempts to assign a 'value' to 'services' provided to humans by the natural environment; i.e. the value of ecosystem services (ES). Most notably, the Millennium Ecosystems Assessment (MEA; <http://www.unep.org/maweb/en/Index.aspx>) was set up in 2001 in order to assess the consequences of ecosystems changes to human health and to develop a scientific underpinning for actions to maintain these services in a rapidly changing world (MEA 2005b). Other initiatives have included the Intergovernmental Platform on Biodiversity and Ecosystem Services (<http://ipbes.net>), The Economics of Ecosystems and Biodiversity (<http://www.teebweb.org>), the Ecosystems Services Partnership (ESP; <http://www.es-partnership.org/esp>) and the Wealth Accounting and the Valuation of Ecosystem Services partnership (WAVES; <https://www.wavespartnership.org/en>).

The MEA published a list of ES under four categories (MEA 2005a) and these have generally been upheld when examined by other authors subsequently. In agreement with the MEA's broad definition of ES, Wallace 2012 published a more concise version of the list (Table 1). The MEA examined 24 ES globally and concluded that 15 had degraded in the last 50 years, including capture fisheries, water supply, waste treatment, natural hazard protection, regulation of air quality and erosion, and multiple cultural services. Only four services were found to have improved, these being, crops, livestock, aquaculture and recently, carbon sequestration (MEA 2005a). A recent estimation of the global value of ES lost due to land use between 1997 and 2011 was \$US4.3-20.2 trillion p.a. (Costanza, de Groot et al. 2014). These global trends may not be reflected on KI and different issues may be relevant, however, it is worth recognizing that they are of widespread occurrence and that KI is not immune from processes leading to ES degradation.

While the definition of ES as being 'benefits provided to humanity by the environment' is generally accepted (Wallace 2007, Fisher, Turner et al. 2009), the classification of the services themselves, the way environmental components and processes interact to produce them, and how these concepts should be defined and considered in the development of management plans, are still the subject of significant debate (Wallace 2007, Costanza 2008, Fisher, Turner et al. 2009, Burkhard, de Groot et al. 2012, Wallace 2012, Adams 2014, Costanza, de Groot et al. 2014, Mace 2014).

A criticism of the MEA-based classification (Table 1) has been that listed ES (also expressed as 'benefits' or 'products') do not differentiate between environmental processes and the ES they provide, which equate to 'means' and 'ends' from a management perspective (Wallace 2007). Further, there should be an understanding of how compositional elements of the environment, which may be inherent (e.g. air, water, minerals) or socio-cultural (e.g. domestic stock, roads, buildings), influence environmental processes (which also may include social and economic influences) (Fig 1). Costanza (2008) argued that viewing the processes as a means to an end (which is an ES) is conceptually flawed because they are all means to achieve the greater goal of human well-being and that it may be more use to characterise ES by spatial associations, or by the excludability/accessibility and level of effect on those who do not benefit from an ES. Costanza concluded that the complexity of the systems means that multiple classification systems are needed, which take into account feedback mechanisms and should be tailored to particular applications.

Table 1. Categorisation of ecosystem services. Simplified from MEA (2005b) by Wallace (2007).

Type of service	Service/Benefit
Provisioning services	Food Fibre Genetic resources Bio-chemicals, natural medicines, etc. Ornamental resources Fresh water
Regulating services	Climate regulation Air quality regulation Water regulation Erosion regulation Disease regulation Pest regulation Pollination
Cultural services	Cultural diversity Spiritual and religious values Recreation and ecotourism Aesthetic values Knowledge systems Educational values
Supporting services	Soil formation Photosynthesis Primary production Nutrient cycling Water cycling

In terms of management, human values are a primary concern because they impact on existing compositional elements and processes in an ecosystem, as well as establishing/influencing management of both to enhance the desired ES (Wallace 2012) (Fig 1). Figure 1 attempts to compartmentalise the compositional elements, process and human values into a simple model of their interaction in capturing ES and the evolution of new values and changed ecosystem status. An inescapable conclusion from such a model is that human values are at the heart of all other elements from a management perspective. This is indirectly asserted by one of the 'key messages' from the MEA's biodiversity synthesis (MEA 2005a) which stated that '*Science can help ensure that decisions are made with the best available information, but ultimately the future of biodiversity will be determined by society.*' This highlights the dual needs for stakeholder education and inclusion.

A key challenge for environmental managers on KI is to understand the role and value of native vegetation on KI, which is likely to be significant as it covers ≈40% of the land, more than any other agricultural region in SA. Sixty five percent of this native vegetation is protected under public and private agreements (Neagle 2002, KINRM Board 2009). Wallace (2007) suggested an approach to clarifying targets for management whereby desired ES are linked to discrete compositional elements and environmental processes they derive from. This allows managers to clearly separate the processes that should be managed for the ends (ES) that are desired (but not managed in themselves). Figure 2 provides an example as a simplified flow diagram of how five ES are linked to photosynthesis and pollination processes that produce vegetation in native and

primary production systems (Wallace 2007). In theory this appears to be a sound approach, however, our rudimentary scientific understanding of the complexity and degree of various interactions, prevents them from being defined with confidence in many cases. A simple example is pollination, a process may be performed by abiotic and biotic elements. The various biotic pollinators may have different environmental requirements and may target different plants, plant species may be pollinated in different ways, and it is not clear how much of the value of a given ES (e.g. recreation in natural environments in Fig 2) is attributable to pollination.

Another consideration is that the definition of what an element/service/process is and how they interact, may change with application, scale and/or viewpoint (even when defining the same ES). Therefore multiple classification systems may be needed to deal with this complexity as suggested by Costanza (2008). Fisher, Turner et al. (2009) make the important point that the classification of ES is essentially a decision making tool and that ES classification schemes should have clear and robust ES definitions as well as reflecting the decision-making context in which they reside and characteristics of the associated environment.

Later in the report, I attempt to discuss some of the ecosystem processes and ES that native vegetation contributes to on KI, some threats to these ES and also how native vegetation can contribute to landscape resilience.

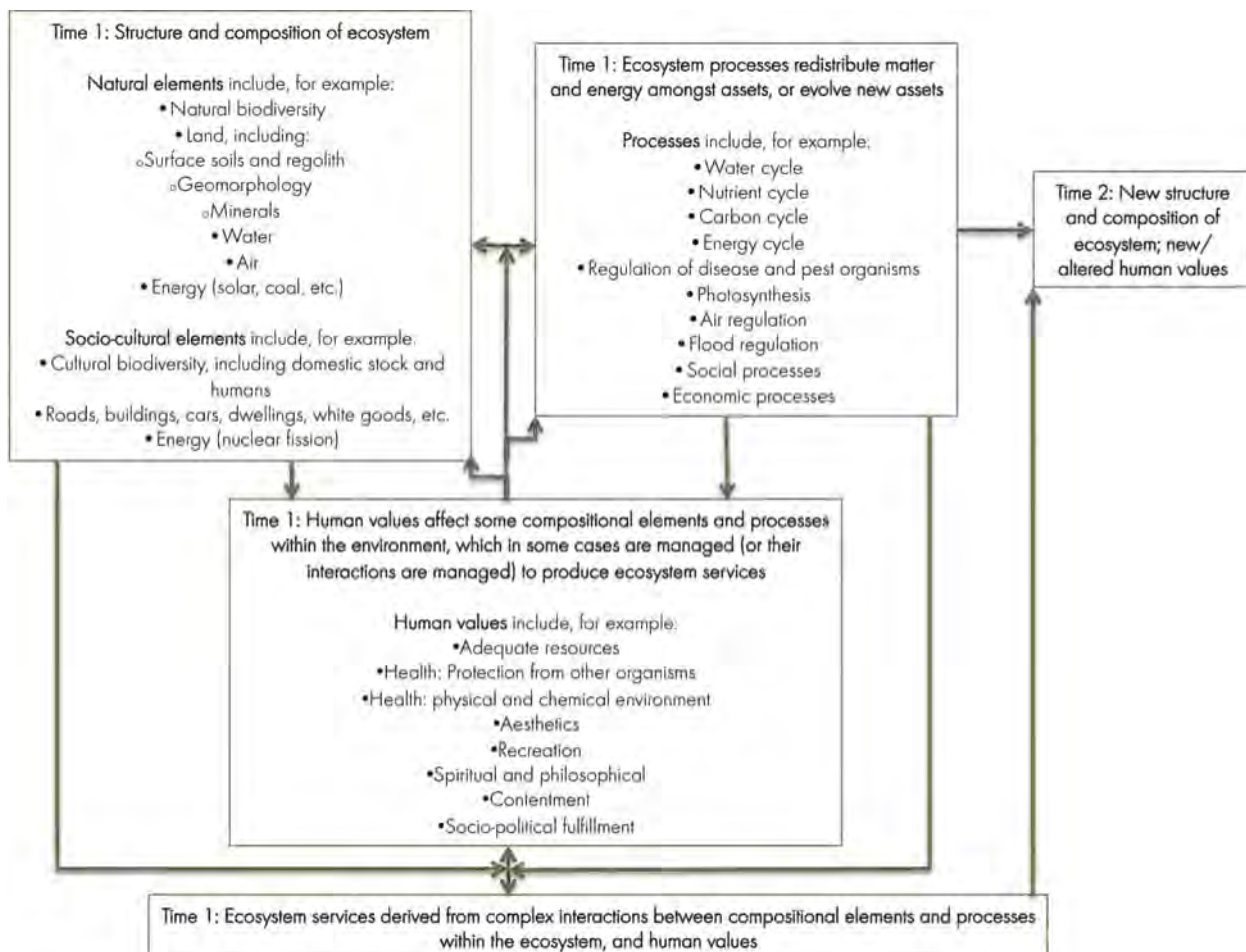


Figure 1. Simplified model of provision of ecosystem services through interactions between structural/compositional elements of an ecosystem, the ecosystem process they underpin, and human values which can impact on the services themselves as well as the ecosystem elements and processes. Arrows represent influence but do not specify the type or degree of influence. Over time environmental processes and altered human values lead to a new set of circumstances (e.g. deriving a new service increases social capital of the underpinning elements and processes). Compiled and modified from Wallace (2007 and 2012). Costanza (2008), suggested that the divisions between structure/composition, process and ES in the above model are in reality not well defined and vary according to application of the model.

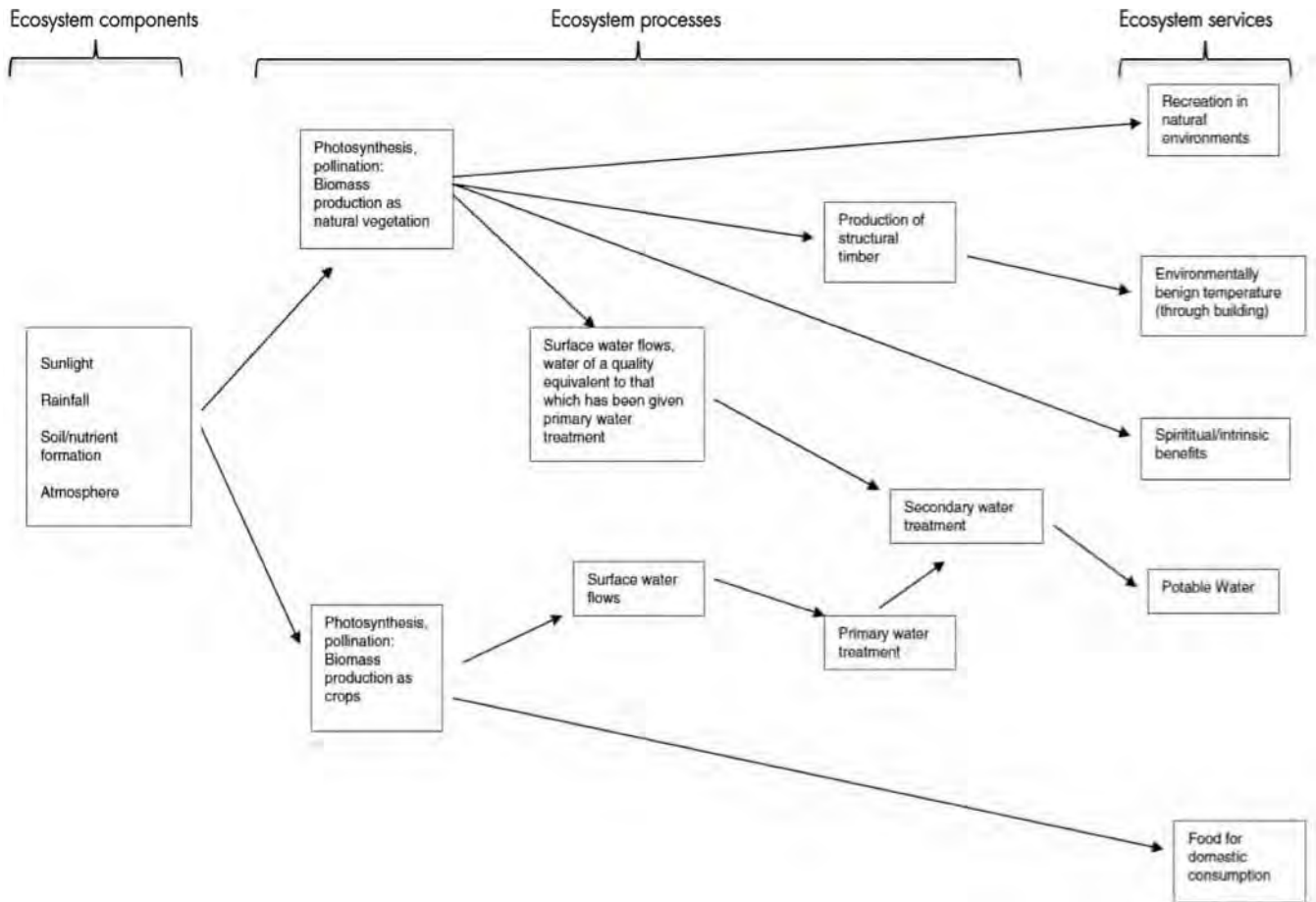


Figure 2. Simplified flow diagram of linkage between basic ecosystem elements, the processes they underpin (here exemplified by photosynthesis and pollination), and the services they provide (adapted from Wallace (2007)). If the interacting parts that produce various services can be accurately identified, quantified and their relationships understood, then this form of ES characterisation may be a useful decision making tool in NRM, for landscape management to maximise/preserve ES delivery. However, definition of what is an element/service/process, and how they interact, may change with application, scale and/or viewpoint, and therefore multiple classification systems may be needed for the same ES.

There is currently not a reliable way to ascribe monetary values to complex ES and the value is unlikely to be constant (MEA 2005a, Costanza, de Groot et al. 2014). A standardised method for economically valuing ES from native vegetation has yet to be developed due to the complexity of the ecosystems themselves, their interaction with human well-being, different views about what ES encompasses, and varying management contexts that use ES classifications. For example, a recent paper cited problems with capturing intangible (non-monetary) benefits and the definition of stakeholder groups as major problems in determining the real value of ES (Brooks, Smith et al. 2014). Even for the relatively targeted assignment of ES to native vegetation on KI, there are significant difficulties in producing meaningful economic values. For example, the value of ES to different stakeholder groups is different and their quantitative relationship unknown (e.g. pest management services provided to primary producers versus intangible benefits to tourism). Also the perceived value amongst individuals within a stakeholder group can vary significantly and the benefits/costs will also vary.

There is also a range of other problems, e.g:

- ES that are an inherent part of the landscape are seen by many as being the *status quo* and their economic value is often not considered

- often there is no equivalent service with which to compare a given ES e.g. prevention of weed establishment. Therefore values are often based on indirect measures and involve estimates of the level of connectedness between these measures and the ES
- ES are often not apparent (or at least, less quantifiable) until they are lost. Indeed, the MEA was set up due to broad-scale degradation of ecosystems in developing countries and the concern that ES associated with human well-being were being degraded (MEA 2005b)
- the scientific understanding of the ES provided may be poor
- different ES interact with each other in complex ways and there is limited understanding of how given management practices act in a cumulative way or at sites distant to their implementation
- there may be a range of trade-offs to consider e.g. an accepted cultural/business practice seen as socially beneficial, could have detrimental effects environmentally
- it is difficult to value prophylactic effects and their value depends on events that may or may not occur
- there is no broad agreement about landscape attributes that correlate with well-being
- stakeholders often have a mindset where dealing with current issues has inherently more value than potential future problems
- the conceptualisation of ES by those that are resident on a given property is often very different to those seeking to manage the ES more broadly
- some ES may not relate to economics, or do so in such a convoluted way as to be indeterminable e.g. scientific value of intact and unique ecosystems

The debate is ongoing regarding approaches to conceptualising ES themselves i.e. what they encompass and how they are categorised, and ascribing values to ES. However, it is clear that ES are significant and globally they are believed to easily outstrip gross domestic product i.e., they are of far more value than the economies they underpin (Costanza, de Groot et al. 2014). It has also been argued that in using the MEA-derived classification presented in Table 1, supporting services (e.g. soil) and regulating services (e.g. pollination) are generally grossly undervalued (Bommarco, Kleijn et al. 2013).

For the purposes of NRM planning on KI with limited resources, it could be argued that we should simply identify/define the potential services, attempt to understand their relative impacts, and aim generally to maintain environmental quality and resilience, rather than expending effort to produce values with low statistical confidence. Indeed, there is an argument that the definition of environmental parameters in economic terms is fundamentally flawed (Monbiot 2014), at least in some cases (Adams 2014, Mace 2014). However, there are dangers to non-assignment of economic values (see Mace 2014) and good practical reasons to frame the relative ES values in economic terms, including:

- many ES are not valued by the community until they are lost and so defining an economic value can highlight the ES and aid in its protection/exploitation
- industry, community & government routinely use economic metrics and therefore require such a characterisation for ease of communication and comparison
- facilitates a move towards full cost : benefit accounting and ability to calculate trade-offs, both of which are important to increase the robustness and efficiency of decision making at a landscape level
- most proactive management decisions in the commercial world (including primary production) are undertaken due to economic imperatives

Other considerations are that placing economic values on ES for differing applications may require use of different economic metrics, may need to be calculated over different spatial scales and/or may require differing degrees of accuracy (Table 2) (Costanza 2008, Costanza, Kubiszewski et al. 2011, Zhang, Holzapfel et al. 2013). For example, in terms of raising awareness and demonstrating concepts about ES, total values and low precision may be sufficient and the spatial scale of calculation matches that of the target audience. In contrast, a full cost accounting application might require a range of economic metrics, high precision and be calculated at regional scales (or greater). A good discussion on full cost accounting, valuing intangible benefits and methods for valuation can be found in Kaval and Baskaran (2013). These issues are key in terms of maximising ES benefits across stakeholder groups (see later).

Table 2. Contrast of (theoretical) economic metrics, spatial scales of calculation, and precision, required to economically value ecosystem services for a range of applications (Costanza 2008).

Use of valuation	Appropriate values	Appropriate spatial scales	Precision needed
Raising awareness and interest	Total values; macro aggregates	Regional to global	Low
National income and well-being accounts	Total values by sector; macro aggregates	National	Medium
Specific policy analyses	Changes by policy	Multiple depending on policy	Medium to high
Urban and regional land use planning	Changes by land use scenario	Regional	Low to medium
Payment for ecosystem services	Changes by actions due payment	Multiple depending on system	Medium to high
Full cost accounting	Total values by business, product, or activity; changes by business, product, or activity	Regional to global, given the scale of international corporations	Medium to high
Common asset trusts	Totals to assess capital; changes to assess income and loss	Regional to global	Medium

One clear upshot of the issues I discuss below, is that management practices that are undertaken at a defined site can impact on the broader landscape and effect operations of adjacent and more distant sites, and potentially of many other people on KI. This is one of the key reasons that many regulatory bodies and other NRM-related groups, are taking a 'landscape' approach to NRM.

Ecosystems Services from Native Vegetation

Agricultural Pest, Weed and Disease Management

There are four general principles that suggest that intact native vegetation has significant benefits related to management of invertebrate pests, weeds and crop diseases in primary production systems:

- 1) Relatedness of crops and weeds and their association with invertebrates: crop plants are generally exotic species and the invertebrate pests that attack them are usually also exotic (Table 3). Crop plants and weeds are also often in the same plant families and so harbour similar invertebrate pests and diseases such as viruses (and the disease vectors). Some of these plant families are rare in native vegetation (see examples in Table 3) as are some key plant viruses.
- 2) Beneficial invertebrates such as parasitoid wasps and predators are known to be associated with (and supported by) native vegetation (Table 4) and most invertebrate pests and plant viruses are unlikely to be common in native vegetation.
- 3) Importance of climatic or regional adaptation: plant diseases, weeds and invertebrate pests have a higher chance of establishing and competing in new regions with similar climatic conditions to their

natural range. In such regions, they have also have an increased chance of interacting with each other and with crops to increase pest pressure and pest reservoirs on land adjacent to crops. For KI, relates mainly to South African and the Mediterranean regions, from which many of our pests derive. A recent discovery highlights such an interaction on KI: an important invertebrate pest for KI grains and pasture crops (red-legged earth mite, RLEM: *Halotydeus destructor*) being supported by bridal creeper, *Asparagus asparagoides* (pers. obs. 2014; Figure 3). Bridal creeper is a 'weed of national significance' (WoNS) and a serious environmental and roadside weed on KI. These pest species both originate from South Africa, and while the observation of RLEM on other South African weeds has been reported (Ridsdill-Smith, Hoffmann et al. 2008, GRDC 2014), its presence on bridal creeper has not. This one example highlights the volatile nature of interactions in disturbed areas between exotic species from similar climatic regions, and links to the following principle that,

- 4) intact native vegetation buffers against changes to species composition, especially introduction of new plants. In agriculture this may be beneficial in inhibiting establishment of weed species (or adjacent volunteer crop species) that carry diseases or infest productive land. This is also important adjacent to primary production as abnormally high nutrient levels (compared to native soils) can drive healthy populations of exotics.

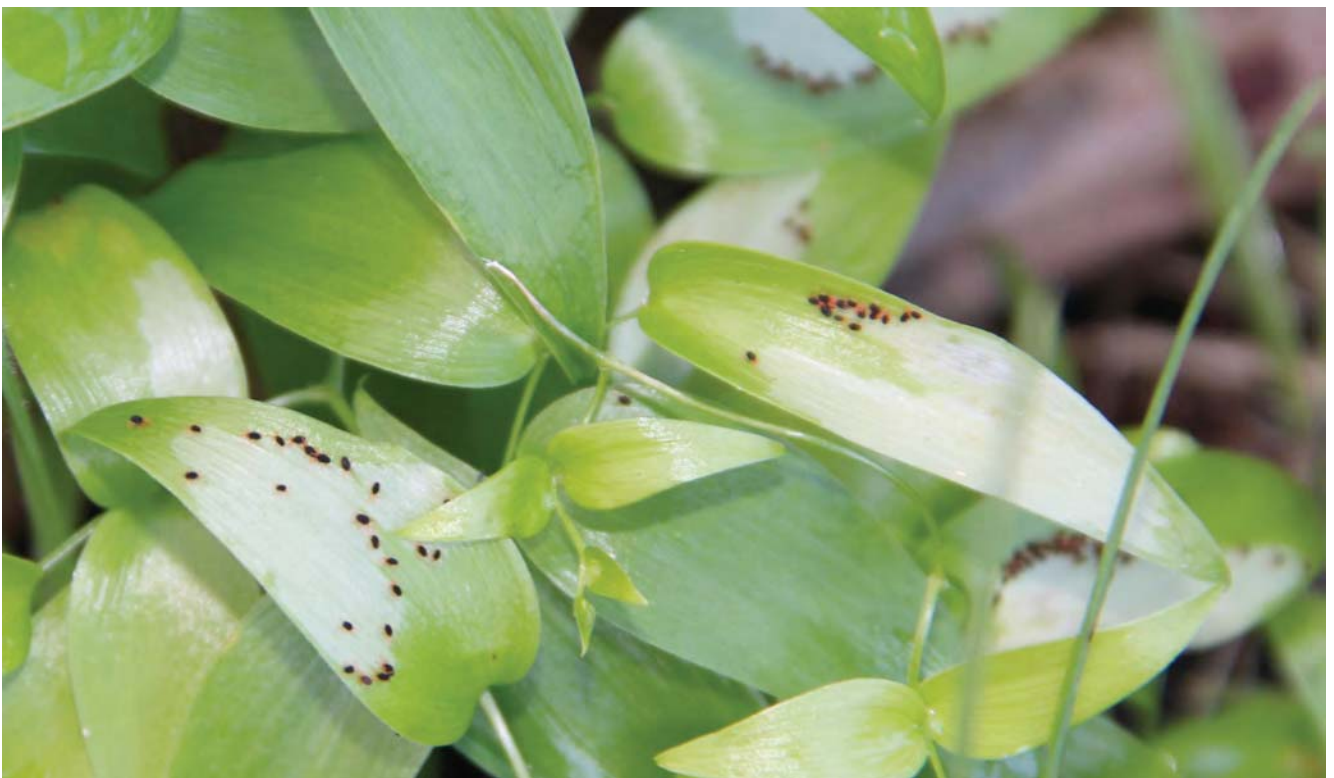


Figure 3. Red-legged earth mite (*Halotydeus destructor*) is an important pest of pasture and grains crops on Kangaroo Island and elsewhere. It was recently discovered feeding on bridal creeper (*Asparagus asparagoides*) adjacent pasture (MacGillivray, June 2014). Both pest species originate from South Africa. Bridal creeper (WoNS species) is common in disturbed roadside vegetation on parts of Kangaroo Island and its presence adjacent to agriculture likely reduces the efficiency of RLEM control measures in crops. Bridal creeper populations are inhibited by dense, undisturbed native vegetation.

Table 3: Two example plant families containing numerous crop plants and weeds. The crop viruses and pest invertebrates (some virus vectors) they support in Australia are listed. Many of the crop viruses and pests are associated with multiple crop and weed species. Both the Brassicaceae and Solanaceae are relatively poorly represented in native vegetation on KI (~1% and ~0.5% of plant taxa, respectively), suggesting that native vegetation has the potential to reduce incidence of both pests and crop viruses when located adjacent to primary production. Thrips and aphids vector most of these viruses. These invertebrate vectors are far more common on weeds than native vegetation, whereas beneficial insects are common in native vegetation (Schellhorn, Glatz et al. 2010, Wood, Siekmann et al. 2010, GRDC 2014).

Plant Family	Crops	Weeds	Viruses	Pest Invertebrates	Comments
Brassicaceae	Canola Cabbage Cauliflower Broccoli Brussels Sprouts Kale Bok Choi Radish Turnip	Lincoln Weed Skeleton Weed Wild Radish Wild Mustard Volunteer Canola	BWYV TSWV TMV TLCV TYLCV TuMV	Diamondback moth Cabbage white butterfly Green peach aphid ^V Turnip aphid ^V Cabbage aphid ^V Western flower thrips ^V Red-legged earth mite Balaustium mite Rutherglen bug ^N	BWYV also infects a range of other crop plants on KI (e.g. pulses, legumes such as lucerne). Outbreak in 2014 in Lower North and Mid North regions of SA linked to weeds supporting BWYV and green peach aphid (both are rare in native vegetation)
Solanaceae	Potato Tomato Capsicum Eggplant Chili	Silver leaf nightshade Blackberry nightshade Apple of Sodom	TSWV INSV CaCV CMV PMMV PVX* PVY* PLRV PVS*	Western flower thrips ^V Tomato thrips ^V Melon thrips ^V Red-legged earth mite Balaustium mite European Earwigs Green vegetable bug Brown shield bug ^N	TSWV is able to infect at least 1090 plant species from 84 families, many of which are weeds.

Abbreviations - BWYV: beet western yellows virus; CaCV: capsicum chlorosis virus; CMV: cucumber mosaic virus; INSV: impatiens necrotic spot virus; PLRV: potato leaf roll virus; PMMV: pepper mild mottle virus; PVS/PVX/PVY potato viruses S, X and Y; TLCV: tomato leaf curl virus; TMV: tomato mosaic virus; TSWV: tomato spotted wilt virus; TuMV: turnip mosaic virus; TYLCV: tomato yellow leaf curl virus.

^Vcrop-virus vector

^Nnative pest but of relatively minor concern in listed crops

*not known to be present and therefore of biosecurity concern for KI

Compiled from Persley, Thomas et al. (2006), Persley, Sharman et al. (2007), Persley and Gambley (2010), Gillam and Urban (2014).

The underlying numerical relationships between populations of a pest species and a beneficial species that is a predator or parasitoid (a parasite that kills its host) of the pest, have been extensively modelled and are quite well characterised. A simple, generic model of these relationships is that of 'delayed density dependence' (Figure 4). In simple terms this means that beneficial populations in a primary production system will respond to pests after an initial lag period, leading to a rise in the beneficial population and a consequent reduction in the pest population and a sustained reduction in the pest population over time.

Table 4. Key agriculturally beneficial arthropods commonly associated with native vegetation on Kangaroo Island and their beneficial roles.

Brood group	Key beneficial groups on KI	Example species occurring on KI (or likely to)	Role
Mantodea (preying mantids)	Most species	<i>Orthodera ministralis</i> (green garden mantid) <i>Archimantis</i> spp.	General predation of arthropods
Hemiptera (true bugs)	<ul style="list-style-type: none"> • Reduviidae (assassin bugs) • Miridae (predatory species only) • Pentatomidae (predatory species only) • Lygaeidae (predatory species only) • Cimicoidea (cimicoid bugs) • Stenocephalidae (stenocephalid bugs) • Enicocephalidae (enicocephalid bugs) 	<i>Nabis kinbergii</i> (Pacific damsel bug) <i>Dicranocephalus</i> spp. <i>Oechalia schellenbergii</i> (spined predatory bug) <i>Geocoris</i> sp. (big eyed bug)	<ul style="list-style-type: none"> • General predation of arthropods • <i>Nabis</i> known to consume aphids & diamondback moth larvae
Thysanoptera (thrips)	Thripidae (predatory species only) Aeolothripidae	<i>Haplathrips victoriensis</i> <i>Scolothrips</i> sp.	Predate on pest thrips, mites, other small invertebrates & invertebrate eggs
Neuroptera (lacewings)	<ul style="list-style-type: none"> • Hemerobiidae (brown lacewings) • Chrysopidae (green lacewings) • Coniopterigidae (dusty wings) • Several other families 	<i>Micromus tasmaniae</i> (common brown lacewing) <i>Chrysoperla</i> sp. (green lacewing) <i>Mallada signatus</i> (green lacewing)	<ul style="list-style-type: none"> • General predation of arthropods • <i>Micromus</i> known as key beneficial predator of aphids • <i>Chrysoperla</i> & <i>Mallada</i> commonly found in agricultural systems
Coleoptera (beetles)	<ul style="list-style-type: none"> • Carabidae (ground/tiger beetles) • Staphylinidae (rove beetles) • Cantharidae (soldier beetles) • Cleridae (clerid beetles) • Melyridae (melyrid beetles) • Coccinellidae (ladybirds) 	<i>Chauliognathus</i> sp. <i>Dicaronolais</i> spp. <i>Cryptolaemus montouzieri</i> (mealybug ladybird) <i>Hippodamia variegata</i> (white-collared ladybird) <i>Coccinella transversalis</i> (transverse ladybird) <i>Harmonia conformis</i> (large spotted ladybird) <i>Diamus notescens</i> (two-spotted ladybird) <i>Cleobora mellyi</i> (southern ladybird) <i>Orcus australasiae</i> (orange-spotted ladybird)	<ul style="list-style-type: none"> • General predation of arthropods; some ladybirds target aphids • Many species may be non-specific pollinators when flower feeding.

Table 4 continued

Diptera (flies)	<ul style="list-style-type: none"> • Nemesiinae (nemesiinae flies) • Therevidae (therevid flies) • Asilidae (robber flies) • Bombyliidae (bee flies) • Empididae (empidid flies) • Dolichopodidae (long-legged flies) • Syrphidae (hover flies) • Tachinidae 	<p><i>Cerdistus</i> spp. <i>Bathypogon</i> spp. <i>Mauropteron pelago</i> <i>Neoratus hercules</i> <i>Simosyrphus grandicornis</i> (common hoverfly) <i>Carcelia</i> sp. <i>Trichopoda</i> sp.</p>	<ul style="list-style-type: none"> • Parasitic or general predation of arthropods; • Bee flies predatory as adults, parasitic as larvae. • Some hover fly larvae predatory on communal bugs such as aphids & whitefly. • Many species visiting flowers & may provide pollination (e.g. hover flies)
Hymenoptera (wasps, ants & bees)	<ul style="list-style-type: none"> • Ichneumonidae (ichneumon wasps) • Braconidae (braconid wasps) • Scelionidae (scelionid wasps) • Chalcidoidea (chalcidid wasps, many families) • Colletidae (short-tongued bees) • Halictidae (halictid bees) • Apoidea (bees; honeybee & ≈ 100 species of native bee) 	<p><i>Netella</i> spp. (parasitoids of noctuid moth larvae) <i>Microplitis demolitor</i> (parasitoid of <i>Helicoverpa</i> moths) <i>Ichneumon</i> sp. (parasitoid of noctuid pupae) <i>Heteropelma</i> sp. (parasitoid of noctuid moth larvae) <i>Lissopimpla</i> sp. (parasitoid of noctuid moth larvae) <i>Aphelinus</i> spp. (parasitoids of aphids) <i>Aphidius</i> spp. (parasitoids of aphids) <i>Cotesia glomeratum</i> (parasitoid of cabbage white butterfly) <i>Cotesia rubecula</i> (parasitoid of cabbage white butterfly) <i>Apanteles ippicus</i> (parasitoid of diamondback moth) <i>Diadegma semiclausum</i> (parasitoid of diamondback moth) <i>Trichogramma</i> spp. (parasitise noctuid moth eggs) <i>Hemiptarenus varicornis</i> (parasitoid of leafmining flies) <i>Apis mellifera</i> (European honeybee) <i>Amegilla chlorocyanea</i> (blue-banded bee)</p>	<ul style="list-style-type: none"> • Many species are specific parasites & often used as biocontrol agents. They attack eggs, larvae & adults of other insects. • Many wasps & bees will visit flowers providing pollination.
Arachnida (spiders, scorpions etc.)	<ul style="list-style-type: none"> • Many spiders • Pseudoscorpions • Predatory mites 		<p>General predation on other arthropods with predatory mites generally attacking other mites</p>

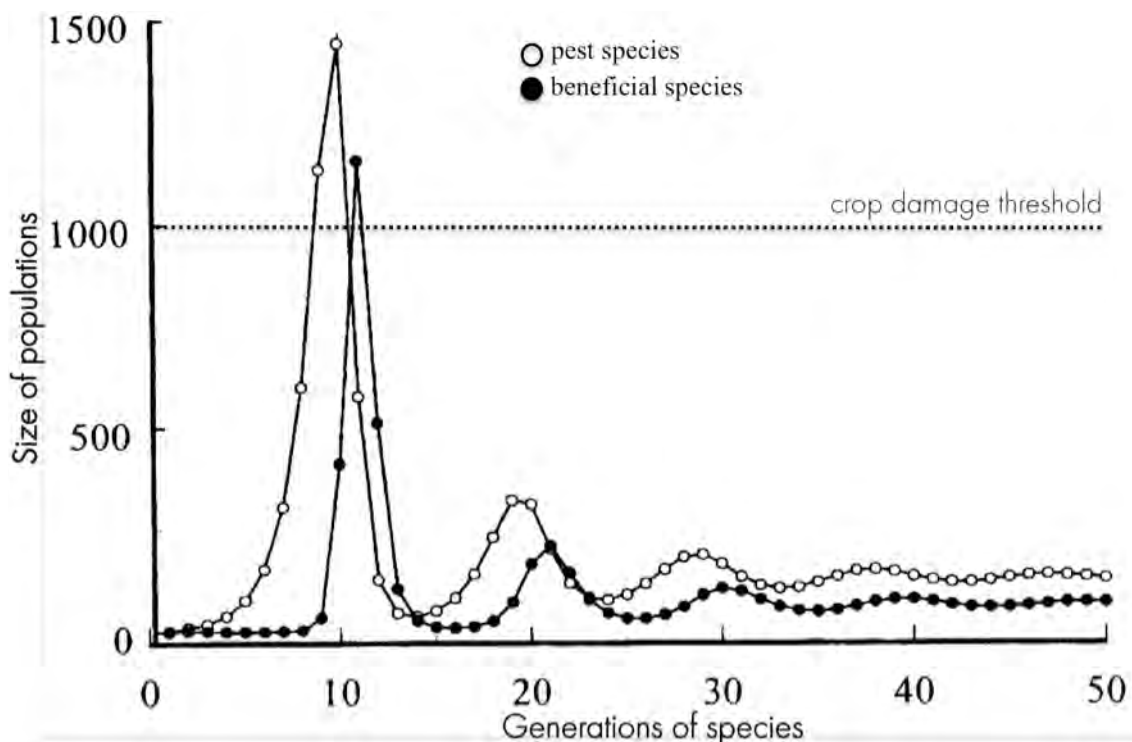


Figure 4. Generic delayed density dependent relationship (using a negative binomial distribution model) between a pest species (white circles) and a beneficial species (black circles) that is either a predator or parasitoid attacking the pest (adapted from Hassell (2000)). The model shows that pest populations can be significantly reduced by the presence of these beneficial species. The model relies on numerous assumptions and is altered by a range of biological and physical variables associated with different pest/beneficial species interactions, however, the underlying principle of delayed density dependence is robust. The level that the pest population can achieve and the speed at which a beneficial species provides pest control are closely related to the starting population levels and how favorable the environment is for each. Both of these important factors may be influenced by the presence of native vegetation and its proximity to crops, and in some cases beneficial species may aid to prevent pest populations from exceeding the crop damage threshold. The model shows the situation in a natural context where generations of coexistence lead to more stable populations of both species, whereas a typical annual cropping system would "reset" the model after harvest.

Thus, native vegetation can be manipulated to aid in reducing pest/disease population peaks (or reduce cost/collateral damage of controls) through either inhibition of pest numbers, earlier provision of beneficials, and/or increased provision of beneficials. These may occur through:

- native vegetation inhibiting establishment or reducing weed populations
- providing resources for beneficial insects (e.g. shelter, nectar, hosts); known as "conservation biological control"
- reduction of pest reservoirs (or prevention of near-crop establishment)
- addition of beneficials into crops early in, or ahead of, pest pressure
- inhibiting movement of pests by fragmenting exotic host weed populations

Each of these processes will act to increase the starting population of beneficials and/or lower the initial pest populations. Both of these effects have potential as part of an integrated pest management system aimed at early establishment of beneficial invertebrates within the crop, reducing the ultimate size of pest populations and aiding in keeping pest numbers below the threshold of acceptable crop damage (Fig 4).

While these general principles have been known for some time, and the benefits of landscape engineering to provide agricultural ES postulated in the scientific community, there has been limited direct scientific evidence about the effectiveness of using native vegetation in specific agricultural pest management scenarios (Landis, Wratten et al. 2000, Gurr, Scarratt et al. 2004, Zehnder, Gurr et al. 2007, Schellhorn, Bianchi et al. 2014). Further, explicit economic advantages have not been easy to define due to the biological complexity and variability of even agricultural systems. However, increasing pest problems in areas with little native vegetation and reduced efficacy of standard control practices (e.g. insecticide resistance), have led some primary industry bodies to investigate the value of native vegetation. Most notably, this has occurred in mid north and western SA where significant losses of canola crops through insecticide-resistance in diamondback moth and green peach aphid, and the aphid-vectoring plant virus BWYV (Table 2), have highlighted these issues. Indeed, weed 'bridges' caused by high rainfall was cited as a key reason for the BWYV outbreak in 2014 (Kimber, DeGraaf et al. 2014).

With regard to crop viruses (that can cause significant losses and be difficult to control), a common part of integrated management is weed control. This is because weeds are often reservoirs for the crop viruses and for thrips/aphids, which are their primary vectors (Persley, Sharman et al. 2007, Persly and Gambley 2010, Wood, Glatz et al. 2011) (Table 2). A 1997 study conducted in Perth reported that TSWV was detected in 16 out of 45 exotic weeds tested but was found in only one of 42 Australian species tested (Latham and Jones 1997). An example of research on this problem was conducted on the Northern Adelaide Plains (NAP) by SARDI, and funded by government and industry groups (Wood, Glatz et al. 2011, Wood, Glatz et al. 2011). The role of weeds in supporting tospoviruses such as TWSV and CaCV, and the thrips that vector them (see Table 2), had led horticulturalists in the region to manage the viral disease by maintaining bare earth around their crops using herbicide. Research showed that native vegetation was useful as a weed control option because it was competitive, adapted to local conditions and did not contain the crop viruses. Also, significantly less thrips vectors were found on the native plant species used but beneficial insects were abundant, including a parasitoid wasp that attacked the key thrips pest (western flower thrips; *Frankliniella occidentalis*). Furthermore, it was shown that risk of exotic plants in harbouring the thrips vectors (which are exotic) was higher than for native plants, and that pest thrips populations were lower when further from the crop (Schellhorn, Glatz et al. 2010). This work led to the production of guides to revegetation and local insects relevant to vegetable growers on the NAP (SARDI 2009a and 2009b).

A recent factsheet produced by the Grains Research & Development Council (GRDC) and CSIRO, which listed problem weeds and the invertebrate pests they support, as well as native plants and the beneficial species on them (GRDC 2014). Additionally they advised growers that native vegetation would in general provide pest-management-related ES to producers and that the level of the ES would likely be increased when vegetation was closer to crops because arrival of beneficial species was quicker. As mentioned above, higher starting populations of beneficial species, will produce greater dampening of the peak pest populations (and potentially the duration of population levels above the crop damage threshold; see Fig 4).

This advice to growers suggests that the grains industry accepts scientific research indicating that a landscape with significant native vegetation mixed with production systems is a good model for (economic) production goals. Presumably industry leaders would consider that in hindsight a superior land management approach would have better preserved the native vegetation near agriculture in the study regions. Thus, it is realised that there is a pest-management ES provided by native vegetation that can impact economic outcomes and thus has an economic value. This ES is still available to many producers on KI and minimising its reduction should be an aim of producers and governments at all levels.

It should be noted that I have presented general principles highlighted by some specific examples, but that there are exceptions to these principles. For example, some pest invertebrates are native (Table 1) and occur in native vegetation and/or weeds. However, species that control these native pests (such as highly specific parasitoid wasps) are also naturally present and can mitigate them to some degree unlike many exotic pests) Therefore, it is important to undertake research with regard to requirements of different crops and their management systems. For example, there is no database that defines invertebrate and plant species that are important to KI in terms of being pests, disease reservoirs and beneficial to production. Indeed, a recent report from a regional species assessment project (phase 1) underway in DEWNR takes into account only one invertebrate on KI (Gillam and Urban 2014). Nevertheless, there are obvious potential shared production and biodiversity benefits that could be realised through revegetation programs that target pest management objectives in primary production. It could be argued that many of these issues have not become as serious on KI due to the fact that a lot of native vegetation still exists near agriculture, however, this also means that historically there has not been a good recognition of these benefits on KI and indeed, management practices such as roadside maintenance and fuel-reduction burning ignore these issues and may reduce their efficiency. For example, the current roadside management plans discuss the cost of removing/maintaining roadside vegetation but do not account for any production effects (Kangaroo Island Council 2006).

Similarly, fire management protocols related to fuel reduction discuss asset protection but do not account for beneficial effects of native vegetation on primary production or the reduction of asset values through disturbance, weed introduction and loss of beneficial species from treated areas although some of these concerns are mentioned from a biodiversity perspective (DEWNR 2009, KIDBPC 2009). With regard to shared benefits (or shared problems), fire adapted weeds provide obvious cause for concern. For example, Gorse (which has a very limited KI distribution) is a serious weed of natural systems and agriculture, and reduces the value of agricultural land (DAFF 2006). Additionally, it is highly flammable and seeds are viable for many years in soil. Thus, if introduced to areas that are consistently burnt, Gorse has the potential to cause significant impacts with insufficient resources for its control. For example, it is now a common plant in dense native vegetation in Kyeema CP on the Fleurieu Peninsula after several fires there (pers. obs).

There have been preliminary investigations into the use of controlled burns for biodiversity purposes on KI. These have primarily aimed at regeneration of rare plant species existing in seed-banks of isolated patches of mallee that are considered "senescent" due to long periods without fire resulting in highly reduced plant diversity in the understory and poor condition of the remaining trees. This research has not investigated the effect on organisms related to the adjacent production systems, however, the use of targeted fires may have utility in agricultural weed/pest management and provision of agriculturally beneficial organisms (or in some cases may be detrimental to production). Considering just these two management practices as examples i.e., management of fire and roadside vegetation which are both beset by insufficient resourcing, highlights potential for improving them with regard to the structure of their administration and/or obtaining dual production and ecological benefits.

In this section, I have provided several specific examples to highlight the contributions that native vegetation makes to agricultural pest management. However, there are many more examples in literature and the manipulation of native vegetation to provide agricultural ES is in its infancy, particularly at a landscape scale. The effect of KI flora species for use in pest management on current and potential KI production systems has not been examined in detail and warrants further study.

The issues discussed here under pest management, also have relevance for biosecurity (below).

Agricultural Biosecurity

Pest management and biosecurity issues are similar at a biological level and are mainly differentiated by whether a given organism already exists in the landscape (pest management) or could be introduced there and spread (biosecurity). KI is currently free of a range of serious mainland pests including rabbits/hares, foxes, European wasp, European honeybee (*Apis mellifera*) bacterial diseases European and American foulbrood (Gellard 2005, Glatz 2015). Because of the absence of some obvious and high-profile pest species and being an island, KI biosecurity has been a focus of PIRSA and the various incarnations of DEWNR for some time and departmental plans/legislation have been produced in this regard (Gellard 2005). However, this has primarily focused on the management of entry points for new pests and on-farm biosecurity and there has been little work on several important areas such as:

- identifying key threatening pests (particularly invertebrates and microorganisms) for KI under predicted climatic parameters
- identifying landscape ES that pertain to introduction and spread of newly introduced species
- identifying management practices that maximise these services and will aid in preventing an incursion, or limiting its spread and severity at a landscape level

Intact native vegetation buffers changes to species (especially plant) composition, as mentioned above. Therefore, it is likely the best (free) passive defence in resisting the spread (and hence economic impact on production) of new introductions of exotic pests, weeds and diseases. This is because models of pest/disease spread show that important factors include:

- potential suitable area available
- suitability of climatic conditions
- number and interconnectedness of susceptible host organisms e.g. weeds and crops supporting a disease or invertebrate pest,
- presence/abundance of vectors (including humans)
- presence/degree of competing factors such as control measures.

Biosecurity is particularly important in the context of rapid climate change as presumably KI will be subject to a different suite of potential pests/diseases as conditions alter and the land area that is buffered against this will likely be proportional to the inhibitive capacity of the landscape, particularly for adjacent production systems. This is particularly so for 'cold blooded' organisms such as insects because most aspects of their biology (notably development rates) are regulated by temperature. The Plant Biosecurity CRC (<http://www.crplantbiosecurity.com.au/>) has conducted projects aimed at modelling risk of potential invasive species. For example, the risk of exotic insects and plants entering Australia was analysed using quantitative self-organising maps of pest species assemblages internationally, based on impact metrics (Paini, Worner et al. 2010, Morin, Paini et al. 2013). These studies both commented that current data sets in this area are beset by subjectivity (particularly regarding relative impacts of specific taxa) but that their approach had some merit in adding objectivity to what is currently a largely consultative process. For weeds in particular, it was suggested that analysing characteristics of invasiveness could be a superior approach in minimising subjectivity (Morin, Paini et al. 2013). It should be realised that this type of research is still examining different models for agreement with current data sets to assess the usefulness of various approaches, and predictive models of this kind are not yet in widespread managerial use. However, it is useful to be aware of developments in this area, and to attempt to engage with relevant researchers to analyse data sets relevant to KI. Determining the most likely and/or most damaging incursions for KI, will help to prioritise landscape attributes to be managed for biosecurity outcomes although the underlying principle of reduction of disturbed, non-managed areas are likely to be important in most cases. The plant biosecurity CRC is also investigating a

range of technologies for real-time biosecurity monitoring as well developing biosecurity networks for information sharing and diagnostics.

The value of intact native vegetation in providing biosecurity-related ES to agricultural production systems was recently acknowledged by the KINRM board who endorsed a recommendation from its Biosecurity Advisory Committee stating that “degradation/clearance of native vegetation adjacent to primary production is a Key Threatening Process for agricultural biosecurity on KI” (KINRM Board 2014). Given that resources available to control new outbreaks will be insufficient to significantly reduce their population size and rate of spread, the presence of intact native vegetation should be seen as an insurance against the occurrence or severity of such incursions and could conceivably be worth many millions of dollars in that regard. A further consideration is that biosecurity incursions may not occur in adjacent mainland areas, in which case there could be prohibitions placed on KI exports and/or sales, which would have significant impact on affected industries. There are numerous examples of this such as several fruit fly species on mainland SA, the discovery of which results in establishment of exclusion zones from which fruit and vegetables cannot be exported.

Not only can native vegetation act as a passive aid to biosecurity through reducing the area and hosts allowing establishment and spread of a given pest, but there is potential for it to host natural biological control agents for serious pests that are yet to occur. For example, research on the NAP showed that native saltbush species were supporting parasitoid wasps that were attacking small native flies mining in their leaves (Wood, Siekmann et al. 2010). One wasp in particular, *Hemiptarsenus varicornis*, is a known biological control agent for an Emergency Plant Pest (EPP) as declared by Plant Health Australia (PHA 2014). This pest, which is a fly known as the vegetable leaf-miner (*Liriomyza sativae*), causes serious losses in vegetables and ornamentals by mining in their leaves and has become increasingly difficult to control by insecticides in other countries (Murphy and LaSalle 1999, Rauf, Shepard et al. 2000, Salvo and Valladares 2007). Furthermore, the pest flies would not likely mine the saltbush leaves. Therefore, these saltbushes provide the capability of producing prophylactic populations of *H. varicornis* (and other wasp species also) near relevant crops (Murphy and LaSalle 1999, Wood, Siekmann et al. 2010). Also, the saltbushes supported native biodiversity including useful insects, were less likely to support other key vegetable pests such as thrips virus-vectors (Table 3) and required little post-establishment management (SARDI 2009, Schellhorn, Glatz et al. 2010, Wood, Glatz et al. 2011).

Management practices for biosecurity applications are necessarily prophylactic and therefore their value is difficult to assess as they attempt to encompass measures of risk; they are akin to an insurance policy in that their real value is determined by the occurrence of future events. However, the majority of people do consider it appropriate to use insurance to mitigate risk for major occurrences that are relatively unlikely. This is because the cost of these risk factors far outweighs the insurance cost. Landscape management for biosecurity purposes should be considered similarly in that the cost of altering current management practices (or introducing new practices) to reduce area for pest establishment and spread is likely to be a fraction of the cost of serious incursions under a ‘business as usual’ scenario. Such incursions could have large impacts and cost KI through ongoing reduced production, control measures, quarantine measures, certification problems etc., and in a worse case scenario could involve increased regulation or banning of inter- or intra-island movement/trading.

Pollination

It is well known that natural ecosystems provide pollination services to crops and that agricultural intensification generally requires trade-offs with these services and with pollination of native plant species (Allen-Wardell, Bernhardt et al. 1998, Kleijn and van Langevelde 2006). The European honeybee is widely recognised for its contribution to the pollination of some agricultural plants. On KI, this relates mainly to broad-leaf pasture,

canola, pulses and horticultural production, with cereals being wind pollinated. However, natural ecosystems support a diverse range of native pollinating insects that appear to provide good pollination services, which are less well characterised and generally underestimated. These pollinating insects include many species of flies, wasps and bees (some examples in Table 4), which regularly visit flowers and have the potential to pollinate them. Observations suggest that there are about 100 species of native bee on KI (the only introduced species is the honeybee), which nest either in dead wood or in the ground.

There are two main issues to consider with regard to wild pollinators and native vegetation management:

- 1) the crop pollination ES that can be derived from native vegetation
- 2) pollination of native vegetation as an ecosystem function

The degree of 'native pollination' of crops is yet to be fully understood and will vary with crop type, proximity of habitat to crop etc. However, there is clear evidence that there is a pollination ES provided by adjacent native vegetation to a range of crops across different environments and that pollinator density is a key driver of this effect (Blanche, Ludwig et al. 2006, Ricketts, Regetz et al. 2008, Arthur, Li et al. 2010). Importantly for KI, research on temperate Australian canola crops showed that densities of wild honeybees were greater at the margins of crops (compared to the centre) and positively correlated with good quality woody vegetation within 300 metres of crops (Arthur, Li et al. 2010). This study also found that collectively, hover flies and native bees were more abundant visitors than honeybees but were not as strongly associated with the woody vegetation likely due to the native bees being ground nesting. In the UK, nutrition of managed honeybees was positively correlated to the amount of grassland and broadleaf woodland around hives and negatively correlated with the amount of "arable and horticultural farmland" (Donkersley, Rhodes et al. 2014). Furthermore, landscape complexity and bee abundance have been correlated across many cropping systems (Kennedy, Lonsdorf et al. 2013). These findings highlight that different pollinator species have different habitat requirements and respond to landscape management in different ways (Greenleaf and Kremen 2006). Therefore, to inform vegetation management aimed at delivering pollination ES, research is required to tease out the specifics of these variables with regard to production of different crops adjacent to different suites of native plants. Some researchers are attempting to find reliable ways to assess the crop pollination potential afforded by various adjacent vegetation types e.g. see (Ricou, Schneller et al. 2014). Farming systems themselves, also appear to play a role in the efficiency of capturing the available pollination services of wild bees. For example, a large study assessed factors correlated with abundance and diversity of wild bees in 39 crops globally and found that both measures were higher in landscapes comprising more quality habitats and in organic or multi-crop fields (Kennedy, Lonsdorf et al. 2013). In agreement with the Australian canola study cited above, they found that bee diversity in conventionally farmed fields of low diversity were correlated with high quality surrounding landscape. Two key conclusions were that:

- 1) pollinator resilience will depend on maintenance of high quality habitat around farms
- 2) that local management practices may help to reduce the pollination trade-offs inherent in agricultural systems that are intensive monocultures

With regard to native plant species it is crucial that diverse pollinator populations are maintained, which essentially requires habitat protection for a broad range of pollinator species, which include birds, mammals and many species of insect. It is important to recognise that while many native plants have quite general pollination requirements (such as Mrytaceae) there are many that require a more defined pollinator suite and in some cases (particularly orchids) pollination may be highly specific. It is important to note that many native plants require vibratory pollination (commonly known as buzz-pollination) and on KI this can only be performed by a subset of native bees and highlights the need to maintain healthy populations of these native pollinators. The European honeybee cannot perform buzz pollination and cannot efficiently pollinate these plants although honeybees may still harvest the pollen these flowers use to attract their natural pollinators.

This also highlights the potential complexity of the biological trade-offs that need to be assessed and managed as part of a landscape-based ES approach. While honeybees are required for sufficient pollination of some exotic crops, they are likely to negatively impact on native ecosystems in numerous ways (Carr 2011, Glatz 2015). It should be considered that southern Australian native plants have coevolved with native pollinators, all of which have quite different biology to the honeybee. For example, no KI bee species forms eusocial colonies or forages throughout the year. A decision framework for formulating trade-offs in managing a species that is both agriculturally useful and ecologically deleterious was investigated for buffel grass (Grechi, Chades et al. 2013) and a similar approach could be useful for management decisions regarding such species on KI.

The health of honeybees is currently topical due to the threat posed by the parasitic *Varroa mite* (*Varroa destructor*), which has reduced wild populations where it has established. Additionally, the occurrence of 'colony collapse disorder' in the US and Europe has been linked to *Varroa* introduction although clearly there are also other interacting factors which are not yet understood. It was estimated that economic losses from the introduction of the *Varroa* mite to Australia would range from AUS\$21.3-55.5 million per year (Cook, Thomas et al. 2007). This has focussed increasing attention on maintaining current pollination services and harnessing pollination services provided by species other than the honeybee; landscape management is increasingly seen as having a role to play in this regard. An example of a concerted pollination initiative is *The Integrated Crop Pollination Project* in the USA (ICCP 2015). With regard to biosecurity of honeybees, KI is far better prepared than other Australian regions due to long standing legislation and geographical isolation (Glatz 2015). This is also applies to the Asian honeybee (*Apis cerana*) which has now established around Cairns, Qld.

Salinity

The most serious changes that can occur in a landscape are physiochemical changes, as they are seen as 'permanent' and generally they completely alter the associated biodiversity and productive capacity of affected land (Pisanu, Rogers et al. 2013). On KI and elsewhere in Australia, salinity is the most serious of such changes, particularly dryland salinity which is caused by significant removal of deep rooted, perennial native vegetation and/or its replacement by shallow rooted, annual plants (most often crops, pastures and weeds). This reduces the amount of water that is taken up by plants which causes the mean level of the water-table (which naturally rises and falls with seasonal rainfall) to rise, leading to the increased deposition of naturally occurring salt in upper layers of the soil or at the surface. This reduces and in many cases destroys productivity and/or existing biodiversity, which is replaced by far fewer species that are salt tolerant. This is most pronounced in low lying areas and has been clearly demonstrated in some parts of KI such as the Eastern Plains where many previously freshwater soaks and lagoons have markedly increased in size and salinity. This has in turn resulted in loss of much of the associated biodiversity in affected areas and marginalised associated agricultural land.

In 2000, it was estimated that almost 10,000ha were effected on KI (NDSP 2000) and this is expected to increase (Pisanu, Rogers et al. 2013). The only solutions that have provided mitigation at landscape level have been large engineering efforts such as drains (such as in south-east SA) and evaporation basins (e.g. Riverland). However, these are expensive to establish and maintain, and are associated with their own environmental problems. Given the small rates base of the KI council and the difficulty in remediating such land, the maintenance or cooperative reestablishment of deep-rooted, perennial native vegetation in such areas is likely to be the best long term solution especially in light of the other benefits discussed here. Technologies such as salt tolerant (perhaps GM) crops will also be important as they could reduce the area of agricultural land that is marginalised without requiring solutions causing further environmental damage or reducing tourist appeal e.g. salt drains and pipelines.

Biodiversity

The biodiversity of KI is better protected than other agricultural regions on mainland Australia, largely due to the significant natural vegetation remaining on a large portion of the island. KI displays quite a high level of plant endemism with ≈ 46 endemic taxa, representing $\approx 5\%$ of species (Neagle 2002, Gillam and Urban 2014, Glatz 2015). However, KI also has a lot to lose and has significant challenges with 21% of flora species and 21% of fauna species (only one invertebrate assessed) classed as threatened, and with significant threatened flora in fragmented and degraded areas e.g. roadsides of the Eastern Plains (Pisanu, Rogers et al. 2013, Gillam and Urban 2014). These figures increase to 52% and 59% if 'rare' or 'near threatened' taxa are included. Native vegetation is crucial to broader biodiversity as it provides habitat, indeed clearance/fragmentation of vegetation is often cited as a key issue in species loss. Native vegetation is also important for regulation of ecological processes that maintain biodiversity such as maintaining water quality.

Researchers recently assessed whether certain landscape design principles would likely protect significant native biodiversity under models encompassing a range of future climates and land uses (Doerr, Williams et al. 2013). Interestingly, none of the currently applied principles they modelled were always effective but their 'aspirational' principle of $\approx 30\%$ vegetation cover was reliable for improving biodiversity outcomes. KI currently exceeds this percentage (suggesting significant ongoing ES in this regard), however, this is principally due to large, intact conservation regions in the south and west of KI. Vegetation cover in the Eastern Plains and Dudley landscape is currently $\approx 27\%$, again occurring in the southern coastal belt. Other remnant vegetation in this region exists in long unburnt isolated patches associated with primary production and along roadsides (Pisanu, Rogers et al. 2013). There are already significant threats to biodiversity in these areas due to fragmentation and inappropriate fire regime and the same is true for parts of the north coast, west of Dudley Peninsula.

Biodiversity considerations raise issues of how landscapes are classified because biodiversity is highly variable in a landscape and cannot be traded between areas. Differing biotic communities occur across the landscape due to variables such as soil type, climate, aspect etc. Pisanu, Rogers et al. (2013) attempted to address this by analyzing vegetation cover for different soil types and reported that Dudley Peninsula had only $\sim 16\%$ cover on ironstone soils. These data suggest that with regard to landscape management, biodiversity protection can be achieved in significant parts of the island by protecting the integrity of the existing vegetation. However, in more degraded areas there are significant concerns that may be partly mitigated by targeted, cooperative (inter-stakeholder) revegetation. Elucidating the broad benefits and non-utilitarian values of native vegetation on KI are key aspects to maximizing protection of KI's biodiversity (see Fig 10), partly through realisation of shared benefits across stakeholder groups. However, it is crucial that vegetation management principles such as revegetation, are planned using landscape models that are relevant to local biodiversity and targeted to sustain the maximum biodiversity over the long term, rather than achieving an arbitrary level of average cover when considering the entire landscape. Furthermore, revegetation should target degraded, marginal, surplus and/or non-managed areas near primary production, rather than land currently sustaining primary production.

A recent NCCCARF report (Dunlop, Parris et al. 2013) listed three significant shortcomings to the development of conservation management plans tackling rapid climate change, viz:

1. lack of robust means to characterise ecosystem health and human activities in ecological terms
2. poor understanding of how society values biodiversity and other related concepts such as ecosystems and landscapes
3. poor policy mechanisms for definition and implementation of objectives that are ecologically sound and socially endorsed.

The authors also developed a prototype flow chart of questions/answers to help NRM planners set conservation management objectives. The three shortcomings listed above are all significant issues for KI, and as mentioned the island has more to lose than most areas with regard to biodiversity. The NRM board's On-ground works program has for several years applied a process aimed at selecting projects that contribute the most to landscape-level connectivity, patch size, threatened species habitat and site condition (G. Flanagan, pers. comm., 2015). This current approach may therefore provide the basis for a refined model with increased nuance with regard to ES delivery through on-ground works.

Biosecurity is a key consideration with respect to biodiversity conservation. I have mentioned above the need to understand what the major pest threats are likely to be for agriculture under rapidly changing climatic conditions. The same is true for organisms that threaten natural systems. As mentioned, agriculturally relevant invertebrates/viruses are usually largely confined to exotic hosts and generally do not impact the natural ecosystems significantly; thus they are largely an economic issue and not a direct concern in preserving biodiversity. However, introduction of exotic organisms that can thrive in land under native vegetation and are not subject to their normal controls are a major concern as they have the capacity to permanently alter ecosystems that have evolved over millions of years. The honeybee is an interesting example because it is beneficial to production of canola, pulses, fruit and vegetables but is one the most invasive and widespread species known, and is likely to negatively impact natural ecosystems on KI (Paton 1996, Neagle 2002, Goulson 2003, Celebreeze and Paton 2004, Paini and Roberts 2005, Singh, Levitt et al. 2010, Glatz 2015). In 2002 in NSW, invasion of natural ecosystems by honeybees was assessed as a Key Threatening Process to native biodiversity (Carr 2011).

It should be noted that our scientific understanding of our natural ecosystems has large gaps. Besides plants, the organisms that play key roles in maintaining ecosystem function are invertebrates, fungi and microorganisms. These groups also contain the most species diversity on land and in the ocean, however, many of the species are not known (Fig 5) and most are not well understood. KI's biodiversity is no exception and in recent years a range of new invertebrate species have been discovered on KI including an entirely new family of moth (the enigma moth) with an ancient association with *Callitris* (native pine) (Kristensen, Hilton et al. 2015) and a new genus of braconid wasp that parasitises it (unpublished data). This illustrates the scientific value of the intact ecosystems of KI, as well as being an indication of how much there is to learn in terms of ES delivery from native invertebrates, fungi etc. It should be noted that recent publicity surrounding the "KI Enigma moth" has brought global attention to KI and the quality of its ecosystems (e.g. Casey 2015, Hilton and Edwards 2015) which also illustrates the potential economic benefits from improving our understanding and protection of KI's unique natural heritage.

Currently, DEWNR can consider only the species contained in their own database amounting to some plants, birds and other vertebrates (and one insect) (Gillam and Urban 2014), which represent only a small proportion of the existing taxa. This is a scientific shortcoming given that much of the ES delivery and ecosystem functioning rely on taxa that cannot currently be easily assessed such as invertebrates, fungi and microorganisms (plants are also significant contributors). Furthermore, such taxa are likely to contain the best indicators for ecosystem function, validated examples of which are most desirable. This is because they are diverse and can have very specific niches or interactions with other organisms; they both support and rely on native vegetation and so are intricately linked to the population dynamics and overall well-being of plant species. It would be beneficial for DEWNR to investigate ways to tap into other large datasets (some of which are publically available) and ways to incorporate these data into their assessments and management plans. For example, the South Australian Museum contains many records of invertebrates etc. and resides in another state department. A national example is the Australian Faunal Directory (<http://www.environment.gov.au/biodiversity/abrs/online-resources/fauna/afd/home>).

There is significant current research aimed at developing high-throughput molecular assays to assess large numbers of species in environmental samples such as soil samples. This provides an opportunity for KI to link with such research to begin to harness these technological advances by making KI a focus of collaborative research projects that address environmental monitoring, particularly with regard to the assessment of management practices.

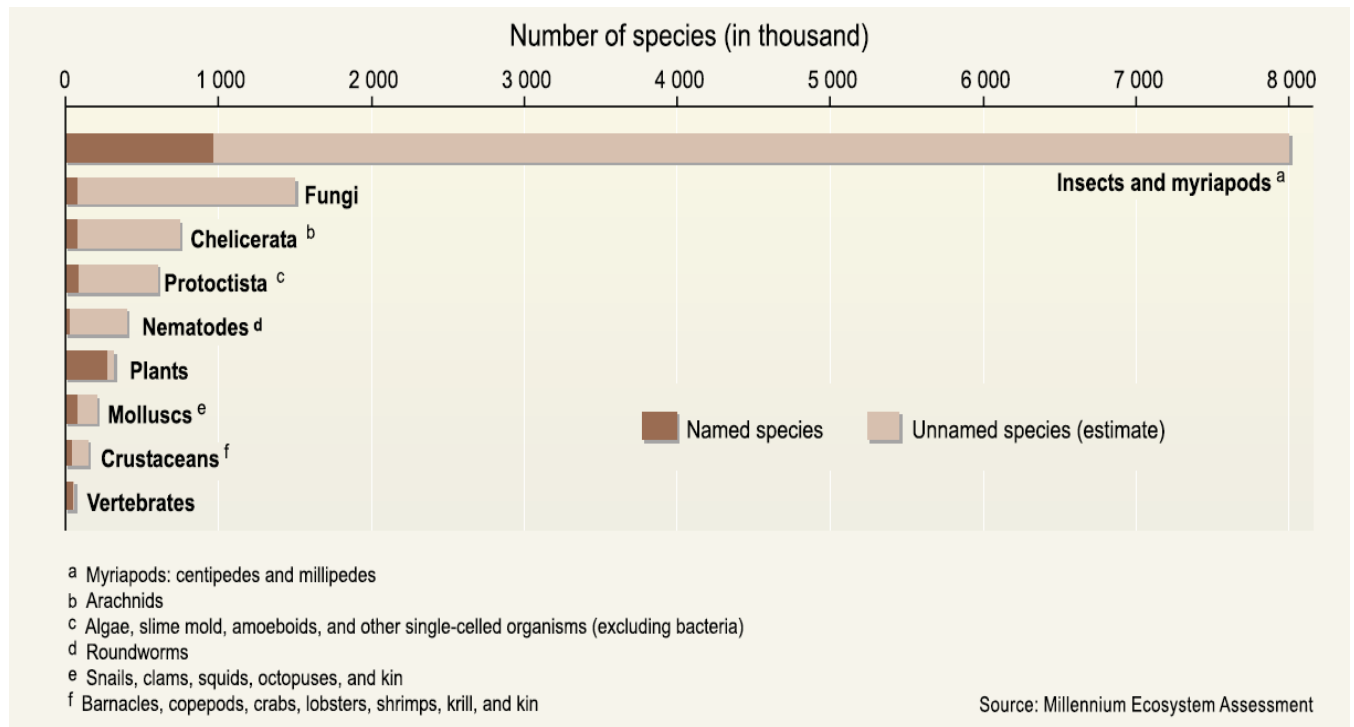


Figure 5. Breakdown of named and unnamed species residing in various taxonomic groups (MEA 2005b). Most of the terrestrial biodiversity consists of invertebrates of which many are not known, whereas plants and vertebrates (birds, reptiles and amphibians are not shown) contain relatively few species and are relatively well characterised. In terms of understanding and capturing ES, this is a significant knowledge gap as many of the ES (or basic ecosystem functions) are regulated by invertebrates, fungi and microorganisms.

Another knowledge gap in for biodiversity maximisation is the population genetics of many island species. For example: overall levels of genetic diversity, the level of gene flow across the island, and the degree to which isolated populations are suffering genetic bottlenecks (an effect of population disturbance) are all important questions with regard to the adaptive capacity and resilience of the natural ecosystems (see Fig 6 below). Such information is crucial with regard to maximizing desired outcomes of conservation management decisions. The technology to assess these metrics is available but would again require collaboration with researchers in this field.

It may be an achievable goal to attain 30% native vegetation cover on Dudley Peninsula and Eastern Plains (as defined by Pisanu, Rogers et al. (2013)) With regard to broad ES and biodiversity benefits, this would best be undertaken by revegetation or regeneration of targeted environmental associations in fragmented areas of these regions rather than increasing the current conservation areas that largely consist of coastal limestone habitats. In particular those associations supported by ironstone soils would be preferable. This could be achieved through pilot projects delivering production and biodiversity ES in targeted collaboration with primary producers and council. This would obviously need to be considered in the context of fire risk, however given that almost the entire landscape is highly flammable a relatively small increase in native vegetation cover (or improved quality of existing cover) is unlikely to significantly increase fire risk. This risk can be minimised by

integrating revegetation/regeneration activities into the fire risk assessment process within the respective fire management plans.

In general, a combination of soil type, plant community and level/type of previous disturbance is intuitively a useful way to target areas for biodiversity related revegetation or regeneration, as the soil directly influences plant biodiversity through physical and chemical properties as well as containing the inherent potential to recover from disturbance through the soil bank.

Tourism & marketing

It is clear that the main draw-card for tourists on KI is the natural environment: the large areas of intact native vegetation, the coastal and marine environment, and the biodiversity they support being the most obvious features. This further contributes to the case that it is in KI's economic interest to maintain the integrity of the remaining ecosystems. KI's roadside vegetation is renowned and provides the ambience and uniqueness that is so important for the islands image as an intact environment that provides healthy ('clean and green') produce.

The abundance of KI endemic plants in some areas gives KI its own aesthetic and although this does not seem to be widely recognised on the island it is immediately obvious and remarkable to visitors who travel to observe the natural environment or have an interest in native plants. Some examples include: KI narrow-leaf mallee arbours, KI conesticks, KI gland-flower, round-leaved *Bertya*, KI riceflower, the *tateana* subspecies of yacca. This unique aesthetic should be promoted where possible in public spaces; this is to be contrasted with planting of exotic ornamentals in public spaces, which gives the appearance of so many rural mainland country areas that have little native vegetation remaining.

Additionally, the remaining native vegetation is crucial to marketing of KI food and wine because it suggests to consumers that the environment is 'pristine' and so the resultant produce is healthy. This is particularly so given that farming systems on KI are not significantly different to elsewhere. Additionally, the proximity of native vegetation to crops gives a 'clean and green' image to consumers as it insinuates care for the environment, integrated management systems and benign management practices. This also strengthens KI's brand in the sense that provenance and quality of food are key concerns for consumers interested in food and wine. Identification of benign/innovative farming systems with KI strengthens these perceptions and provides a talking point for publicity.

Therefore, there is not only an economic advantage provided to KI by native vegetation with regard to tourism and marketing but there exists the opportunity to derive new production, tourism and marketing opportunities from the incorporation on native vegetation into farming systems. Table 6 provides a theoretical example.

Social and Community Benefits

The social benefits of native vegetation are hard to define and somewhat personal. For many, the presence of vegetated landscapes is more about ambience than commercial ES, biodiversity or ecological values, and the species that exist on the island are not well understood and/or of relatively little personal importance. This does not reduce the importance of these personal feelings however, the lack of appreciation/awareness could be considered a lost opportunity. It has been suggested that in the long term, a lack of appreciation for endemic biodiversity or for it having an intrinsic non-utilitarian values, will reduce the amount of biodiversity that is conserved (Fig 10 below).

A recent study in the USA attributed forest and tree effects to an air quality improvement of 1% (17.4 million tonnes) which accounted for estimated human health benefits of US\$6.8 billion (Nowak, Hirabayashi et al. 2014). In the context of native vegetation-related ES on KI, it is interesting that most of this effect occurred in rural areas suggesting that proximity was important. Besides environmental/physical health advantages of native vegetation there is mounting evidence that a close connection with natural systems is related to mental well being, and that a disconnect from natural environments may compromise this (for a literature review see Maller, Townsend et al. (2008). The native biodiversity supported by native vegetation on KI is abundant and visible and the vegetation brings it into the proximity of people, be they local or visiting. This generally gives a feeling of environmental wellbeing, and is sought after by many.

It is noteworthy that a sound environment is cited by many recent immigrants to KI as a key reason for becoming resident, and is also cited as crucially important by most of the community, including those with intergenerational links to KI. Additionally, the natural environment is the focus of many in KI's artistic community. These facts point to native vegetation being important to the 'psyche' of the KI community, however, personal aspects of this are hard to define and there is significant disagreement about how native vegetation should be managed.

Perhaps the greatest social benefits largely flow from the impact of native vegetation on providing ES that facilitate a vibrant community which maintains significant numbers of primary producers that are resident property owners (through maintaining production options value), other businesses that provide support services to the community, and environmental integrity. The native vegetation of KI is able to be utilised for leveraging significant ES and providing marketing opportunities for tourism and KI produce, that captures and exploits KI's unique attributes i.e., natural ecosystems and cultural heritage. A key to maximizing these ES is to understand what is special about KI ecosystems, maintaining these unique aspects and putting them at the forefront of marketing in tourism and primary production. Currently, agricultural production systems and related businesses on KI are similar to those elsewhere and they are not key drivers of tourism compared to the natural environment. However, there are some exceptions to this that utilise unique aspects of the KI environment with value-adding, for example *Eucalyptus* oil production, a boutique spirit distillery, high quality seafood, and to a lesser extent marron farming.

ES associated with physical properties of native vegetation are more obvious and widely understood. Much of the remaining vegetation on farmland is there due to its use as a shelter-belt, primarily for stock shelter or as a crop wind-break, the latter being important for KI given its coastal weather. Indeed, a historical example of landscape management on KI is the numerous plantings of exotic trees (especially *Pinus* spp.) as wind-breaks around dwellings and farm infrastructure. Native species can perform the same function and should be utilised in the future, perhaps designed to produce a range of ES (e.g. combined wind-break and honeybee forage). In summer months, native vegetation also provides shade and breaks dust movement. Given the moderate climate of KI and the relatively low number of days with extreme heat, the placement of vegetation to shade dwellings in summer can largely remove the energy requirements needed to actively cool dwellings.

Some authors have argued that by taking a social ecology perspective to landscape resilience a more nuanced consideration of the dynamics of human-environmental interactions can be achieved leading to improvements in how scientific and biological data are accepted and translated by the community into resilience outcomes (Stokols, Lejano et al. 2013). Regardless of the exact method there may be merit in examining social attitudes to the environment, adaptive capacity, resilience etc., as well as methods of improving understanding of the complexity and science of natural ecosystems, and the complete range of ES they offer and support.

Contributions to landscape adaptive capacity and resilience

In addition to ES, the concept of resilient landscapes has become a focus due to the weight of scientific evidence for rapid warming of the globe (IPCC 2014). In the context of this report I define resilience of a terrestrial landscape as *the capacity of the landscape to continue to provide ecosystem services and support high levels of endemic biodiversity under changing physical, socio-economic and political drivers*. The way in which vegetation contributes to ecosystem resilience was discussed recently by Pisanu, Rogers et al. (2013), where resilience was presented as the capability of an ecosystem to remain below ecosystem-process damage thresholds (as per King and Hobbs (2006)). Standish, Hobbs et al. (2014) reiterated that resilience is related to an ability of an ecosystem to remain within disturbance/damage thresholds and suggested that resilience can be assessed by detecting changes to the functional diversity of the ecosystem, indices of which can act as proxies for resilience if direct measures are not available.

A relatively lower degree of vegetation degradation is associated with damage to biotic interactions that can cause functionality of ecosystem processes to cross a 'biotic' threshold. It was suggested that beyond this biotic damage threshold (which presumably has been exceeded in many areas), manipulations to vegetation are required (beyond removal of degradation processes) to recover original ecosystem integrity. At this time, abiotic interactions may be damaged but still able to recover without significant manipulation, however, once increased degradation causes significant damage to abiotic interactions, an upper threshold of ecosystem process damage is reached. Beyond this upper threshold, ecosystem processes may become non-functional and require manipulation of biotic interactions to reinstate integrity of basic processes. While the above characterisation of resilience was discussed in a context of conserving biodiversity, a similar model could be proposed for the resilience of the ES delivered by biodiversity. Thus, in the context of ES delivery, native vegetation contributes to resilience by supporting ecosystem processes that facilitate ES (or mitigating damage to them). General principles are the same as for pest management and biosecurity; the more 'non-managed' area that is under 'good quality' native vegetation (see below for quality characteristics), the greater the resilience in provision of associated ES and correspondingly less requirement for management to preserve or restore these ES.

It is clear that once native vegetation is lost or compromised, it is often extremely difficult to recover the full benefits and management options are generally reduced. Even with long-term and active restorative management (for which resourcing is unlikely), infestation by exotic species is unlikely to be eliminated. When considering resilience, it is important to understand what attributes constitute 'good quality' native vegetation. These include:

- displaying (or having the capacity to regenerate through soil seed-bank) biodiversity near to the ecosystem it was derived from in an undamaged state,
- having none (or low levels) of exotic infestations,
- generally being dense except through natural attrition through aging,
- having a soil seed-bank that has the capacity to regenerate a high number of naturally occurring species without favouring increase in exotic infestations,
- being of sufficient quality to support diversity at various levels (see Table 5 below).

There are obvious spatial and temporal aspects to these attributes. For example, spatial aspects such as the size of a given patch of vegetation, the soil diversity within it, its interconnectedness/isolation with respect to other patches, surrounding land use etc. all influence its ability to provide ES, adapt to disturbance/change and support landscape level biodiversity. Temporal aspects such as its age, disturbance frequency, and integrity of the seed-bank, can impact similarly. Thus, good quality vegetation is that which has the capacity to

support high levels of native biodiversity, has low levels of exotic infestation, can regenerate much of its original biodiversity and contributes to overall genetic, species, population and/or ecosystem diversity (Table 5).

There is an increasing understanding of the way that biodiversity at various scales (including landscape) acts to sustain ecosystem functionality and there is increasing discussion about this in the scientific community (Mokany, Burley et al. 2013, Pasari, Levi et al. 2013). This concept effectively links biodiversity to resilience and suggests that maintaining diversity and population integrity of native plant species (and thereby reliant taxa) is important for maintaining ecosystem functionality. Pollination is an ecosystem function for which this concept is relatively intuitive. With regard to the potential ES that can be derived from native flora and fauna, an important consideration is to level of diversity is therefore likely correlated to the ES options available through adaptive management. In other words, there should be an aim to maximise ES for current conditions and industries but prevent foreclosure management options for new industries, under changing climatic conditions, and also other changes such as those related to legislation, economy, consumer preferences etc.

In recent years, the word biodiversity has achieved widespread use in the general populous; it now has a variety of usages and is commonly used as a proxy for “flora and fauna” without necessarily encompassing diversity. However, it is important to realise that the crux of the concept of biodiversity is diversity (which could also be expressed as ‘variation’). In biology, the concepts of diversity and adaptive capacity are closely intertwined, and are the basis for evolution through natural selection.

Further key considerations are that diversity is required at all biological levels (from genes to ecosystems) and that diversity is maintained over a sufficient distribution. With regard to ES provision and landscape adaptive capacity/resilience, these biological levels are important for different reasons (Table 5) and therefore should be inherent in plans aimed to protect and exploit biodiversity. For example, genetic diversity relates to adaptive capacity of organisms, while species diversity relates to interactions producing ecosystem function. These levels are not independent, for example, genetic diversity of a species allows it to adapt and survive to changing conditions thereby making continued contributions to ecosystem function. Simply considering the species richness of a landscape does not allow information from other biological levels to be utilised in NRM planning.

Table 5. The importance of biodiversity (variability) at various biological levels (MEA 2005b).

Level	Importance of diversity/variability	Importance of quantity & distribution
Genes	adaptive variability for production and resilience	local resistance and resilience to environmental change, pathogens, and so on
Populations	different populations retain local adaptation	local provisioning and regulating services, food, fresh water
Species	the ultimate reservoir of adaptive variability, representing option values	community and ecosystem interactions are enabled through co-occurrence of species
Ecosystems	different ecosystems deliver a diversity of roles	the quantity and quality of service delivery depend on distribution and location

If a simplified metric is to be utilised for management decisions then it may be wise (given current knowledge and resourcing) to concentrate on conservation of the highest order unit (ecosystems) because maintaining a diversity of ecosystems in good condition and over sufficient should contribute to preservation of finer-scale diversity. Further, different ecosystems (or vegetation associations) have been defined on KI for some time now (Robinson and Armstrong 1999, Willoughby, Oppermann et al. 2001) so there is existing data that can be used to assess ecosystem units with regard to maximising their diversity.

The way vegetation impacts the landscape is not always obvious and can be surprising in scale of the effect. A well-known example is the contribution of global vegetation to reduction of atmospheric carbon and increase in oxygen levels. In addition to biodiversity within habitats, the extent of vegetation in a landscape can impact on climate across multiple scales. MEA (2005a) suggested that landscape-level vegetation effects can substantially alter climate at a local-regional scale. Land areas >10 kilometres in diameter with lower albedo (solar energy reflection) and higher surface temperature than neighbouring patches, create cells of rising warm/dry air above the patch (convection). This air is replaced by cooler/moister air flowing laterally from adjacent patches (advection). Climate modelling of this effect in WA showed that the replacement of native heath vegetation by wheat would increase regional albedo. This was predicted to increase the level of convection over the native heath (which is dark, more solar-absorptive and therefore warmer) drawing more moist air from the surrounding wheat crops. The net effect was predicted to be a 10% increase in heathland rainfall, and a 30% decrease in rainfall over crops. Regardless of the real effects, this example illustrates the interconnectedness of environmental processes, how accumulative actions can increase the scale of impact, and the need to fully account for ES effects of individual management practices on entire ecosystems.

To summarise, fully accounting for the range of ES supplied by native species may assist us in managing landscapes to maximise their adaptive capacity and resilience. This is important to maintain maximum flexibility to respond to change. In recent years climate change has become a focus that has led to a deeper questioning of ES, however, landscape resilience and adaptive capacity maximises the ability to respond to a whole range of natural and anthropogenic perturbations. For KI, this adaptive capacity will aid in coping with change by:

- aiding in maintaining production levels in current systems, potentially reducing inputs and maintaining community integrity through healthy primary production and tourism sectors,
- providing flexibility to adapt to changing climate with new crops/production systems combined with suppression of new pests (i.e. adaptive capacity of landscapes to a range primary production with desirable attributes,
- maximise economic benefits of natural vegetation that is still abundant (e.g. salinity prevention, tourism, pest suppression etc.),
- maximise future ecotourism opportunities which should involve innovative primary production,
- maintain functional integrity of unique KI ecosystems, their associated biodiversity and the ES they support.

Threats to ecosystem services provided by native vegetation on KI

Threats to native vegetation and associated ES on KI appear to related to four main issues, which are discussed below, viz:

- direct vegetation disturbance mechanisms
- rapid climate change
- non-recognition of full benefits (and shared benefits) and trade-offs of ES
- capacity of regulatory bodies to characterise and manage ES adequately i.e., research, resourcing, planning, policy, legislation, implementation

Disturbance Mechanisms

Disturbance of native vegetation can take many forms and act over different spatial and temporal scales. They are not all necessarily detrimental in all cases although most have the capacity to reduce floral biodiversity. Some processes such as clearance and salinity have obvious and broad effects, while other mechanisms such as climate change and inappropriate fire regimes produce changes that may be subtle in that they do not

result in obvious loss of floral biodiversity over short time-frames, but likely cause significant (perhaps chronic) changes to ecosystem functioning as exposure increases/changes.

It is intuitive that ES derived from native vegetation will decrease or be qualitatively degraded proportionally with the degree of vegetation degradation at a landscape scale. However, it is also intuitive that impacts on stakeholders will be greater the closer or more tightly linked they are to the source of a disturbance process/event. For NRM purposes, disturbance processes and resultant impacts must be considered at a landscape level because they generally accumulate across increasing area, effects of many processes are inter-property, and it is likely that there is an landscape area threshold above which damage is significantly increased and/or mitigation cost is significantly increased or no longer possible.

A good example of cumulative impacts of deleterious processes and the need for a landscape approach, is well illustrated by Fig 6 which shows how genetic bottlenecks in native plant species can be produced by disturbance caused by ecosystem fragmentation and climate change, leading to reduction in fitness (and hence resilience) across a landscape. This reduction in genetic diversity in turn can reduce the resilience of the landscape and its ability to deliver ES. While this particular scenario relates to plant populations, these effects of population fragmentation and reduced genetic variability are generally applicable to most sexually reproducing organisms (such as pollinating insects).

In an agricultural landscape, disturbance events are relatively common and are often management requirements such as harvest, insecticide use etc.) In such systems, non-crop vegetation is crucial for supplying pest management benefits as part of an integrated approach (see crop wheel in Fig 12). Populations of beneficial organisms that can positively impact on production systems are a function of relative levels of immigration/emigration and births/deaths of beneficials occurring in crop and adjacent non-crop vegetation (Schellhorn, Bianchi et al. 2014). Disturbance processes directly affect these metrics and the provision of beneficial invertebrates to production systems is expected to be more efficient under a scenario of reduced disturbance (Fig 7). This illustrates a general principle that disturbance events to which native vegetation (and supported biota) are not well adapted (e.g. pesticides, clearance), will disrupt dynamics of reproduction and dispersal at a population level and reduce the effect of associated ES in agricultural systems.

The frequency, nature and context (including timing) of vegetation disturbance processes are likely to have significant effects on the degree of undesirable and beneficial outcomes. Fire is a good example (see below). Generally, low frequency disturbance of a given type occurring in areas that are not heavily subjected to subsequent pest pressure and/or other disturbance types are unlikely to cause significant changes to biodiversity and may be beneficial. However, increasing the frequency of disturbance can be problematic as it favours species that are competitive colonisers (a common characteristic of weeds) at the expense of species dominant in the medium to long term and increases the time over which pests can easily establish. Frequent disturbance processes that continually expose the soil seed-bank are likely to be deleterious as they may reduce the restorative capacity of the seed-bank and provide increased opportunity for exotic seed to be introduced (see below). This leads to changes which are extremely difficult to counter, may increase the effects of further disturbance, and are likely to impact over the long term, particularly as resources for successful management of weed incursions over medium to long term are generally inadequate.

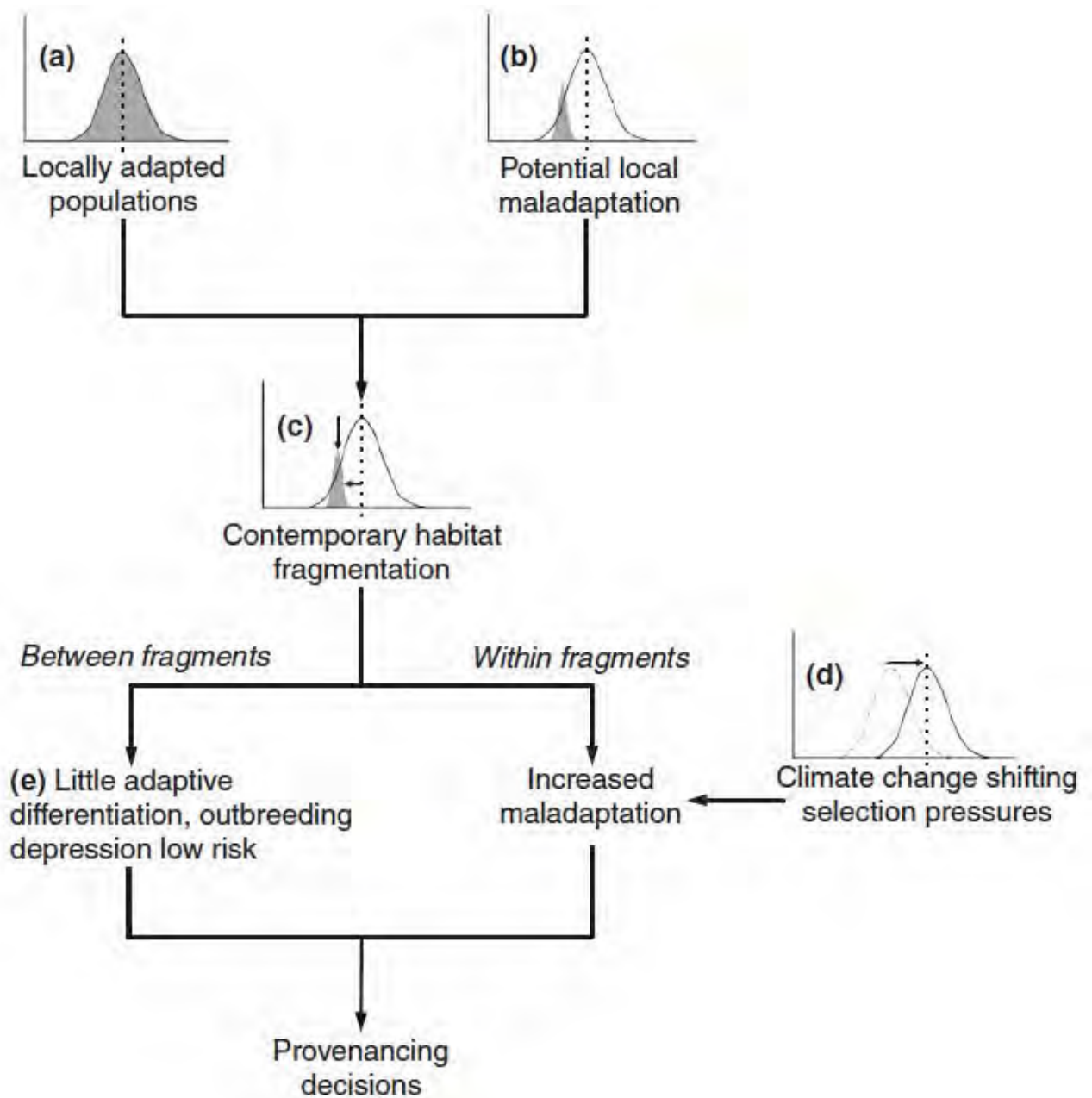


Figure 6. Genetic bottlenecks can be produced by disturbance (in this case clearance/fragmentation) which can cause maladaptation of plants to their environment and can be exacerbated by significant physical or biological selection pressure (in this case due to climate change). Existing plant populations can either be well adapted to local conditions (a) or maladapted due to previous pressures such as historical clearance regimes (b), and maladaptation can be increased due to genetic effects caused by more recent fragmentation (c) reducing the resiliency of the population. When climate change places further selection pressure on these fragmented populations (d) this can lead to increased maladaptation of the population a reduction in the differential adaptive capacity of various fragments (e). Therefore, seed provenancing for revegetation should attempt to maximise adaptive capacity by utilising regional population fragments to attain maximum genetic diversity while reducing potential for outbreeding depression (e) that can be caused by introduction of genetic material adapted to a different region. Here, simplified fitness landscapes indicate the relationship between a landscape's fitness optimum (solid curve with dotted line at the fitness peak), fitness of a local (isolated) population (shaded area), and fitness optimum of the recent past (dotted curve in (d)). Number of genotypes is contained on X-axes and Y-axes represent fitness levels. From Breed, Stead et al. (2012).

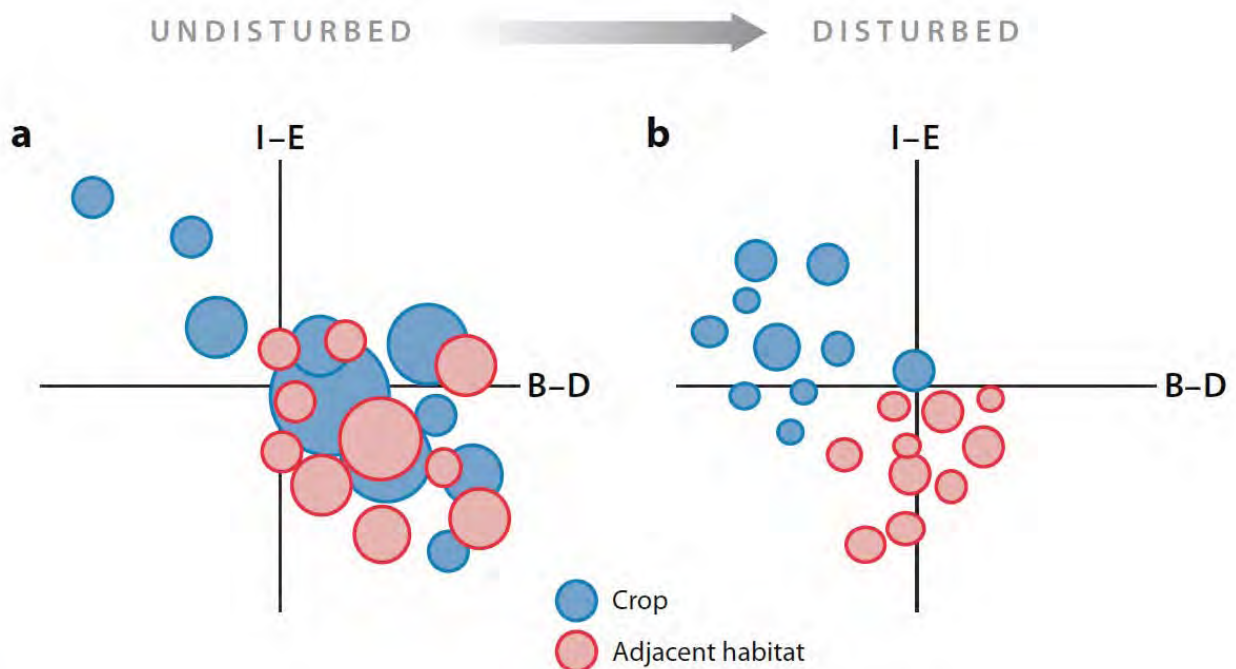


Figure 7. Theoretical relationship between disturbance and pest management ES provided by native vegetation; disturbance reduces beneficial invertebrates supplied by native vegetation into production systems. Populations are a function of the difference between births (B) and deaths (D) at a given site, and immigration (I) and emigration (E) of an invertebrate population. The size of each circle represents number of beneficial arthropods in a sampling event (i.e. the potential ES in native vegetation, and the supplied ES in crop vegetation). An ideal landscape for providing ES through beneficial invertebrates (a) shows increasing populations in crops and native vegetation (i.e. net population increases $B > D$, and export of invertebrates and $E > I$) due to local processes. Disturbance events (b) such as insecticides cause high mortality ($D > B$) in crops and these populations require immigration from native vegetation ($I > E$) for in-crop survival. The disturbance has caused in-crop population units to shrink and cluster in the top left and have effectively become sinks for beneficals. Disturbance such as insecticide can also reduce beneficial populations in native vegetation through mortality which is indicated here by smaller circles that have moved left on the B-D axis (i.e. ratio of births to deaths has decreased). From Schellhorn, Bianchi et al. (2014).

Clearance/Fragmentation

Clearance has long been recognised as most serious threats to landscape-scale ecosystems because apart from removing most of the biodiversity at the site of clearance, there are a range of potential downstream problems, for example:

- ecosystem fragmentation reduces ecosystem resilience/adaptive capacity adaptation (e.g. through preventing gene-flow)
- physicochemical changes (such as salinity) in prone areas
- increased land for establishment of pests/diseases (in unmanaged areas)
- erosion
- species loss
- reduced ES provision

One point that should be considered in landscape management is that natural (or sustainably managed) systems are generally worth more money per area in total benefits than those that are more highly modified or non-sustainably managed (Fig 8). Thus, the clearance of good quality native vegetation is likely to reduce the total benefits provided to society by the land although benefits to a sub-set of individuals may increase. Although such a study has not been conducted in Australian mallee systems, this phenomenon has been demonstrated across a range of landscape use changes in various countries (Fig 8) and there is no obvious reason to believe that this principle should be different on KI.

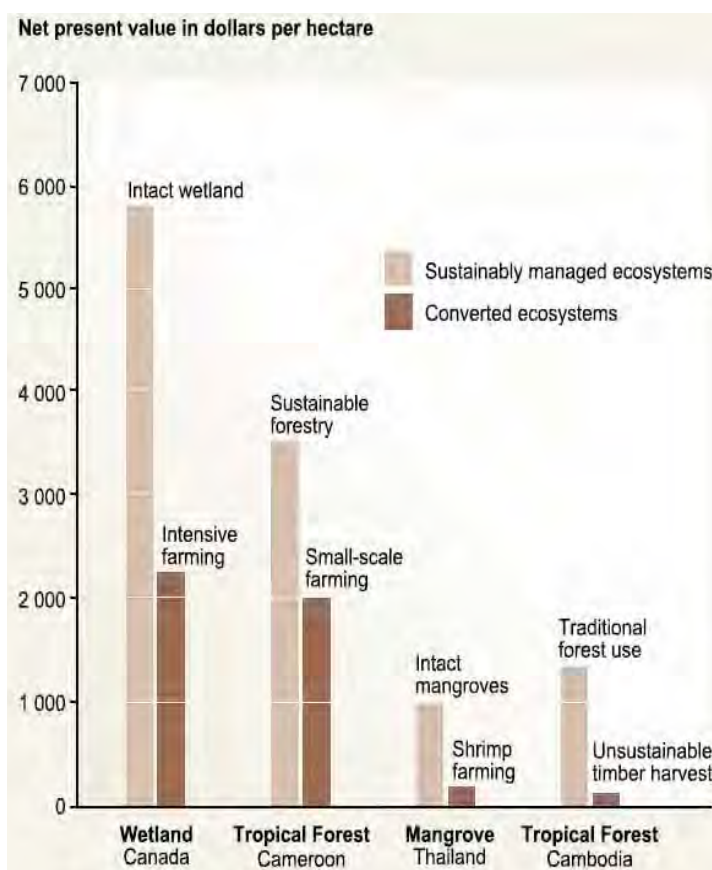


Figure 8. Loss of total economic benefits from conversion of ecosystems from natural or sustainably managed to simplified or unsustainable ecosystems. This correlation is demonstrated for various conversion activities across different ecosystems occurring in Canada, Cameroon, Thailand and Cambodia (MEA 2005a).

Adverse outcomes of widespread clearance have been recognised at a government level for many years and ultimately led to the introduction of the Native Vegetation Act in 1991, which aimed to maintain native vegetation at or above 30% landscape coverage (DEH 1991). This legislation formally protects ~45,000 acres of native vegetation on private land not under state heritage agreements (G. Flanagan, pers. comm., 2015). In 1992, the State moved to increase the level of protection for the highest value ecosystems through introduction of the South Australian Wilderness Protection Act (Government of South Australia 2011); that there are five of the associated Wilderness Protection Areas on KI is a testament to the significant natural heritage values of the island. There is little doubt these pieces of legislation have been beneficial to KI ecosystems, although it should be recognised that most clearance on KI occurred in the years following the soldier settler scheme (largely prior to 1970) (Fig 9).

It should also be recognised that much of the arable land has been highly fragmented and the larger intact areas of the south and west occur on limestone which is of limited use in farming (particularly cropping). Mitigative ES provided by native vegetation (primarily for erosion and riparian management) have also been recognised by some primary producers and delivered to interested parties through programs such as Landcare.

The SA Native Vegetation Act has attracted some controversy on KI with regard to inhibiting the ability of primary producers to effectively manage their properties, many of which contain native vegetation. Additionally, it has been cited by political figures as the primary cause of the severity of large fires on KI in 2007 (Bates 2008, Pengilly 2008), despite a lack of hard evidence that it had any effect and the involvement of other significant drivers such as unprecedented drought conditions, severe and unpredictable local weather characteristics (Peace, Mattner et al. 2011, Peace and Mills 2012), and loss of the majority of the area through back-burning operations.

As Fig 9 shows, the eastern and central parts of KI were fragmented almost to their present level by the late 1960s and in contrast to many other areas, there has been little clearance since then. While the latter fact is remarkable, the clearance pattern means that there are long-standing issues with landscape degradation on non-managed land that is not under protection, particularly on the eastern plains and cleared areas of the Dudley Peninsula. Drivers of this degradation in these areas were recently discussed in Pisanu, Rogers et al. (2013). Because there are a range of ecosystems on KI that are much smaller than the total landmass and generally clumped in distribution, the clearance pattern also means that some ecosystems are in good condition (e.g. *Eucalyptus diversifolia* associations on limestone) but some are now highly fragmented (e.g. *Eucalyptus cneorifolia* associations of Dudley Peninsula) (Robinson and Armstrong 1999, Willoughby, Oppermann et al. 2001, Pisanu, Rogers et al. 2013). Indeed, despite the 40% cover of native vegetation on KI, several floristic associations have been degraded to such a degree that some of the associated plant species are now only (or primarily) found in roadside reserves (e.g. plains of MacGillivray and Haines). Some of these roadsides are weed infested and disturbed at a high frequency. Species restricted to these areas rely on the Native Vegetation Act and Council management considerations rather than intact ecosystems for their protection.

Germination analysis of soil seed-banks from small, long isolated, 'senescent' patches dominated by *E. cneorifolia* revealed that although the seed-bank had not been recently or frequently disturbed and seed of native plants (some rare) were still present and viable, there were invariably exotic species (mainly grasses and daisies) present presumably due to the surrounding land use (Rawson, Davies et al. 2013). The study analysed 10 patches and found the most commonly germinated species (830 individuals) was an exotic weed (*Isolepis marginata*); 26 exotic weeds from 10 families were germinated (1176 individuals) while 65 native species from 35 families (1391 individuals) were germinated. Therefore, weedy species were abundant and contained considerable diversity indicating that seed-banks were significantly compromised and that pest-management values of these patches may also have been reduced. Further, while rare plants may be germinated from the seed-bank, the vegetation overall would still require management to prevent further degradation of the seed-bank with respect to the ratio of rare/native seed to exotic seed. This illustrates how fragmentation can impact on areas even though they may not have been subject to frequently disturbance

Off-target effects of agricultural use

It has long been recognised that there is often off-target environmental damage associated with the use of agrichemicals (particularly herbicides and insecticides) and fertiliser, and this is one reason for the environmental and ES trade-offs associated with agricultural intensification. There has been recognition of this

on KI, and has been specifically mentioned in the context of increasing broadacre cropping on the island (Dohle 2013, Pisanu, Rogers et al. 2013) although aerial spraying of insecticide/miticide is used in pasture management.

The effects of herbicide drift on native vegetation are obvious, resulting in death or reduced health of affected individuals. As for most agrichemicals, the area over which there is an effect can be increased by contamination of water-courses. Insecticides are generally indiscriminate and will kill insects that encounter them in sufficient concentration (in some cases effective doses can be very low). Soluble fertilisers by their nature are immediately available to plants, however, they are difficult to apply in sufficient quantities that give significant yield advantages without excess. Being soluble, these nutrients are readily transported by water into water-courses and the margins of agricultural land. Contamination of water-courses with agricultural nutrients is linked to outbreaks of toxic blue-green algae. Nutrient run-off is also often responsible for allowing weed infestations to flourish in roadside vegetation. On KI bridal creeper and bridal veil (WoNS) can outcompete native vegetation at the margins of agricultural land but are far less competitive elsewhere. All of these effects amount to forms of disturbance, the outcomes of which have been discussed in detail above.

Therefore, off-target effects of agrichemicals have the potential to reduce agricultural ES by:

- directly killing beneficial insects such as pollinators, predators and parasites (Table 4)
- directly killing plants that support these beneficial species
- reducing integrity of surrounding vegetation through promoting weed growth
- reducing water quality through contamination and/or promotion of algal blooms

Inappropriate Fire

Fire is a natural and important part of KI ecology with many species displaying evolutionary adaptations to fire and/or requiring it to maintain healthy populations. However, when fire variables move outside of the thresholds to which the biota is adapted there is the potential for species loss or decline. While there is a reasonable understanding of some aspects of fire ecology for some species such as age thresholds, regeneration time, germination requirements etc., we still lack a detailed understanding of how intertwined communities of plants, animals and microorganisms respond to different fire variables, and how their interactions (e.g. pollination) are affected. As a very simple example, several studies examining the effect of fire on fruit production in Proteaceae (an important family for KI) produced different results which were postulated as being due to variation in fire intensity (Penman and Penman 2010).

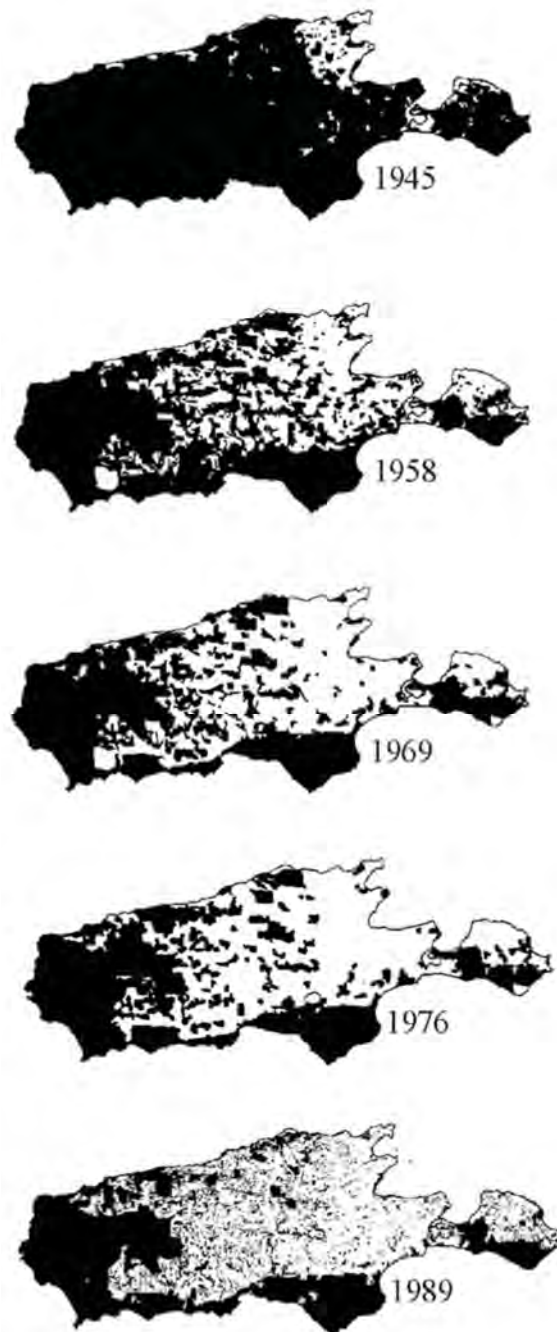


Figure 9. Vegetation coverage on KI at selected time-points between 1945 and 1989 (Robinson and Armstrong 1999). Most clearance was associated with the soldier-settler scheme in the years following World War 2 and clearance rate has significantly decreased since the 1970s. Mallee communities on the limestone soils of the south and west coast are reasonably intact, while plant communities of the east and north are now highly fragmented subject to significant exotic introductions. Improved resolution of vegetation mapping for 1989 allows smaller patches of vegetation to be displayed.

The most obvious concern for native vegetation is fire that is either too frequent (leading to insufficient regeneration) or too infrequent leading to loss of reproductive capacity in the seed-bank. In the highly fragmented areas of the Dudley Peninsula and Eastern Plains there is concern that fragmentation and resultant long-term inhibition of fire has reduced the capacity of the remaining fragments to regenerate some plant species, particularly those that have become rare due to habitat loss. Thus, the KI Eastern Plains Fire Trial was established to investigate fire as a regenerative tool although that program is not currently active. However, its establishment demonstrates concerns about fires that are too infrequent although it should be noted that the upper age threshold for KI ecosystems is not well characterised and is likely to be well beyond 50 years;

several rare insect species on KI are associated with areas that are long unburnt (Glatz, Leijts et al. 2015, Kristensen, Hilton et al. 2015). Lower thresholds are less variable and easier to define, generally relating to seed production. Upper thresholds relate to the regenerative capacity of the seed-bank and/or the visible level of biodiversity present each of which may vary significantly over time depending on environmental factors such as soil, climate, aspect, fire history etc.

In recent years the use of fuel reduction and asset protection burns in public conservation areas, has increased (DEWNR 2009, KIDBPC 2009). While it is realised that this approach requires burning at a frequency that will likely reduce biodiversity within the treated areas (KIDBPC 2009), fire managers regard it as an appropriate tactic for reducing intensity and spread of large fires to reduce the area being burnt in single large events. The merits of the approach are still being debated in the science community (Penman, Christie et al. 2011, Penman, Collins et al. 2013, Enright and Fontaine 2014, Penman, Bradstok et al. 2014) and fire managers are assessing the effectiveness of fuel reduction burns (A. Howard, pers. comm., 2014). It should be noted however, that two recent studies both suggest that concentrating fuel reduction in close proximity to an asset is more effective and economical than treating larger areas that are further from the assets (Enright and Fontaine 2014, Penman, Bradstok et al. 2014). It is possible that adverse ecological impacts, relative lack of effect, and/or cost of large prophylactic fuel reduction burns within conservation regions may well see them reduced.

Other ecological concerns potentially associated with fuel reduction burning in high value conservation areas include:

- weed introduction or spread: potentially resulting from construction of fire breaks and/or prior seed-bank contamination
- *Phytophthora* introduction or spread: associated particularly with the use of earth moving equipment but also through movement of vehicles and people (also associated with other management such as road maintenance)
- erosion: this is associated with most processes that remove vegetation. In a study of prescribed burns in the Mount Lofty Ranges, researchers found only minor erosion and suggested that fire intensity was a bigger factor than slope (Morris, Bradstock et al. 2014).

It is clear that further research needs to be conducted and that consideration needs to be given to the use of fire as a biodiversity management and asset protection tool. In that light, the prescribed burn zones are very useful for research purposes and should be utilised to understand the effects on fire on KI ecology and provision of ES.

Physiochemical changes

The primary physiochemical threat to native vegetation is salinity, which was discussed in detail with regard to the ES provided by native vegetation (see above). Dryland salinity is usually exacerbated by the loss of deep rooted native species, and resultant saline conditions produce long term changes to associated plant communities characterised by species replacement and much reduced diversity (Pisanu, Rogers et al. 2013). Another physiochemical threat discussed above is the change in soil nutrients often found at the margins of primary production or in contaminated water-courses. Soil acidity and non-wetting soils are also physiochemical issues but are largely problematic for agricultural production rather than native vegetation, and are generally treated with lime and clay, respectively.

Weeds, pests and diseases

Biodiversity threats associated with weeds, pests and diseases have long been recognised. It is of note that the MEA biodiversity synthesis listed invasive alien species as the main cause of island extinctions over the past 20 years and the second leading cause in freshwater habitats (MEA 2005a). KI has 15 wetlands considered to be nationally significant in the Directory of Important Wetlands in Australia and New Zealand Environment Conservation Council (Neagle 2002).

With regard to native vegetation, there are three main concerns regarding disease (1) the disease itself (usually a microorganism), (2) disease vectors (often insects) and (3) loss or disruption of species that underpin plant reproduction and ecology e.g. pollinators, fungal associations etc. *Phytophthora* is a well-known and established pathogen on KI, which apart from infecting native species, now requires significant management effort that impacts on most activities in affected areas. Myrtle rust (*Puccinia psidii* s.l.) is a current and obvious threat that is not yet present on KI and has been declared a Category 1 EPP by PHA (PHA 2014). It was first detected in Australia in 2010 at a nursery on the central coast of NSW and has now spread along the coast to Qld and Victoria (Pegg, Giblin et al. 2014). Myrtle rust infects many members of the plant family Myrtaceae, which on KI contains the native genera *Eucalyptus*, *Melaleuca*, *Callistemon*, *Leptospermum* and *Calytrix*, among others. In Qld alone, 48 myrtaceous plant species are considered highly or extremely susceptible; this information is not known for KI. Of further concern is that like all rusts, the spores are easily spread by wind, water and animal vectors (particularly insects) and rust diseases are notoriously difficult to contain; a good model for this on KI is bridal creeper rust (biocontrol agent) which is now present across most of KI due to human-aided spread and wind.

This example highlights the importance of a well-resourced, strong and effective biosecurity program for KI in terms of direct agricultural production and environmental benefits, and for broader economic reasons such as tourism appeal of the island. This is particularly so given that insufficient resources are available to eradicate or significantly control a new exotic outbreak, particularly a microorganism or insect. Additionally, myrtle rust highlights the need to prioritise key biosecurity concerns, assess (ahead of possible incursions) the nature and scope of their threats to KI biodiversity and industry, understand their routes of entry, and design appropriate monitoring and eradication/containment protocols.

Rapid climate change

There is much discussion about the ways that rapid climatic changes will impact plant and animal species. The most common concern is the ability of many species to adapt to new conditions and/or alter their range (usually by changing latitude or altitude) to reduce the climatic differential. Those with limited adaptive capacity (a low adaptation threshold) are likely to become extinct or undergo reductions in population size or range. Because KI is a relatively small, landmass with limited latitudinal or altitudinal span, there is concern that the opportunities for a given KI species to alter its range are relatively few and natural migration of other species to the island may also be limited. As discussed above, high levels of biodiversity are associated with multi-functionality and resilience of ecosystems and therefore climate change may cause reductions in ES through reducing biodiversity. A further concern is that increased temperature will change taxonomic and developmental profiles of diseases and insects that impact on native plants (herbivores, pollinators, disease vectors etc.), which will cause changes to the dynamics of the associated interactions in ways that are not easy to predict. For example, it has been postulated that drier conditions could increase susceptibility to existing diseases such as *Phytophthora*, through drought stress on susceptible plants (Singh, Davey et al. 2010). Other climate-associated changes such as aridity and/or reduction in available ground water are possible threats to native plant biodiversity (Barron, Froend et al. 2014).

Modelling is currently under way to try and understand which areas of KI are likely to act as 'climate refugia' i.e. where the highest level of biodiversity will likely to be preserved under a various climate scenarios. The purpose of this is to provide information to facilitate management of native vegetation to minimise species loss. This is a common approach to predicting and minimising biodiversity loss, however, there is still significant scientific shortcomings in our understanding of how to assess refuge quality at the species and community levels. It was suggested that these need to be overcome for refugia of this type to be truly useful management targets for conservation activities mitigating climate change (Reside, Welbergen et al. 2014). These authors listed key properties of refugia that promote the persistence of species under climate change, viz.

- spatially available to species under threat
- capacity to buffer the species from climate change
- capacity to sustain long term population viability and evolutionary processes
- capacity to minimise deleterious species interactions

They also classified refugia based on the stressors that they mitigate (i.e. thermal, hydric, cyclonic, pyric and biotic refugia) and stated that refugia should provide mitigation against multiple stressors. (James, Vanderwal et al. 2013) recently produced a detailed discussion of climate change refugia for freshwater biodiversity in Australia.

Non-recognition of benefits

One of the most serious threats to native vegetation is simply that its full value is not accounted for and not widely realised amongst landholders and the broader community. Many of the benefits are not realised until they are compromised and resultant problems manifest. For example, as mentioned previously, pest management research related to native vegetation has generally not been conducted until sustainability issues have arisen through economic/management problems such pesticide resistance or disease outbreaks. However, the related research has mainly highlighted problems and suggested solutions that still require research and funding for their implementation. Clearly, it is desirable to learn the lessons from elsewhere and to maintain the current ES that are freely provided as this is a more efficient ecological and economic approach than mitigation. Public acceptance of such an approach is made difficult if local benefits (or the problems faced by others) are not realised and clearly communicated.

The MEA Biodiversity Synthesis (MEA 2005a) suggested that the level of biodiversity that will be conserved is proportional to the level of benefits that are considered/accepted by the community and political leaders (Fig 10). Current trends and policies represent a trade-off between economic development/agricultural production and biodiversity conservation, and will likely lead to significant biodiversity losses. However, understanding of the role of biodiversity in providing ES is likely to increase its protection for utilitarian reasons associated with the ES. Understanding of the contribution to landscape resilience, modifying thresholds and maximising management option values for current and future systems, increases the utilitarian values further and thus subsequent biodiversity conservation. The MEA suggested that recognition of non-utilitarian values (e.g. intrinsic values) would be required to preserve the maximum biodiversity. Burkhard, de Groot et al. (2012) concurred that low levels of shared knowledge about how ecosystems function and how they support human well-being, are key limiting factors for sustaining natural capital. They stated that this could be tackled by targeted education campaigns and clear dissemination of successes and failures, that these should be aimed at elected officials as well as the public, and delivered through collaboration between the public, private industry, and government entities.

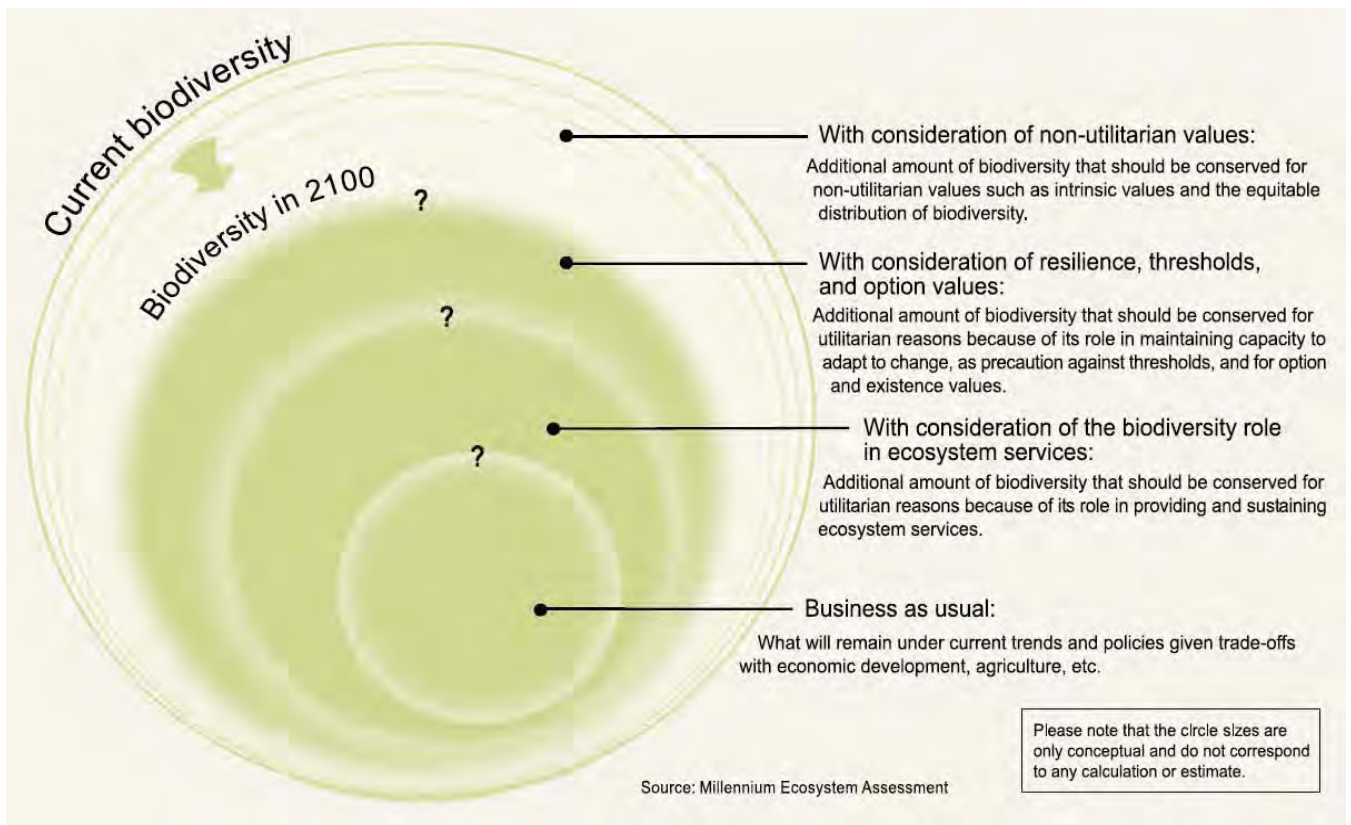


Figure 10. Theoretical global biodiversity conservation scenarios were described based simply on consideration of under-exploited utilitarian values and non-utilitarian values producing changes to current biodiversity trade-offs (MEA 2005a). In a KI context, the outer circle represents total KI biodiversity and inner circles represent the level of biodiversity preserved under various value frameworks; question marks represent uncertainties over boundaries (and hence relative sizes of inner circles). This suggests that understanding and capturing the full benefits provided by biodiversity will lead to improved conservation outcomes.

Increasing economy-of-scale in agricultural production

There has long been a trend in agricultural production, towards increasing economy of scale and a reduction in the number of farm owners and family farming enterprises (Newby 1980). In terms of social structure and public services such a trend is unlikely to benefit the community of KI as economic benefits able to be derived from KI's landmass will be spread between fewer people. The population size is small and already struggles to generate funds to maintain services, and develop infrastructure for residents and visitors alike.

Increasing economies of scale also result in ecological trade-offs through the use of larger land parcels combined with increased scale of mechanisation. For example, on KI it has been suggested that reduction/removal of 'isolated paddock trees' and roadside vegetation be permitted on the basis of facilitating use of larger farm machinery. In the case of isolated trees, vegetation removal requires an offset by the landholder (G. Flanagan, pers. comm., 2015) although these offsets are associated with area/number of trees cleared and not with biodiversity measures or ES provision. Apart from the loss of broad ES in converting more native vegetation to farmland (Fig 8) increasing scale of individual farms decreases the need to reduce overall inputs, increase production intensity, improve production efficiency, increase value of crops grown and increase value-adding which are all desirable for the sustainability and competitiveness of the agricultural sector in Australia. These desirable production attributes are particularly important for KI as they help to maintain producer numbers, overcome transport costs, provide new tourism opportunities (without increasing land area under farming) and aim to exploit the natural advantages producers on KI have (which currently encompass reduced pest pressure and significant ES related to native vegetation cover in excess of mainland producers).

As alluded to above, desirable trends for production on KI include:

- increased intensity of production i.e. more from the same area
- reduced chemical inputs leading to production cost reductions, farmer and public health benefits, reduced off-target effects, reduced disturbance effects (see Fig 7), reduced environmental concerns, extended life-time of chemical use (through reduced resistance)
- increase in profitability through higher value crops, intensification, value-adding
- further integration of production and tourist opportunities
- development of niche products that target KI's natural advantages (including climate) and unique characteristic
- maintenance of the number of producers that are resident and property owners
- increased integrated management plans that recognise and utilise ES provided by native biodiversity

Presently, $\approx 60\%$ of KI is under agricultural production (230,370 ha), with sheep production being the main activity followed by cropping (mainly cereals, pulses and canola) and then beef production (Dohle 2013, Pisanu, Rogers et al. 2013). In the 20 years following 1991, land under cropping increased by almost 250% from 8,000 to about 19,000 ha and includes mixed cropping/grazing enterprises (Dohle 2013). Cropping-related management practices generally involve the greatest ES trade-off and therefore a significant continuation of this trend should be carefully considered. A judicious increase and diversification in the amount of cropping land under horticultural production would likely reduce this trade-off and could contribute to most of these desirable trends on KI, primarily because they are highly intensive systems with good potential for high value produce and value-adding and a reduced requirement for economy of scale. This would also be of benefit to the island community as it would maintain producer numbers in the long term, increasing the diversity and availability of local produce (hence self sufficiency), and increase tourism opportunities.

As far as possible it would seem sensible from an ES perspective, to minimise the amount of conversion of land under native vegetation to primary production or further degrade the existing native vegetation . This is because of the clear ecological and other trade-offs associated with this conversion (e.g. see Fig 8) that is universally recognised by groups involved in ES science. Furthermore, this would ensure that KI would retain its desirable mean native vegetation coverage of $\approx 40\%$. The pending EPBC listing of endangered *E. cneorifolia* communities in KI is therefore likely to produce ES benefits over the long term.

Inappropriate resourcing and legislative framework for research and/or best-practice management

ES as they pertain to landscape management approaches, are a relatively new consideration that government policy will need to keep up with. There are several resourcing and management factors that have the potential to reduce the effectiveness attempts to increase ES pertaining to native vegetation.

1. insufficient resourcing and/or political will to undertake ES accounting, track ES fluxes and/or support the capabilities required to provide meaningful iteration within an adaptive management framework. Financial pressures and political priorities have produced a situation where even basic functions such as control of exotic species or biosecurity monitoring are severely under-resourced with regard to achieving their goals. Without a significant increase in the political will to make real impacts at a landscape level it is difficult to see how the scientific knowledge and refinement of landscape management practices will occur and/or produce the desired outcomes. A good example is the Eastern Plains Fire Trial which was the only

biodiversity-related fire research being conducted on KI; continuation of this program has stalled due to lack of external funding.

2. insufficient internal scientific capacity and research: there are significant knowledge gaps in many of the areas being discussed here (see below) and a corresponding lack of in-house scientific capacity to produce the required data sets or modelling specific to KI. Even relatively longstanding management issues such as response of biological communities to fire variables, value and type of age-class mosaics, definition and use of upper and lower age thresholds, use of vegetation corridors etc. are still being debated at a scientific level.
3. competing goals of local and state government. In many issues surrounding land management, the primary focus of KI council and state government is different, and may be competing in some cases. The most obvious examples are roadside management practices where the main concern of council are liability and infrastructure issues, which are generally at odds with biodiversity and biosecurity concerns of DEWNR and owners of heritage agreements. For example, small heritage grants can be obtained by landowners to prevent weed infestation at the periphery of heritage agreements while adjacent road reserves are managed by local government in a manner that encourages weed invasion. It is of note however, that council has kept significant vegetation on some three chain roads which has provided biodiversity benefits, particularly when located within highly fragmented land (Kangaroo Island Council 2006, Gillam and Urban 2014).
4. policy and red tape as a disincentive to good management practices. The complexity (and other vagaries) of legislating land management practices across landscapes with increased nuance means there is a high chance of discouraging participation in appropriate management, and thereby reducing efficiency of ES accounting and delivery, simply through the design of the legislative framework. While protecting biodiversity and broad ES, legislation has to facilitate:
 - flexibility in land owners undertaking on-ground works
 - efficient cooperation between local and state government
 - expedited assessment of management options
 - expedited translation of research and management feedback into refined management practices
 - encouragement, finical or otherwise, of land owners to undertake practices that preserve or increase broad ES
 - timely assessment and uptake of appropriate technologies

Increasing combined stakeholder benefits of ecosystem services from native vegetation

As alluded to above, apart from many scientific shortcomings, key factors that threaten the loss of ES relate to awareness and/or understanding in that full benefits are not well understood by individual stakeholders, and the shared benefits (common ground) have not been well defined.

The three key 'forces' on KI are tourism, primary production and biodiversity. Each of these shares some common ground with regard to shared benefits (conceptualised in Fig 11 left especially between the biodiversity and each of the others and with less common ground between primary production and the environment which are generally seen as having little shared value. In order to find more common ground attempts should be made to develop management tactics and collaborations that allow dual benefits to be realised in an adaptive management context.

For example, to facilitate biodiversity outcomes, native vegetation management could consider production outcomes where possible. This could be as simple as revegetation supplied on farmland to provide biodiverse windbreaks, or more nuanced such as revegetation or burning of degraded land near agriculture for supply of beneficial invertebrates specific to a given crop. By understanding shared benefits, making them explicit, and managing native vegetation to harness them in an adaptive process, the shared benefits between primary production and biodiversity could be increased (Fig 11). This should provide additional benefits such as the leverage of private effort to achieve these mutual goals and reduce the cost of their delivery e.g. producers could agree to manage weeds in such a planting in return for the planting being supplied. By managing landscapes to maintain their adaptive capacity and option values choices regarding new crops and production systems will be maximised under a rapidly changing climate, especially those for which KI has a natural advantage. In conjunction with increased value-adding, the development of niche products, and innovation, these new production systems will link to new tourism and biodiversity opportunities again increasing shared benefits. Given the current shortcomings in our ability to fully account for the degree and flow of ES, and the effect of various management and legislative processes on them, this is largely a theoretical concept that still requires scientific underpinning, and a relevant and efficient legislative framework. Suggestions to address with these shortcomings are discussed below.

The overarching aims in minimising the levels of clearance and landscape disturbance caused by management practices are capturing and maximising native vegetation-based ES for multiple stakeholder groups, and involve the broader community in this effort. This makes economic as well as ecological sense, given the MEA data showing that increase in sustainability equates to increase in total economic value (Fig 8). Therefore, if highly disturbed/degraded land (e.g. roadsides, agricultural margins, 'wasteland') can be managed more sustainably from a biodiversity perspective, its value to the community should increase. In order for government and the community to achieve this, a clear management structure needs be applied which can iteratively assess needs and outcomes for different stakeholders, and account for a significant proportion of ES provision. Apart from an efficient and relevant management structure, two crucial elements are required: (1) clear management priorities, and (2) means to maximise beneficial outcomes.

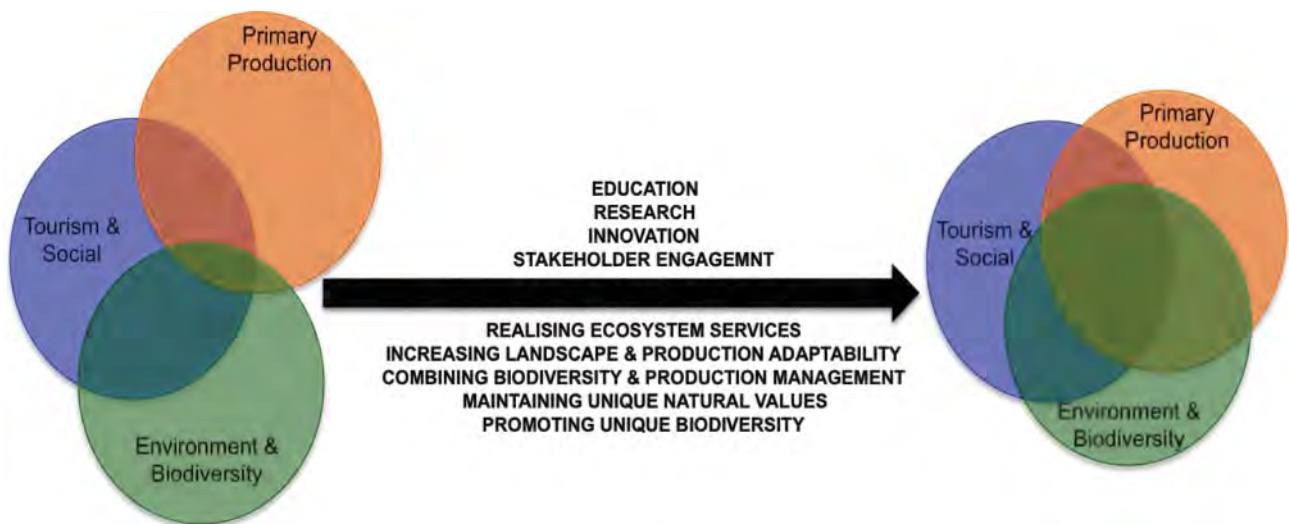


Figure 11. Theoretical model of current (left) and potential shared benefits (economic and ecological) (right) between primary production, tourism and environment sectors on KI, derived from a combination of engagement, education, innovation, ecosystem integrity and landscape adaptive capacity, and restructuring landscape management approaches (arrow). The shared benefits of each sector (overlapping sections of circles) can be increased through ES accounting and resultant improvements to landscape management approaches. This is expected to lead to increased efficiency in ES maintenance/delivery, and improved biodiversity outcomes, through leverage of effort from stakeholders due to increased understanding and attainment of shared benefits.

The key to capturing broad stakeholder benefits is the engagement of the relevant stakeholders (local, regional, national, and global) in developing and implementing management decisions. This is crucial for the credibility and broad acceptance of legislation that assigns appropriate responsibilities and underpins adherence/enforcement (Burkhard, de Groot et al. 2012).

Identifying management priorities

As part of identifying priorities for landscape management, DEWNR recently produced a landscape assessment for KI, whereby the island was divided into three landscapes (management units) based on contiguous areas sharing similar physical and biological parameters (Pisanu, Rogers et al. 2013). The 'health' of these landscapes was then modelled using ecosystem-function thresholds and their status with regard to key drivers that regulate these functional parameters (e.g. vegetation age classes and fire, respectively). The purpose of this was to identify key drivers of ecosystem degradation and identify related management priorities with respect to biodiversity. The ES research I have discussed suggests that there is a range of ways that landscapes can be defined and there may be merit in different definitions for different landscape management aims.

In terms of vegetation management priorities on KI, a key issue for all landscape managers and legislators is managing native vegetation to deliver ES to agriculture whilst achieving improved biodiversity and/or ecosystem functionality. Engaging innovative producers will be crucial to understand constraints and opportunities of their management systems (e.g. see Fig 12 below), and to deliver pilot projects.

A key to delivering agricultural benefits is to understand the management of cropping systems and the role of different native plant species in regulating pests, beneficials and diseases. KI-specific research is required in this regard. A challenge for NRM planning based on agricultural outcomes is the functional categorisation of the landscape (e.g. Figure 2) with respect to beneficial species, which needs to capture the compositional,

temporal and spatial heterogeneity of an agricultural landscape subject to significant disturbance events e.g. pesticides, harvest etc. (Schellhorn, Bianchi et al. 2014). Figure 12 shows an example of an 'agricultural landscape wheel' for temperate Australian cropping systems that represents compositional, temporal and disturbance aspects of vegetation in the landscape (from (Schellhorn, Bianchi et al. 2014). It demonstrates that non-crop vegetation has the ability to supply beneficial insects for multiple crops at the times they are most needed.

One obvious example of a management practice aimed at providing ecological, agricultural and tourism outcomes, is revegetation (or ecological rehabilitation) to supply honeybee forage. Native vegetation is of importance to apiarists because it is key to supplying enough forage to maintain healthy colonies for honey production and crop pollination using managed hives. Beekeepers have long sought access to conservation areas but have usually been denied due to environmental concerns (mentioned above) and/or bad management practices. Against a backdrop of increasing concern about environmental impacts of honeybees, and the threat to honeybee populations posed by introduction of Varroa mite (see Pollination above) and Asian honeybee, one of the apiary industry's key goals is increased access to public lands for foraging purposes.

A potential solution (previously suggested by PIRSA (2007)) is to revegetate private land to supply floral resources for honeybees. As apiarists have a good knowledge of native forage plants and their flowering times, and their own management requirements, there exists an opportunity for custom designed revegetation to maximise honeybee foraging at a given site. Benefits could be extended to include pest-management and pollination outcomes for other adjacent production systems. Table 6 summarises the potential problems and benefits that are encompassed in a theoretical revegetation program aimed at honeybee forage.

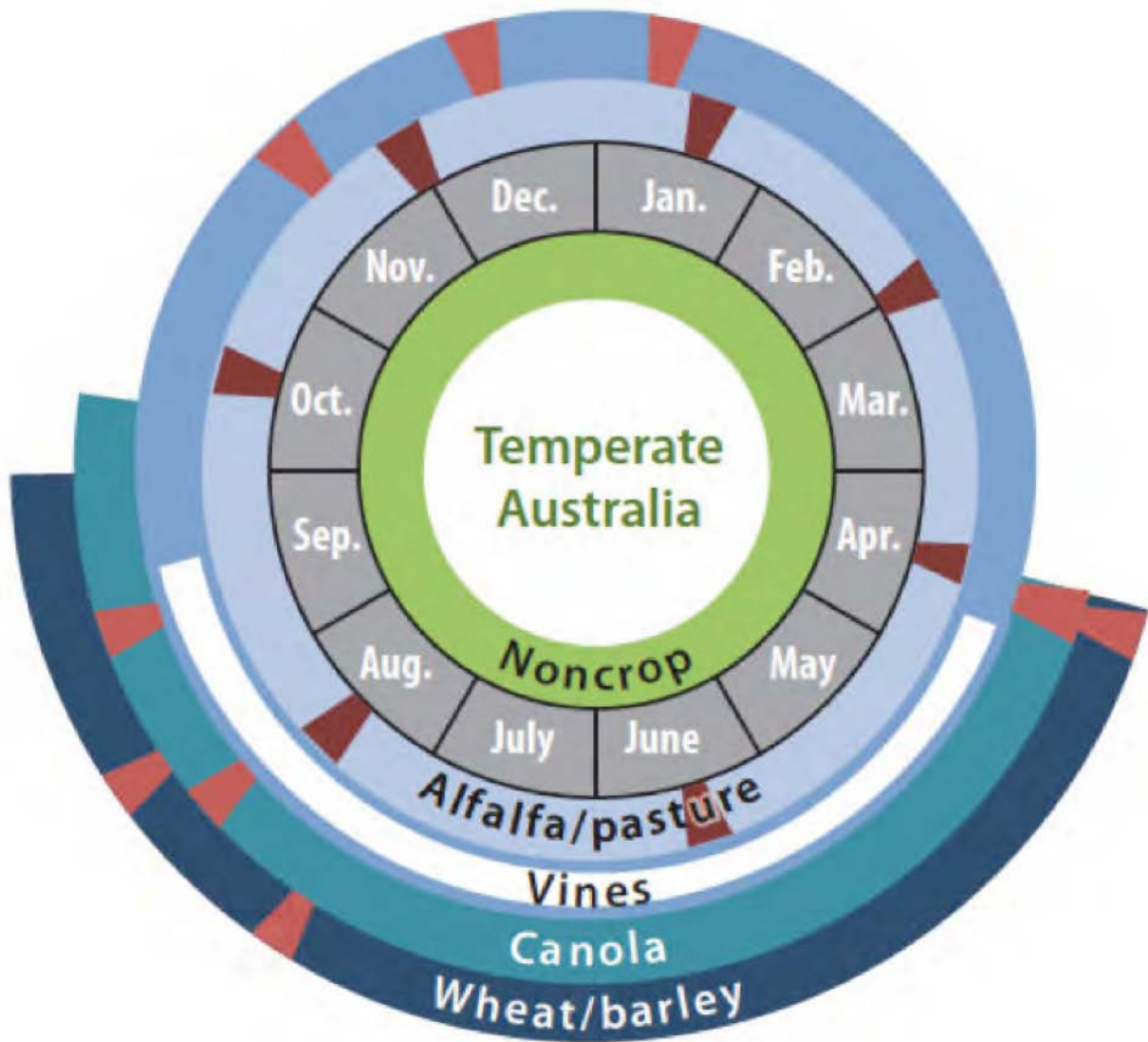


Figure 12. Agricultural landscape wheel for temperate Australia, reflecting temporal (grey circle) and compositional (green and blue circles) heterogeneity, and occurrence of disturbance events by red boxes (insecticides are light red; periodic harvests are dark red). White area within a bar represents leaf-fall in a deciduous habitat. The degree of compositional heterogeneity is represented by the number of circles and temporal heterogeneity by the alignment of circles. The wheel indicates the times that non-crop habitat (green inner bar) are useful for maintaining beneficial species and influencing emigration/immigration dynamics in production systems. From Schellhorn, Bianchi et al. (2014).

Table 6. Theoretical benefits of a revegetation program conducted in conjunction with primary producers and aimed at delivering production benefits for apiarists. Stakeholder groups (and associated problems addressed by the revegetation program) are listed, along with the deliverables supplied and benefits gained. By maximising stakeholders that can be involved in the planning of the program, certain ES can be targeted and shared benefits identified. Through use of a well designed monitoring and assessment strategy that has a sound scientific basis, the revegetation program can be subsequently optimised for improved performance. In reality stakeholder groups on KI are not discrete and overlap.

Stakeholder group	Problem(s) addressed	ES-related deliverables	Benefit(s) received
Apiarists	<ul style="list-style-type: none"> • insufficient forage • hive transport costs • insufficient hives for pollination/honey production • winter & early spring colony vigour 	<ul style="list-style-type: none"> • increased forage plants customised for timing & abundance of flowering 	<ul style="list-style-type: none"> • reduced requirement for access to conservation land • reduced transport needs • increased vigour of colonies in winter/spring • increased pollination & honey production capacity • increased tourism experiences if also operating as a tourism business • improved production efficiency & profitability • improved public perception of apiary management practices
Other Primary Producers	<ul style="list-style-type: none"> • less than optimal pollination • lack of beneficial invertebrates • nearby crop pest/disease reservoir • invasion of weeds from unmanaged adjacent land • need to use pesticides • strength of economy less than optimal 	<ul style="list-style-type: none"> • pest management benefits perhaps including reduced chemical use • improved pollination • cheaper managed pollination services 	<ul style="list-style-type: none"> • improved production efficiency and/or yield • reduced chemical inputs (cost and health benefits) • increased tourism experiences if also operating as a tourism business • marketing opportunity around innovative, 'green' production & management • improvement to resilience and adaptive capacity of landscape • economy strengthening through production efficiency and tourism opportunities

<p>Tourism Operators</p>	<ul style="list-style-type: none"> • need for new and novel tourist experiences • need for integrated tourist experiences (farming and natural environment) • strength of economy less than optimal 	<ul style="list-style-type: none"> • novel management practices associated with KI production systems and using KI wildlife (perhaps rare species) • increased vegetation in landscape 	<ul style="list-style-type: none"> • marketing opportunity for KI as place of innovative, 'green' production & management • extra (and integrated) tourism opportunities either through visiting the sites or delivering/maintaining the revegetation • improved tourist amenity outside of conservation areas • economy strengthening through production efficiency and tourism opportunities
<p>Community/ Environment</p>	<ul style="list-style-type: none"> • degraded natural vegetation and ecosystems • use of agrichemicals • strength of economy less than optimal 	<ul style="list-style-type: none"> • increased native vegetation in landscape • reduced pressure to permit invasive species in conservation areas • reduced use of agrichemicals 	<ul style="list-style-type: none"> • improvements to landscape amenity from native vegetation • improvement to resilience and adaptive capacity of managed landscape • improved biodiversity and conservation values from increased and specified vegetation • reduced managed honeybees in conservation areas • healthier production landscape and produce (if reduce pesticides) • economy strengthening through production efficiency and tourism opportunities

This is just one example of how a remedial activity for the natural environment could be targeted for delivery to benefit a range of stakeholders and thereby broaden the value and acceptance of the action. The importance in fully understanding the ES that can be delivered and how they relate to various stakeholders and their activities are key goals for the consultation and design stages of the adaptive management process, as they are crucial to integrated delivery of benefits across groups and/or minimising competing outcomes. Another potential example could be the use of primary production landscapes for targeted protection of rare KI species, combined with the right of associated producers to utilise the species (or their conservation activities) in marketing of their products, or a labelling strategy that aims to highlight producers who undertake collaborative remediation/conservation (or subsidies for the same). This could also provide tourism opportunities on-farm. There are endless opportunities in this space and collaboration of stakeholder groups is key to identifying and maximising beneficial outcomes at a landscape level.

A key to driving innovation in farming systems is to engage 'innovators' in the farming community. It is well known that in primary production that there are generally a small percentage of innovators that are quick to take up new practices and technologies, and that the bulk of primary producers will change their approach if benefits are demonstrated by the innovators, but are not highly influenced by benefits espoused by scientists and/or the government. A small percentage will always be resistant to change. Therefore, general uptake of management practices by the broad primary producer community is best facilitated by engaging with the innovators to demonstrate benefits in pilot programs.

Given that there is likely to be insufficient resources to actively drive all desired management outcomes, a key question that will need to be addressed is the relative assignment of resources to restoration/remediation and protection. While protection of high value areas is likely to be simpler and cheaper (mainly requiring control of exotics), the ES provided are not well defined in an economic sense and are broadly distributed (and hence without an obvious advocate). Alternatively, remediation of degraded areas is more complex and likely to require a more active ongoing approach, however, stakeholder benefits may be easier to define and/or capture through the ability to custom-design the resultant landscape. Pisanu, Rogers et al. (2013) stated that it is obvious that biodiversity resources would best be applied to the highly degraded areas of the Eastern Plains and Dudley Peninsula where many of the endangered plant taxa exist. However, there was limited discussion about why this was a better use of limited resources over the long term than protecting high value areas, and there is as yet no consensus in the broad general debate on this question (Wilson, McBride et al. 2006, Rudd 2011). The EDGE group (<http://www.edgeofexistence.org/index.php>) has produced lists of priority species for conservation based on how evolutionary distinct and globally endangered they are. Regardless of the merit of that particular approach, it highlights the debate in this area and the fact that prioritisation will likely be required due to the scale of the problems and the insufficient resources available for management of all ecosystems and their constituent species.

In degraded areas needing active management, it will be crucial to efficiently define ES and resilience benefits for multiple stakeholders to enable quick decisions, multiple benefits, meaningful participation and prevention of dissatisfaction. The full accounting of ES in remediation situations is a key strategy for prioritizing delivery of on ground works, stakeholder engagement and value adding by stakeholders. For native vegetation management on KI there is a lot to be gained from simply learning the lessons from other regions where little native vegetation remains and associated problems have been manifest in these areas, but may not yet be obvious on KI. Therefore, the prior events from other regions can act as 'case studies' to help define the problems (and the proposed solutions) in economic terms. By combining this with science aimed at elucidating specific aspects of KI landscape attributes and associated ES, KI-specific management solutions can be derived in a meaningful way and act as a sound basis for iteration through the adaptive management process.

Maximising beneficial outcomes

In 2008 the Ecosystem Services Partnership was established to '*enhance communication, coordination and cooperation, and to build a strong network of individuals and organisations*' for '*conceptualisation and application of ecosystem services*'. Against a background of identified emerging needs for scientific development and fostering of applications and environmental management based on ES, participants in a 2011 conference organised by ESP released the '*Salzau Message on Sustaining Ecosystem Services and Natural Capital*' (Burkhard, de Groot et al. 2012). This statement, signed by many of the leaders in ES science, listed a series of agreed facts about ES and 'natural capital', which served to underpin their specific recommendations regarding research into ES methods and applications.

Some of these agreed facts related to ensuring beneficial outcomes to multiple stakeholders, *viz*:

- an ES approach helps to identify and quantify ecological and socio-economic trade-offs and synergies on which decision making should be based.
- many ES cannot, and should not, be privately owned and are thus ignored by conventional markets.
- many ES are such that providing benefits to one person does not reduce the amount of benefits available for others. They are "non-rival" and "non-excludable" and therefore best treated as "public goods".
- there will remain enormous uncertainties about how ES are provided, the magnitude of their benefits, and how human activities affect their provision.
- adaptive management/learning is a useful approach that allows one to learn from the system dynamics and manage under this uncertainty.

Encompassing the viewpoints of multiple stakeholders and dealing with ecological and other trade-offs is a key part of ES science and moving towards full accounting. This should take into account the benefits and costs of all stakeholders associated with a given landscape management activity. For example, the incorporation or proximity of native vegetation to production land may provide biodiversity and insect pest management benefits, but may have adverse impacts for some stakeholders such as increasing impacts of sheltered animals such as pigs, goats and native grazers. The complexity of the various biological systems and their interaction with human activity means that these trade-offs must always be managed; this is in fact the primary aim of full accounting. For native vegetation most of the trade-offs are ecological and arise from two sources (Burkhard, de Groot et al. 2012):

1. scarcity and restrictions in the amount of ES that can be provided
2. distribution of the costs and benefits for provisioning the ES

Burkhard et al. (2012) stated that the purpose of ES science is to make these trade-offs explicit and facilitate stakeholder discourse around planning and management, and thus enable sound value judgements by all parties. It also makes explicit the degree to which ES are applicable (i.e. personal vs group vs community). Thus, ES science and full accounting aim to produce robust socio-ecological knowledge for stakeholders and policy makers and produce sets of planning options to resolve as best as possible, social conflicts surrounding ES delivery through landscape management (Burkhard, de Groot et al. 2012).

One tranche of recommendations in the *Salzau Message* related to dealing with uncertainties that will continue to surround many aspects of ES science, using adaptive (or iterative) approaches. They stated that this required constant evaluation of the impact of existing systems and the design of new systems with stakeholder participation as experiments from which to more effectively quantify performance and learn. DEWNR already recognises the need for an adaptive management approach and so I will not discuss a generic adaptive management framework here; for such a discussion see (Sabine, Schreiber et al. 2004, Pisanu, Rogers et al.

2013). Briefly, adaptive management amounts to using best available knowledge and multiple stakeholder inputs to model a range of management options from which a 'best-bet' approach is chosen and implemented, with monitoring and subsequent evaluation used to improve future outcomes. Haasnoot, Kwakkel et al. (2013) provide an example of a recent approach to making adaptive policy and management decisions when dealing with uncertainty.

One advantage of the early phases of an adaptive management cycle (Sabine, Schreiber et al. 2004) is that it has the capacity to classify and quantify landscape approaches based on multiple stakeholder inputs such that ES goals are clearly defined to allow stakeholders to work towards them. This seems a worthwhile approach and essentially amounts to common sense given the current thinking in ES science. However, the capacity to truly utilise adaptive management to improve landscape resilience/adaptive capacity is limited not only by scientific knowledge in many cases but also the resourcing to drive the interactive process in a meaningful way.

Thus, there are three notes of caution regarding the use of adaptive management as it currently stands:

1. the fact that iterative improvement is inherent in the approach should not be used as an excuse for either a poor starting point or to proceed in the absence of a sound scientific basis.
2. that 'best available knowledge' is not used in an internal (departmental) sense but in an external (scientific) sense. This is crucial as it facilitates the pre-requisite scientific underpinning required for good outcomes in this complex area. Just because a number has been assigned to a given metric does not make it robust or useful.
3. that sufficient resourcing is available to perform required research and consultation to support each phase of the adaptive management process, especially the development of a 'best-bet' plan and the monitoring/assessment required to drive refinement.

It should also be noted that unless trialling the learning (adaptation) process is a goal in itself, that management plans based on poor (or insufficient) information, or poor interpretation of available information, may be worse than the *status quo*. A further consideration is that 'doing nothing' or reducing intervention in the absence of good/sufficient information and/or sufficient expertise, may be legitimate management approaches in many cases. This is particularly so where:

- resource use efficiency has a reasonable prospect of improving in the short/medium term e.g. where a scientific basis is being established,
- the low cost of the approach gives good cost : benefit ratio,
- there is a lag time until drivers of the management decision are impacting significantly,
- a management approach is being applied more broadly than strictly required in attempts to achieve some other efficiency.

Apart from the areas of defining and understanding dynamics of ES (see previously), there are still large knowledge gaps in monitoring and evaluating ecosystem health. Generally, current biological monitoring does not have well defined metrics to assess degradative changes to ecosystem functioning in real time; it is restricted to assessing high-order symptoms of deleterious processes, rather than subtle changes that reflect specific progress of processes. For example, a recent report stated that birds could be used to assess ecosystem health, and linked reduction in numbers of several species to deleterious processes on Dudley Peninsula (Pisanu, Rogers et al. 2013). While they may be indicative of significant/broad scale degradation of ecosystems (which was a correlation used to support the assertion), birds are unlikely to have the functional

resolution to be useful indicators of subtle changes to ecosystem processes as they are not very diverse in species number or behaviour and they do not generally have specific associations with other organisms.

A key challenge current NRM planners is the need to deal with complex decisions that often need to be made without a strong scientific underpinning, which limits the ability to monitor outcomes and likely reduces the effectiveness of management tactics (or adverse outcomes may be produced). For KI, it should be an aim to increase interaction between land managers and researchers working in the areas discussed here. There are many scientists in Australia (see numerous references cited) and elsewhere with significant capability that could be applied to KI-specific situations. These researchers seek model systems to test their hypotheses and also need a competitive advantage in funding applications, such as an important region or current issue. KI is attractive in this regard because of:

- the unique multi-use landscape,
- high national and global profile for tourism and biodiversity (iconic status),
- discrete landmass and administration (i.e. one council, KINRM board) but a regional context at state/national level,
- discrete KI-specific data sets already existing ,
- many important questions not specifically addressed here,
- significant natural capital remaining, including biodiversity assets of national importance and scientific value.

Given the current administrative load of and focus of DEWNR, it is not able to conduct research projects, however, it does not need to. Its role should be to use KI's competitive research funding advantages (dot points above) to leverage the research expertise. DEWNR can continue to undertake an administrative role through regional planning, supply of datasets, access to land, input into grant applications, identifying collaborators, gathering regional industry support, supplying in-kind assistance etc. Some suggestions to move towards such a model are:

- develop/prioritise defined and discrete research questions to inform landscape management plans
- produce a database of relevant institutes and researchers (defined by the previous)
- liaise directly with researchers to develop KI-specific funding proposals
- incorporate literature reviews into research projects to leverage information gathering based on defined research goals
- at a state level, consider formal involvement with topic-based national/international research bodies of relevance (some current examples in Australia are NCCARF and Plant Biosecurity CRC)

This approach will allow DEWNR to obtain quality datasets and models and can reduce the effort currently applied to gathering complex information derived elsewhere, and attempting to interpret it in a KI context for management purposes. However, it is likely to require some state funding to achieve it in the short term although the benefits are expected to significantly outweigh this investment because of the leverage of latest knowledge and expertise.

A similar improvement to land management issues is to place effort into working directly with local government in a formal and ongoing way, to identify shared benefits and shared problems in any issue concerning plants. Again, this should be driven through co-development of grant proposals to tackle these issues and address current funding constraints. Given the competitive advantages listed above, targeted grant proposals with regional impact and combined council/DEWNR (and potentially PIRSA) support, would have a high chance of obtaining funding to investigate difficult vegetation management issues.

As alluded to above, the current less-than-optimal attainment of shared benefits (mainly between agriculture and environmental sectors) is partly the result of administrative structures such as the traditional departmental separation of production and conservation activities. The need for a more holistic approach to landscape management has been realised with the remit of the former Department of Environment and Heritage being increased to include NRM (and water). However, NRM is not well defined in this context and this approach has essentially led to a reduction in conservation activities and an increase in expectations that such an NRM-related department must deal with issues pertaining to agricultural production. Therefore, in order to manage the landscape efficiently to maximise shared benefits, biological realities and complexities need to be reflected in the administrative structures of government. In that sense, it would seem beneficial to have a united body dealing with NRM and ES (or simply landscape management), containing sub-units that deal with functional subcategories (e.g. biodiversity, soils, water, biosecurity etc.) at a landscape level, considering both natural and managed systems and associated interactions. Currently, management of NRM and primary production is more disparate.

There are two other strategically important issues with regard to achieving beneficial outcomes at a landscape level. The first is to encourage uptake or increase of production systems where KI has a natural (biological or regional) advantage. This is aimed to reduce overall production costs (reduce inputs and ES trade-offs) and maximise the ES that can be derived from the landscape. As a general principle government and producers should aim to increase production of high quality, high value, high intensity, high efficiency, innovative, high value-added commodities and trend away from greater economies-of-scale which generally ignore efficiency of biological inputs and rely on technological improvements that drive profitability in large-scale production systems. This will act to maintain sufficient numbers of primary producers, increase the value and efficiency of production, and make use of KI's advantages to overcome disadvantages such as export costs.

Secondly, conservation approaches should aim to protect biological communities (rather than individual species), which can be well defined by soil type, plant-species composition and land use history. This is already realised by DEWNR who have moved to protect the remaining *E. cneorifolia* communities (under the federal *Environment Protection and Biodiversity Conservation Act 1999*) that are unique to KI and have been severely fragmented, and therefore often not exposed to fire for long periods. However, because of the high level of degradation of some of the most diverse biological communities on KI such as those of the MacGillivray Plains, there are numerous endangered plant (and probably other reliant) taxa that require attention at the species level because their remaining habitat comprises only roadsides and/or small conservation blocks.

Knowledge Gaps and Future Research

In many areas of biology, there is far a far greater knowledge gap than there is validated scientific knowledge. The very broad area of NRM and ES is no exception. Many of the knowledge gaps have been mentioned under specific sections earlier in this report. While the existence of ES is intuitive and now a broadly accepted concept, ES as a field of study is still in its infancy and the supporting science is gaining in sophistication. A good summary of the current research questions and directions in ES science was provided by Burkhard et al. (2012) on behalf of the ESP; a short summary is provided below in Table 7. Most of these issues have been discussed during the report in a KI-specific context. They also point out that ES research has evolved from introductions and conceptual questions to now focus on more specific and detailed questions regarding methods and applications.

Table 7. Summary of broad research areas and associated research questions in the field of ES science (derived from Burkhard et al. (2012)).

Broad Research Area	Research Questions
Integrated quantification, modeling and valuation of ES	How to measure & evaluate ES?
	How to link ecosystem functions, services & benefits?
	How to explicitly link ES to human well-being?
Accounting for ES at the landscape level	How can the ES approach be applied to landscape analysis?
	How can the ES approach be applied to landscape planning?
	How can the ES approach be applied to landscape management?
Adaptive management of ES	What supporting tools have to be developed to validate the ES approach in adaptive management?
	How can the ES approach be implemented in management and institutions?
Environmental, social & economic trade-offs	How can ES be evaluated from social & economic points of view?
	What instruments should be developed to foster these evaluation strategies?

The following areas of research are recommended to support the movement towards a validated approach to native vegetation-related ES delivery through landscape management on KI:

- developing integrated quantification, modelling and valuation of ES
- significant accounting for ES at a landscape scale
- development of a scientifically-based adaptive management approach to ES
- understanding and characterising social and economic trade-offs on KI
- understanding and characterising interactions between native biota on KI and primary production systems
- determining key biosecurity threats for native vegetation on KI and developing prophylactic and response plans
- defining a range of biological and physical metrics (including indicator species) that can be used for ongoing and standardised assessment of ES delivery and ecosystems function on KI
- adopting all safe technologies that provide a sustainability advantage to production systems and environmental management practices

Among many things, some specific activities and research could include:

- establishment of a KI rainfall transect project to provide long term monitoring of key biological and environmental variables across the gradient
- production of a database of current weed and invertebrate pests, and diseases for key crops
- assessment of beneficial and pest invertebrates on KI's native plant species
- develop a database of pollinating invertebrates and their relationship to crops
- assessment of the impact of various management practices (especially fire) on diverse groups such as invertebrates and microorganisms that effect plant establishment, growth and reproduction (e.g. mycorrhizal fungi, seed-germination fungi, pollinators)
- assessment of areas of greatest risk for incursion and spread of new organisms
- continued assessment of fire for regeneration purposes

- means to improve DEWNR data sets (e.g. access other national and state databases such as SA museum, Australian Faunal Directory)
- assessment of new primary industries for which KI will have a natural advantage under increasingly warm and arid conditions
- examining means by which KI biota can be used in marketing of agricultural produce
- establishing meaningful thresholds for a range of disturbance processes impacting key ecological communities

As discussed above (see *Maximising Beneficial Outcomes*) the iconic status and high value ecosystems of KI combined with multi-institutional (e.g. council, state, industry, community) grant proposals, should be used to leverage research expertise to produce KI-specific data sets. This will increase the scientific capability being applied to these questions on KI and will increase confidence in parameters used for management decisions.

Conclusions & Recommendations

There is no doubt that a landscape based ES-accounting approach is broadly seen as a useful strategy for maximising current and future ES from the environment, and the approach although virtually in its infancy, is continually being refined and debated. Furthermore, it is now beyond all reasonable doubt that there will be an unprecedented rate of warming of the globe, to a degree that will severely impact some ES that are yet to be well defined. A big part of maintaining ES is to work to improve economic and biological adaptive capacity/resilience of the landscape. Therefore, the new NRM approach of landscape management aimed at adaptive capacity and resilience is to be commended as a sound strategic approach to change and uncertainty.

However, it needs to be recognised that although ES, resilience, adaptive capacity etc. are not new concepts, there still remains a significant knowledge gap in terms of turning these theories into on-ground management providing significant ES benefits, particularly against a cultural background that tends to focus on direct individual benefits and costs of management, rather than the broad spread required for full ES accounting. This largely relates to developing integrated quantification, modelling and valuation of ES across management units.

Moving towards significant accounting of ES in NRM

- apply latest thinking regarding full accounting of ES to develop adaptive land management models because ES accounting will be a major future driver of economies. This requires an explicit understanding of both individual (land owner) and broadly applicable ES, as well an explicit definition of the associated costs and benefits of native vegetation to these groups.
- develop multi-benefit revegetation models for KI that are designed to deliver biodiversity and production-specific ES
- engage innovative producers to deliver biodiversity- and production-based pilot projects, highlight ES benefits and promote value of current ES delivery
- biosecurity, pest management and other ES should be considered in all matters involving vegetation (e.g. roadside maintenance, construction approval) particularly adjacent agriculture or conservation land
- examine marketing/tourism opportunities based on rare, iconic and endemic KI taxa

Research and data

- leverage scientific expertise: use KI natural systems and iconic status to actively engage researchers to develop proposals and facilitate subsequent projects generating relevant KI-specific data sets.
- develop mechanism to continually develop joint research proposals between the state departments, KI council and KI industry which exploit KI's iconic status and improve leveraging of external NRM funding
- establishment of a KI rainfall transect project to provide long term monitoring of key biological and environmental variables across the gradient
- production of a database of current weed and invertebrate pests, and diseases for key crops
- assessment of beneficial and pest invertebrates on KI's native plant species
- develop a database of pollinating invertebrates and their relationship to crops
- assessment of the impact of various management practices (especially fire) on diverse groups such as invertebrates and microorganisms that effect plant establishment, growth and reproduction (e.g. mycorrhizal fungi, seed-germination fungi, pollinators)

- assessment of areas of greatest risk for incursion and spread of new organisms
- continued assessment of fire for regeneration purposes
- means to improve DEWNR data sets (e.g. access other national and state databases such as SA museum, Australian Faunal Directory)
- assessment of new primary industries for which KI will have a natural advantage under increasingly warm and arid conditions
- examining means by which KI biota can be used in marketing of agricultural produce
- establishing meaningful thresholds for a range of disturbance processes impacting key ecological communities

Land management

- incorporate weed management into activities that disturb vegetation and/or seed-bank at high frequency (e.g. roadside maintenance, fuel reduction burning) – examine joint funding proposals for this based on ES provision
- refine roadside vegetation management practices to provide removal of encroaching mallee branches (with little biodiversity risk) while leaving the shrub layer and soil undisturbed (to give biodiversity and biosecurity gains)
- similarly, refrain from disturbing roadside vegetation where there is no clear safety, functional or management benefit from doing so (identify such areas to provide cost-savings and improved ecological management)
- examine joint-benefit revegetation/regeneration projects to deliver biodiversity and production benefits
- develop monitoring and response strategies for key pests and diseases threatening KI
- highlight and promote awareness of KI's rare plants (e.g. utilise in marketing and tourism)
- protect diversity across the full range of biological "levels" (e.g. genetic, species, population and community)
- fully investigate use of technologies designed to increase sustainability or input use-efficiency of primary production systems and/or minimise ES-tradeoffs
- set 30% native vegetation target on Dudley and Eastern Plains (currently at $\approx 27\%$). Because much of the current coverage is contained in large conserved blocks on limestone, the focus of the increased coverage should be ironstone habitats in multi-use (fragmented) areas. This is designed to not only increase the ES values of the primary production landscape in these degraded regions, but to examine research questions and multi-benefit revegetation/regeneration models, and to drive debate regarding uptake of broader ES accounting on KI.
- examine targeted incentive schemes to deliver vegetation management aimed at tackling key biosecurity and biodiversity challenges
- promote ES benefits by highlighting the costs (lost ES) of poor management of native vegetation in other regions, rather than the poorly defined benefits that are currently received on KI through having maintained the native vegetation. For example, grains and horticultural industry advice about the usefulness of native vegetation has been driven by loss of vegetation in other agricultural regions (e.g. west coast of SA and northern Adelaide plains) and the resultant production problems this has produced.
- investigate innovative methods/models of harnessing volunteers for management of feral plants and animals e.g. streamlined environmental volunteer legislation, tourism opportunities, progress associations

References

- Adams, W. (2014). "The value of valuing nature." Science **346**(6209): 549-551.
- Allen-Wardell, G., P. Bernhardt, R. Bitner, A. Burquez, S. Buchman, J. Cane, P. Cox, V. Dalton, P. Feinsinger, M. Ingram, D. Inouye, C. Jones, K. Kennedy, P. Kevan, H. Koopowitz, R. Medellin, S. Medellin-Morales, G. Nabhan, B. Pavlik, V. Tepedino, P. Torchio and W. S (1998). "The potential consequences of pollinator declines on the conservation of biodiversity and stability of food crop yields." Conservation Biology **12**(1): 8-17.
- Arthur, A. D., J. Li, S. Henry and S. A. Cunningham (2010). "Influence of woody vegetation on pollinator densities in oilseed Brassica fields in an Australian temperate landscape." Basic and Applied Ecology **11**: 406-414.
- Barron, O., R. Froend, G. Hodgson, R. Ali, W. Dawes, P. Davies and D. Mcfarlane (2014). "Projected risks to groundwater-dependent terrestrial vegetation caused by changing climate and groundwater abstraction in the Central Perth Basin, Western Australia." Hydrological Processes **28**(2): 5513-5529.
- Bates, J. (2008). Island Fires: A community planning the way forward. The International Bushfire Research Conference 2008. Adelaide, Australia: 6pp.
- Blanche, K., J. Ludwig and S. A. Cunningham (2006). "Proximity to rainforest enhances pollination and fruit set in orchards." Journal of Applied Ecology **43**: 1182-1187.
- Bommarco, R., D. Kleijn and S. G. Potts (2013). "Ecological intensification: harnessing ecosystems services for food security." Trends in Ecology and Evolution **28**(4): 230-238.
- Breed, M. F., M. G. Stead, K. M. Ottewell, M. G. Gardner and A. J. Lowe (2012). "Which provenance and where? Seed sourcing strategies for revegetation in a changing environment." Conservation Genetics **14**: 1-10.
- Brooks, E. G., K. G. Smith, R. A. Holland, G. M. Poppy and F. Eigenbrod (2014). "Effects of methodology and stakeholder disaggregation on ecosystem service valuation." Ecology and Society **19**(3): 18-26.
- Burkhard, B., R. de Groot, R. Costanza, R. Seppelt, S. E. Jorgensen and M. Potschin (2012). "Solutions for sustaining natural capital and ecosystem services." Ecological Indicators **21**: 1-6.
- Carr, A. J. (2011). Asian Honeybee: possible environmental impacts. Report for the Department of Sustainability, Environment, Water, Population and Communities. Sustineo Pty Ltd., Canberra. 41pp.
- Casey, M. (2015) "Living dinosaur moth discovered in Australia." CBS News Online. Retrieved 28 May 2015, from <http://www.cbsnews.com/news/moth-living-dinosaur-discovered-in-australia/>
- Celebreeze, T. and D. C. Paton (2004). "Do introduced honeybees (*Apis mellifera*, Hymenoptera) provide full pollination service to bird-adapted Australian plants with small flowers? An experimental study of *Brachyloma ericoides* (Apecriaceae)." Austral Ecology **29**: 129-136.

- Cook, D. C., M. B. Thomas, S. A. Cunningham, D. L. Anderson and P. J. De Barro (2007). "Predicting the economic impact of an invasive species on an ecosystem services." Ecological Applications **17**(6): 1832-1840.
- Costanza, R. (2008). "Ecosystem services: Multiple classification systems are needed." Biological Conservation **141**: 350-352.
- Costanza, R., R. de Groot, P. Sutton, S. van der Ploeg, S. J. Anderson, I. Kubiszewski, S. Farber and R. K. Turner (2014). "Changes in the global value of ecosystem services." Global Environmental Change **26**: 152-158.
- Costanza, R., I. Kubiszewski, D. Ervin, R. Bluffstone, J. Boyd, D. Brown, H. Chang, V. Dujon, E. Granek, S. Polasky, V. Shandas and A. Yeakley (2011). "Valuing ecological systems and services." F1000 Biology Reports **3**: 14.
- DAFF (2006). Gorse National Best Practice Manual, Department of Agriculture, Fisheries and Forestry, Canberra, Australia.
- DEH (1991). The South Australian Native Vegetation Act, 1991. Department for Environment and Heritage, Adelaide, South Australia.
- DEWNR (2009). Flinders Chase Fire Management Plan. South Australian Department of Environment and Heritage, Adelaide. 86pp.
- Doerr, V., K. Williams, M. Drielsma, E. Doerr, M. Davies, J. Love, A. Langston, S. Low Choy, G. Manion, E. Cawsey, H. McGuinness, T. Jovanovic, D. Crawford, M. Austin and S. Ferrier (2013). Designing landscapes for biodiversity under climate change: Summary for landscape managers and policy makers. National Climate Change Adaptation Research Facility, Gold Coast, Australia. 3pp.
- Dohle, L. (2013). Implications of the change of landuse from grazing to cropping on the soils of Kangaroo Island. Primary Industries and Regions, Rural Solutions SA, Adelaide, Australia.
- Donkersley, P., G. Rhodes, R. Pickup, K. Jones and K. Wilson (2014). "Honeybee nutrition is linked to landscape composition." Ecology and Evolution **4**(21): 4195-4206.
- Dunlop, M., H. Parris, P. Ryan and F. Kroon (2013). Climate-ready conservation objectives: A scoping study, National Climate Change Adaptation Research Facility, Gold Coast, Australia. 110pp.
- Enright, N. J. and J. B. Fontaine (2014). "Climate Change and the Management of Fire-Prone Vegetation in Southwest and Southeast Australia." Geographical Research **52**(1): 34-44.
- Fisher, B., R. K. Turner and P. Morling (2009). "Defining and classifying ecosystem services for decision making." Ecological Economics **68**: 643-653.
- Gellard, J. (2005). Repel the Invaders - Border Protection Program, Kangaroo Island Biosecurity Strategy Project Report. Department of Environment & Heritage and the Kangaroo Island Natural Resource Management Board, Kangaroo Island, South Australia. 101pp.

Gillam, S. and R. Urban (2014). Regional species conservation assessment project, phase 1 report: Regional species status assessments, Kangaroo Island NRM region. Department of Environment, Water and Natural Resources, Adelaide. 105pp.

Glatz, R., R. Leijes and K. Hogendoorn (2015). Biology, distribution and conservation of Green carpenter bee (*Xylocopa aeratus*: Apidae) on Kangaroo Island, South Australia. Technical report to the Foundation for National Parks and Wildlife. Kangaroo Island, Sydney, Australia: 32pp. DOI: [10.13140/2.1.3841.0560](https://doi.org/10.13140/2.1.3841.0560)

Glatz, R. V. (2015). "The curious case of the Kangaroo Island honeybee (*Apis mellifera* L. 1758) sanctuary." *Austral Entomology* **54**(2): 117-126.

Goulson, D. (2003). "Effects of introduced bees on native ecosystems." *Annual Review of Ecology, Evolution and Systematics* **34**: 1-26.

Government of South Australia (2011). South Australia Wilderness Protection Act 1992. Version 16.6.2011. Department of Environment and Natural Resources, Adelaide. 30pp.

GRDC (2014). Pest suppressive landscapes fact sheet. Grains Research and Development Council, Canberra. 4pp.

Grechi, I., I. Chades, Y. Buckley, M. Friedel, A. Grice, H. Possingham, R. van Klinken and T. Martin (2013). "A decision framework for management of conflicting production and biodiversity goals for a commercially valuable invasive species." *Agricultural Systems* **125**: 1-11.

Greenleaf, S. and C. Kremen (2006). "Wild bee species increase tomato production and respond differently to surrounding land use in Northern California." *Biological Conservation* **133**: 81-87.

Gurr, G., S. Scarratt, S. Wratten, L. Berndt and N. Irvin (2004). Ecological engineering, habitat manipulation and pest management. *Ecological Engineering for Pest Management: Advances in Habitat Manipulation for Arthropods*. G. Gurr, S. Wratten and M. Altieri. CSIRO Publishing, Collingwood, Victoria, Australia. pp1-12.

Haasnoot, M., J. Kwakkel, W. Walker and J. ter Maat (2013). "Dynamic adaptive policy pathways: a method for crafting robust decisions for a deeply uncertain world." *Global Environmental Change* **23**: 485-498.

Hassell, M. P. (2000). *The spatial and temporal dynamics of host-parasitoid interactions*. Oxford University Press, Oxford, UK.

Hilton, D. J. and T. Edwards (2015) "Newly discovered moth is enigmatic evolutionary wonder." *The Conversation*. Retrieved on 28 May 2015, from <http://theconversation.com/newly-discovered-moth-is-enigmatic-evolutionary-wonder-38276>

ICCP. (2015). "The Integrated Croop Pollination Project." Retrieved 28 May 2015, from <http://icpbees.org/>

IPCC (2014). IPCC Fifth Assessment Synthesis Report. Intergovernmental Panel on Climate Change, Geneva, Switzerland. 116pp.

James, C., J. Vanderwal, S. Capon, L. Hodgson, M. Wade, N. Waltham, D. Ward, B. Anderson and R. Pearson (2013). Identifying climate change refuges for freshwater biodiversity across Australia. National Climate Change Adaptation Research Facility, Gold Coast, Australia. 424pp.

Kangaroo Island Council (2006). Kangaroo Island roadside management plan 2007. Kangaroo Island Council, Kingscote. 132pp.

Kaval, P. and R. Baskaran (2013). Key ideas and concepts from economics for understanding the roles and value of ecosystem services. Ecosystem Services in Agricultural and Urban Landscapes. S. Wratten, H. Sandhu, R. Cullen and R. Costanza Eds. John Wiley & Sons, Ltd., Chichester, UK. pp28-42.

Kennedy, C., E. Lonsdorf, M. Neel, N. Williams, T. Ricketts, R. Winfree, R. Bommarco, C. Brittain, A. Burley, D. Cariveau, L. Carvalheiro, N. Chacoff, S. A. Cunningham, B. Danforth, J.-H. Dudenhofer, E. Elle, H. Gains, L. Garibaldi, C. Gratton, A. Holzschuh, R. Isaacs, S. Javorek, S. Jha, A. Klein, K. Krewenka, Y. Mandelik, M. Mayfield, L. Morandin, L. Neame, M. Otieno, M. Park, S. G. Potts, M. Rundlof, A. Saez, I. Steffan-Dewenter, H. Taki, B. Vianna, C. Westphal, J. Wilson, S. Greenleaf and C. Kremen (2013). "A global quantitative synthesis of local and landscape effects on wild bee pollinators in agroecosystems." Ecology Letters **16**(5): 584-599.

KIDBPC (2009). Kangaroo Island Bushfire Risk Management Plan 2009-2014. KI District Bushfire Prevention Committee, Kingscote. 50pp.

Kimber, W., H. DeGraaf, K. Perry, M. Nash and G. Baker (2014). SARDI Entomology Pest Facts SA and western Victoria Edition. Issue No. 6, 9th July 2014., South Australian Research and Development Institute: 6pp.

King, E. and R. Hobbs (2006). "Identifying landscapes among conceptual models of ecosystem degradation and restoration: towards an integrative framework." Restoration Ecology **14**: 369-378.

KINRM Board (2009). Kangaroo Island Natural Resource Management Plan 2009: Introduction to the Plan. Kingscote. 19pp.

KINRM Board (2014). Minutes of meeting held at 9.30am on 23 June 2014, Board Room, 35 Dauncey Street, Kingscote. Department of Environment, Department of Environment, Water and Natural Resources, Kingscote. 13pp.

Kleijn, D. and F. van Langevelde (2006). "Interacting effects of landscape context and habitat quality on flower visiting insects in agricultural landscapes." Basic and Applied Ecology **7**: 201-214.

Kristensen, N. P., D. J. Hilton, A. Kallies, L. Milla, J. Rota, N. Wahlberg, S. A. Wilcox, R. V. Glatz, D. A. Young, G. Cocking, T. Edwards, G. W. Gibbs and M. Halsey (2015). "A new extant family of primitive moths from Kangaroo Island, Australia and its significance for understanding early Lepidoptera evolution." Systematic Entomology **40**: 5-16.

Landis, D., S. Wratten and G. Gurr (2000). "Habitat management to conserve natural enemies of arthropod pests in agriculture." Annual Review of Entomology **45**: 175-201.

- Latham, L. and R. Jones (1997). "Occurrence of tomato spotted wilt virus in native flora, weeds and horticultural crops." Australian Journal of Agricultural Research **48**: 359-369.
- Mace, G. M. (2014). "Whose conservation?" Science **245**(6204): 1558-1560.
- Maller, C., M. Townsend, L. St Leger, C. Henderson-Wilson, A. Pryor, L. Prosser and M. Moore (2008). Healthy parks, healthy people: The health benefits of contact with nature in a park context. A review of relevant literature. Deakin University, Burwood, Melbourne. 96pp.
- MEA (2005a). Ecosystems and human well-being: biodiversity synthesis: a report of the Millennium Ecosystem Assessment, World Health Organization. 100pp.
- MEA (2005b). Ecosystems and human well-being: health synthesis: a report of the Millennium Ecosystem Assessment, World Health Organization. 64pp.
- Mokany, K., H. Burley and D. Paini (2013). "Beta diversity contributes to ecosystem processes more than by simply summing the parts." Proceedings of the National Academy of Sciences, USA **110**(43): E4057.
- Monbiot, G. (2014). "The pricing of everything." Retrieved 06 September 2014, from <http://www.monbiot.com/2014/07/24/the-pricing-of-everything/>
- Morin, L., D. Paini and R. P. Randall (2013). "Can global weed assemblages be used to predict future weeds?" PLoS One **8**(2): e55547.
- Morris, R., R. Bradstock, D. Dragovich, M. Henderson, T. Penman and B. Ostendorf (2014). "Environmental assessment of erosion following prescribed burning in the Mount Lofty Ranges, Australia." International Journal of Wildland Fire **23**(1): 104-116.
- Murphy, S. and J. LaSalle (1999). "Balancing biocontrol strategies in the IPM of new world invasive *Liriomyza* leafminers in felid vegetable crops." Biocontrol News and Information(20): 91N-104N.
- NCCARF (2014). NCCARF 2008-2013: the first five years. National Climate Change Adaptation Research Facility, Gold Coast, Australia. 92pp.
- NDSP (2000). NDSP factsheet: Dryland salinity management on Kangaroo Island. National Dryland Salinity Program. 4pp.
- Neagle, N. (2002). National Land and Water Resources Audit. Conservation Strategy Case Study: Kangaroo Island subregion, South Australia. Department for Environment and Heritage, Adelaide. 62pp.
- Newby, H. (1980). Green and pleasant land? Social change in rural England. Penguin Books Ltd., London.
- Nowak, D., S. Hirabayashi, A. Bodine and E. Greenfield (2014). "Tree and forest effects on air quality and human health." Environmental Pollution **193**: 119-129.
- Paini, D. and D. J. Roberts (2005). "Commercial honey bees (*Apis mellifera*) reduce the fecundity of an Australian native bee (*Hylaeus alcyoneus*)." Biological Conservation **123**: 103-112.

- Paini, D., S. P. Worner, D. C. Cook, P. J. De Barro and M. B. Thomas (2010). "using a self-organising mnp to predict invasive species: sensitivity to data errors and a comparison with expert opinion." Journal of Applied Ecology **47**: 290-298.
- Pasari, J., T. Levi, E. Zavaleta and D. Tilman (2013). "Several scales of biodiversity affect ecosystem multifunctionality." Proceedings of the National Academy of Sciences, USA **110**(25): 10219-10222.
- Paton, D. C. (1996). Overview of feral and managed honeybees in Australia: Distribution, abundance, extent of interactions with native biota, evidence of impacts and future research. Australian Nature Conservation Agency, Canberra, ACT. 77pp.
- Peace, M., T. Mattner and G. Mills (2011). The Kangaroo Island bushfires of 2007. A meteorological case study and WRF-fire simulation. 19th International Congress on Modelling and Simulation, Perth, Australia. pp228-234.
- Peace, M. and G. Mills (2012). A case study of the 2007 Kangaroo Island bushfires. CAWCR Technical Report No. 053, The Centre for Australian Weather and Climate Research. 47pp.
- Pegg, G., F. Giblin, A. McTaggart, G. Guymer, H. Taylor, K. Ireland, R. Shivas and S. Perry (2014). "Puccinia psidii in Queensland, Australia: disease symptoms, distribution and impact." Plant Pathology **63**(5): 1005-1021.
- Pengilly, M. (2008) "Kangaroo Island Fires." Speech to state parliament. Retrieved 28 May 2015, from <http://www.michaelpengilly.com.au/news/default.asp?action=article&ID=7&WorkDate=1-Feb-2008&Archived=true>
- Penman, T., R. Bradstcok and O. Price (2014). "Reducing wildfire risk to urban developments: simulation of cost-effectisve fuel treatment solutions in south eastern Australia." Environmental Modelling and Software **52**: 166-175.
- Penman, T., F. Christie, A. Anderson, R. Bradstcok, G. Cary, M. Henderson, O. Price, T. C, G. Wardle, R. Williams and A. York (2011). "Prescribed burning: how can it work to conserve the things we value." International Journal of Wildland Fire **20**(6): 721-733.
- Penman, T., L. Collins, O. Price, R. Bradstcok, S. Metcalf and D. Chong (2013). "Examining the relatixve effects of fire weather, suppression and fuel treatment on fire behaviour - a simulation study." Journal of Environmental Management **131**: 325-333.
- Penman, T. and S. Penman (2010). "Influence of prescribed burning on fruit production in Proteaceae." Pacific Conservation Biology **16**(1): 46-53.
- Persley, D., M. Sharman, J. Thomas, I. Kay, S. Heisswolf and L. McMichael (2007). Thrips and tospovirus. A managerment guide. Department of Primary Industries and Fisheries, Queensland. 18pp.
- Persley, D., J. Thomas and M. Sharman (2006). "Tospoviruses - an Australian perspective." Australasian Plant Pathology **35**: 161-180.

Persly, D. and C. Gambley (2010). Viruses in vegetable crops in Australia. Integrated virus disease management. Queensland, Agri-Science Queensland, Department of Employment, Economic Development and Innovation.

PHA. (2014). "Categorised Pests." Retrieved 28 May 2015, from <http://www.planthealthaustralia.com.au/biosecurity/emergency-plant-pests/pest-categorisation/categorised-pests/>

Pisanu, P., D. Rogers, J. O'Conner, D. Thompson and D. Peters (2013). Identifying priority landscapes and ecosystems for nature conservation in the Kangaroo Island NRM region. Department of Environment, Water and Natural Resources, Adelaide. 62pp.

Rauf, A., B. Shepard and M. Johnson (2000). "Leafminers in vegetables, ornamental plants and weeds in Indonesia: a survey of host crops, species composition and parasitoids." International Journal of Pest Management **46**: 257-266.

Rawson, T., R. Davies, M. Whalen and D. Mackay (2013). "Fire-related cues and germination from the soil seed bank of senescent remnants of mallee vegetation on Eastern Kangaroo Island." Austral Ecology **38**: 139-151.

Reside, A., J. Welbergen, B. Phillips, G. Wardell-Johnson, G. Keppel, S. Ferrier, S. Williams and J. Vanderwal (2014). "Characteristics of climate change refugia for Australian biodiversity." Austral Ecology **39**(8): 887-897.

Ricketts, T., J. Regetz, I. Steffan-Dewenter, S. A. Cunningham, C. Kremen, A. Bogdanski, B. Gemmill-Herren, S. Greenleaf, A. Klein, M. Mayfield, L. Morandin, A. Ochieng and B. Vianna (2008). "Landscape effects on crop pollination services: are there general patterns." Ecology Letters **11**: 499-515.

Ricou, C., C. Schneller, B. Amiaud, S. Plantureux and C. Bockstaler (2014). "A vegetation-based indicator to assess the pollination value of field margin flora." Ecological Indicators **45**: 320-331.

Ridsdill-Smith, T., A. Hoffmann, G. Mangano, J. Gower, C. Pavri and P. Umina (2008). "Strategies for control of the redlegged earth mite in Australia." Australian Journal of Experimental Agriculture **28**: 1506-1513.

Robinson, A. and D. Armstrong, Eds. (1999). A Biological Survey of Kangaroo Island South Australia. Adelaide, Department for Environment, Heritage and Aboriginal Affairs, South Australia.

Rudd, M. (2011). "Scientists' opinions on the global status and management of biological diversity." Conservation Biology **25**(6): 1165-1175.

Sabine, E., G. Schreiber, A. Bearlin, S. Nicol and C. Todd (2004). "Adaptive management: a synthesis of current understanding and effective application." Ecological Management and Restoration **5**(3): 177-182.

Salvo, A. and G. Valladares (2007). "Leafminer parasitoids and pest management." Ciencia E Investigacion Agraria **34**: 167-185.

SARDI (2009a). Guide to insects on the Northern Adelaide Plains, South Australian Research and Development Institute, Adelaide.

SARDI (2009b). Guide to using native plants on the Northern Adelaide Plains to benefit horticulture, South Australian Research and Development Institute, Adelaide. 58pp.

Schellhorn, N., F. Bianchi and C. Hsu (2014). "Movement of entomophagous arthropods in agricultural landscapes: links to pest suppression." Annual Review of Entomology **59**: 559-581.

Schellhorn, N. A., R. V. Glatz and G. M. Wood (2010). "The risk of exotic and native plants as hosts for four pest thrips (Thysanoptera: Thripinae)." Bulletin of Entomological Research **100**(5): 501-510.

Singh, R., A. L. Levitt, E. G. Rajotte, E. C. Holmes, N. Ostiguy, D. vanEngelsdorp, W. I. Lipkin, C. W. dePamphilis, A. L. Toth and D. L. Cox-Foster (2010). "RNA viruses in hymenopteran pollinators: evidence of intertaxa virus transmission via pollen and potential impact on non-*Apis* hymenopteran species." PLoS One **5**(12): e14357.

Singh, S., S. Davey and M. Cole (2010). "Implications of climate change for forests, vegetation and carbon in Australia." New Zealand Journal of Forestry Science **40**(Sp. Iss. S1): 141-152.

Standish, R., R. Hobbs, M. Mayfield, B. Bestelmeyer, K. Suding, L. Battaglia, V. Eviner, C. Hawkes, V. Termperon, V. Cramer, J. Harris, J. Funk and P. Thomas (2014). "Resilience in ecology: Abstraction, distraction, or where the action is?" Biological Conservation **177**: 43-51.

Stokols, D., R. P. Lejano and J. Hipp (2013). "Enhancing resilience of human-environment systems: a social ecological perspective." Environment and Society **18**(1): 7-18.

Wallace, K. J. (2007). "Classification of ecosystem services: problems and solutions." Biological Conservation **139**: 235-246.

Wallace, K. J. (2012). "Values: drivers for planning biodiversity management." Environmental Science and Policy **17**: 1-11.

Willoughby, N., A. Oppermann and R. Inns (2001). Biodiversity plan for Kangaroo Island, South Australia. Department for Environment and Heritage, Adelaide. 233pp.

Wilson, K., M. McBride, M. Bode and H. Possingham (2006). "Prioritising global conservation efforts." Nature **440**: 337-340.

Wood, G., R. Glatz, H. DeGraaf, G. Siekmann and C. Stephens (2011). Revegetation at a property scale - designing the 'right' biodiversity for sustainable vegetable production. Final Report for HAL project VG06014., South Australian Research and Development Institute, Adelaide.

Wood, G., R. Glatz, H. DeGraaf, G. Siekmann and C. Stephens (2011). Revegetation by Design. Promoting the 'on-farm' use of native vegetation as agents of 'natural pest control'. Final Report for RIRDC Project PRJ-000568. Rural Industries Research and Development Corporation. 84pp.

Wood, G., G. Siekmann, C. Stephens, H. DeGraaf, J. La Salle and R. Glatz (2010). "Native saltbush (*Rhagodiaspp.*; *Chenopodiaceae*) as a potential reservoir for agromyzid leafminer parasitoids on horticultural farms." Australian Journal of Entomology **49**(1): 82-90.

Zehnder, G., G. Gurr, S. Kuhne, M. Wade, S. Wratten and E. Wyss (2007). "Arthropod management in organic crops." Annual Review of Entomology **52**: 57-80.

Zhang, Y., C. Holzapfel and X. Yuan (2013). Scale-dependent ecosystem service. Ecosystem Services in Agricultural and Urban Landscapes. S. Wratten, H. Sandhu, R. Cullen and R. Costanza. Chichester, UK, John Wiley & Sons, Ltd.: 107-121.



D'Estrees
ENTOMOLOGY
Science Services

1669a Three Chain Rd (RSD 105)
MacGillivray, SA 5223
PO Box 17, Kingscote, SA 5223
T +61 8 8553 8294
M 0419 843 254
richard@dess.net.au
www.dess.net.au
ABN 19595627325

Minister for Planning,
The Hon. John Robert Rau, LLB, MP
Attention: Robert Kleeman, Manager
Development Assessment (Investment Management)
Department of Planning, Transport and Infrastructure
GPO Box 1815 ADELAIDE SA 5000

Public Submission regarding:

PROPOSED KANGAROO ISLAND GOLF COURSE RESORT
RELEASE OF PUBLIC ENVIRONMENTAL REPORT (PER) FOR PUBLIC COMMENT

Dear Minister Rau,

I am writing to express my serious concern about the PER associated with the proposed Kangaroo Island Golf Course Resort development by Programmed Turnpoint Pty Ltd.

Firstly, I feel that my professional background is pertinent to the PER and I would like to briefly summarise some relevant aspects. I have a Degree in Agricultural Science and a PhD in Entomology from Adelaide University. I have worked with the CSIRO and then became a Senior Research Scientist in SARDI Entomology working on sustainability of agricultural production and biosecurity. I am now a nationally established entomologist and have published over 30 papers in science journals; I hold affiliate positions with both Adelaide University and South Australian Museum. I am also a resident of Kangaroo Island (KI) and have started a science consultancy on the island; my main role has been to advise DEWNR about the development of their new NRM Plan to cover 2015-2025. To this end I recently produced a detailed report about native vegetation and ecosystem services on KI (it is highly relevant to some my concerns and I have attached it as supplementary material). I have discovered a range of new insect species on KI including the KI Enigma Moth, which generated global scientific and popular interest. Finally I own 800 acres of heritage bushland on KI and have excellent knowledge of the geology and biodiversity of the site of the proposed development.

Dr Richard Glatz
D'Estrees Entomology & Science Services
Kangaroo Island
29 June 2015

My specific concerns are as follows:

1. Inadequacy of the PER. The PER is unfortunately lacking in detail for most of the important issues. The document reads as a vision of what the proponents would like the development to be but it completely (it seems to me intentionally) obfuscates the “hard bits” and often uses language that is vague. It makes many unsubstantiated assertions. Although the proponents were wise enough to actually state many of the key challenges they apparently did not think apparently think it worth addressing them in detail. There is little or no real information about the costs and feasibility for the infrastructure, placement, management, economic viability, environmental issues. There is virtually no detailed financial information produced and yet a total budget and powerline access cost are provided; given the scope of the PER and supplementary information it is inconceivable that other financial information has not been provided. The total budget seems grossly inadequate with the powerline costs (not complete connection) already uses 13%. I will not discuss further inadequacies here (they are below) but from my perspective as a scientist and consultant to government, this PER simply does not permit due diligence of a project which is proposed for one of the most important ecological regions in the world. I am concerned that the proponents are not serious about investing in the “pre-contract” phase (has any budget been done?) and will likely leverage this lack of information by threatening to walk away from the development if any serious issues need to be addressed; I hope this does not impact on your assessment. **Regardless of views of specific aspects of the project, the proponents must at the very least be made to produce meaningful and substantiated information to allow due diligence to occur.**

2. Sustainability of resource use. The fact that this project requires a water source some 80km distant (including ≈35km of new pipeline) is alarming and highlights the tenuous nature of this proposal. Various SA governments have been (rightly) outspoken about the need to use the water from our river systems wisely and in my opinion this proposed use of KI’s scarce water supply would make a mockery of this. I urge you to consider that:

- allocation of water use from the Middle River dam is already locally controversial due to availability being highly variable and that demand usually outstrips supply
- the proposal is in a semi-arid environment (mean <500mm) over a highly porous stratum. Furthermore it is coastal and subject to almost constant medium-strong wind containing salt. The soil is highly alkaline and very nutrient poor. To have good quality fairways and greens would require significant water in summer months that are very dry, and in some winters, and ongoing physical/chemical/nutrient management. Likely the site was purchased because it is naturally beautiful and cheap. There is predicted to be increased aridity in the region as the climate warms and an increase in water demand. These issues are not seriously addressed in the PER and I wonder if the proponents have visited the site. Native vegetation on the coastal cliffs is about knee-waist high, due to the wind
- the natural ecology of Middle River and its surrounds has already suffered damage due to long term use, impacts of surrounding land use and complete alteration of the natural flows. However, it is still an important river system for KI in this regard. Like the Murray River the winter flows and connection with the ocean is crucial for its ecology. This proposal would effectively use up most of the ecological flow from a river that is 80km distant and opens into a key tourist destination (Snelling Beach). It seems to me that this kind of development is archaic in that sense, given the national conversation on water

- both DEWNR and the KI Council are opposed to the proposed use of the water resource (and other aspects) and indeed, it flies in the face of a number of existing strategic land management goals that these local bodies have been considering for a number of years. I submit that acceptance of the proposal would require a willing and premeditated overrule of the direct advice of local government, other state government and in my opinion, of scientific advice also.

3. **Reduction of environmental resilience.** In my report to DEWNR (supplementary information) I discussed environmental resilience, which is the ability natural systems to stay within damage thresholds such that their functional integrity is maintained. Apart from the direct and long-term effect on the Middle River mentioned above, there are two broad (multi-faceted) concerns regarding impacts on medium-term resilience of the area. It is important to note that it is almost impossible to prevent these impacts and that knowledge and resources providing for mitigation of their effects are almost always insufficient. In both cases, the impacts may be initially subtle but will be accumulative for many years. The PER does not meaningfully address these issues and the proposed budget would not permit their management given all it has to cover.

If this proposal were to be approved, there would at the very least need to be contractual obligations regarding independent monitoring and management of the issues discussed below and also a mechanism for significant financial recourse if there is non-adherence.

- i. **Contamination of Pelican Lagoon (and American River Estuary).** Pelican Lagoon and part of the associated estuary have long been an Aquatic Reserve and are now part of the recently declared Marine Sanctuary Zones. This water body is of great ecological importance and is a fish nursery. The proposed development sits almost centrally within the drainage basin for Pelican Lagoon, it sits much higher than the lagoon, it is on a porous stratum and it is a relatively short distance from the lagoon (a few km, compared to the drainage basin size). As mentioned, to maintain a good quality golf course in this environment requires significant input of herbicides and nutrients (it should be remembered that grazing was attempted here previously and a golf course was considered – both pursuits were abandoned due to environmental constraints).

These facts mean that:

- nutrients and other chemicals from the golf course WILL drain into Pelican Lagoon. This will occur through both infiltration through the porous soil/limestone and run-off through intense rainfall events or engineering to prevent infiltration. Given that the golf course is roughly central in the basin, water WILL move from there to the lagoon (as it does from beyond the development). This has the potential to reduce the resilience of the Pelican Lagoon environment and reduce its ability to adapt to other stressors.

I do not believe this is adequately addressed in the PER and in fact cannot be prevented.

- ii. **Damage to the coastal zone.** One of the most undesirable aspects of this proposal is the widespread planting of a large area with a serious environmental weed (couch grass). I simply cannot accept this would be allowed in a Coastal Conservation Zone; none of the golf course should be permitted in that zone. Couch grass is such a threat that the local consultants considered that it was worth spraying the entire margin with herbicide and attempting to prevent seeding. In my opinion, it is a massive challenge to prevent the spread of grass. The labour and amount of herbicide required would be massive and ongoing and in all probability would fail. I am not aware of an example where large areas of grass have been successfully managed for their spread in this way. There is no doubt that acceptance of this proposal will lead to couch grass infestation of the nearby coast. I am sure that you will receive many submissions about further coastal impacts including

Dr Richard Glatz
D'Estrees Entomology & Science Services
Kangaroo Island
29 June 2015

impacts on endangered birds (which KI is renowned for). This cannot be ignored and again is not meaningfully addressed in the PER.

I would also like to draw your attention to the fact that our knowledge most of the important functional biodiversity (e.g. invertebrates/fungi etc) is poor and I have recently discovered a range of new insect species in similar environments across KI. The plant survey itself was conducted at one time of year and could not assess highly ephemeral species such as orchids, of which there are many. In short, we simply do not understand what species would be effected but we know there are many unknown species present. Therefore such invasive developments should not be permitted in high value ecological regions. Although not directly comparable in terms of environmental impacts, the basis for the SA government's decision to prevent mining of the Flinders Ranges park was based on the non-negotiable ecological and tourism importance of the region (risking a much larger economic development). I feel the same should apply for environmentally damaging proposals for KI, given its iconic status internationally as a wilderness region.

All plantings associated with the development should be using native species of KI provenance. This is consistent with council and DEWNR advice. This is also a recommendation of my report to DEWNR (supplementary information). Additionally, DEWNR staff and plant nursery should be involved in any plantings. To say (as the PER does) that mostly (or a majority - 51%) of native species will be used is meaningless; do they mean area/cost/number of species? To say that a certain association will "generally" not be cleared is meaningless. What if another serious weed is to be planted as an ornamental? As for other concerns, there is too little detail to permit a decision as to the appropriateness of the development.

4. Biosecurity Concerns: There are two key concerns regarding biosecurity of KI, which is one of the major challenges facing government and industry.

- i. Establishment of non-managed weeds that are closely related to crop plants. This is discussed in detail in my report to DEWNR (supplementary information). Briefly, the spread of couch grass outside of managed areas is of concern because it is related to other grasses of economic importance such as wheat, barley, oats etc. Because of this, it has a high chance of supporting introduced crop diseases and invertebrate pests that transmit them. The speed of spread and severity of a new disease is proportional to the number of susceptible hosts and also the area over which the hosts are located (and their connectedness). Thus, the establishment of non-managed couch grass (which is certain to occur, see above) or other similar ornamentals will negatively contribute to agricultural biosecurity over the long term. One of the most important economic services provided by good quality native vegetation is the suppression of these weeds; disturbance of the coastal vegetation is thus reducing this free region-wide ecosystem service for the farming community.
- ii. The area of the proposal is extremely rocky and will require a large amount of earth works to produce a suitable surface for golf. This raises serious concerns about weed and disease introduction amongst other things. None of this is addressed in the PER and in my opinion requires a detailed management plan given that most of KI's economy is affected by these issues. This relates to biosecurity of both the natural environment and agriculture. No soil etc. should be imported to KI.

5. **Incompatibility with regional identity and low chance of economic success:** KI is internationally renowned for the quality and beauty of its natural environment. Increasingly KI is developing a reputation for quality “clean & green” produce. It must be recognised that the farming systems on KI are not different to elsewhere and this image clearly (and almost entirely) derives from the iconic status of the natural environment. Scientifically and economically there is huge value in having these systems maintain their resilience; 95% of the economy comes from agriculture and tourism.

In the recent past, the SA government changed the primary industries department to include a focus on the regions and there has been a strategic move towards establishing and promoting clear points of differentiation for the various regions. Again, a “pristine” wild environment and green produce are the key driving forces for KI. Unfortunately a mid-quality golf course that intrudes onto the coastal zone and requires culling/fencing of the very wildlife that attracts many visitors is ill-conceived with regard to KI’s regional identity and risks damaging KI’s enviable image.

It should not be lost on the state government that there are two very ordinary similar developments that exist on the drive to the KI ferry; Wirrina and Lady Bay. There has also been the failure of a similar development at Port Hughes with tremendous cost for the local community; many of the issues at that site are the same here (inappropriate site characteristics and insufficient demand). A similar development on the coastal fringe of KI would be an absolute tragedy and an indictment on the SA government planning approval process given the lack of detail in the PER and the obvious warning signs that exist.

Golf courses are successful for several reasons:

- large local demand (e.g. in a city centre, like North Adelaide Golf Course)
- tradition; either historically (St Andrews in Scotland) or due holding large events (e.g. Kooyonga & Grange in Adelaide)
- innovation, high quality and promotion to attract events (e.g. Sanctary Cove in Qld)

This proposal meets none of these criteria and entirely lacks innovation from my perspective. There are many nice golf courses in many beautiful areas; many have failed to meet the promise of developers. For KI, this proposal is a poor fit and is unlikely to attract significant interest from golfers. Furthermore it risks watering down the KI brand of being untamed with clean production, which could have significant economic consequences. This development serves to reduce the points of differentiation of KI to the mainland because it will give a similar appearance to many other similar developments at the expense of the unique KI aesthetic and ecology.

Given the lack of detail in the PER (and associated inability for due diligence), the lack of sustainability of the key water resource, the incongruence with strategic planning by KI Council and DEWNR, the expected reductions to environmental resilience, and the incompatibility with the KI regional brand, I urge you to reject this development.

Best Regards,
Dr Richard Glatz
Kangaroo Island

A handwritten signature in black ink, appearing to read 'R. Glatz', with a long horizontal flourish underneath.

Chief Scientist: D'Estrees Entomology & Science Services
Visiting Research Fellow: University of Adelaide
Honourary Research Associate: South Australian Museum

Dr Richard Glatz
D'Estrees Entomology & Science Services
Kangaroo Island
29 June 2015

Scott Hartshorne **Artist**

550A East West Road, Dudley East,
South Australia 5222
T: 08 8553 1456
W: scotthartshorne.com.au
E: enquiries@scotthartshorne.com.au

29 June 2015

Minister for Planning, The Hon. John Rau, MP
Attention: Robert Kleeman, Manager
Development Assessment (Investment Management)
Department of Planning, Transport and Infrastructure (DPTI)
GPO Box 1815 Adelaide SA 5000

DEVELOPMENT ACT 1993

PROPOSED KANGAROO ISLAND GOLF COURSE RESORT

RELEASE OF PUBLIC ENVIRONMENTAL REPORT (PER) FOR PUBLIC COMMENT

Dear Mr Rau and Mr Kleeman,

I am writing to express my opposition to the proposed Kangaroo Island Golf Course Resort.
I strongly urge you to reject the proposal.

Some information about me:

I am a Kangaroo Island resident living on a 150 acre heritage listed property, consisting largely of mature mallee woodland, on the Dudley Peninsula and within the Pelican Lagoon Basin. I live near the south coast and not that far from the site of this proposed Golf Course Resort. I am an artist, creating artwork inspired by the natural environment of Kangaroo Island. I have lived in The Netherlands, a country that is almost completely man made, and so I believe this Island is very precious as a sanctuary of natural biodiversity in a rapidly degrading global environment.

I am not against development on Kangaroo Island, but I am very aware that the wrong sort of development can seriously damage this environment and the tourism economy, putting at risk that which we already have.

My first issue is with the concept: a manicured coastal Golf Course Resort on a far-flung island is a contrived concept that has no bearing on reality and is imposed on the local environment purely for profit. In building this vision, you destroy the immediate environment. The people this proposal is targeting are interested, first and foremost, in playing golf. They enjoy the privilege of touring around to golf courses worldwide playing their game... they have no real interest in Kangaroo Island. And to attract them we have to build a "World Class" golf course that fits THEIR needs, just another version of 18 holes with lush irrigated greens and fairways like all the others, regardless of the local environment. You could just as easily build a drag strip and attract international drag racers, because the punters will come for the venue, not the location. I believe this is folly, because it rides roughshod over those wonderful qualities that make Kangaroo Island unique and different. I believe we need to target people who will pay to come here because they actually want to experience this marvellous wild environment as it already exists. Bird watchers worldwide are a perfect demographic. <http://www.un.org/apps/news/story.asp?NewsID=41970#.VYo4KKa3SHk>

I have recently been involved in the Brand Kangaroo Island steering committee, headed by Mr. Peter Joy, and we have identified the brand values which capture what the brand stands for. The core statement is "Discover the things that really matter in life" and under 5 targeted sub-headings is this statement headed "Connected to unspoiled nature":

"Nature is fundamental to our concepts of humanity and wellbeing: it is why communities like Kangaroo Island's rise up to protect and preserve it. Our secluded beaches, pristine ocean, well managed national parks and prolific wildlife all reflect Kangaroo Island's soul. And a connection to nature is at the heart of much of what happens on Kangaroo Island – our products, experiences and lifestyle are all inspired by our unique environment and natural features."

It would seem that the developers are jumping on the worldwide Golf Course Resort bandwagon without a thought for the unique selling position Kangaroo Island already holds as a world tourism brand. In the process they risk damaging the very thing that Kangaroo Island represents.

My specific issues with the Golf Course Development are:

1. FRESH WATER

The proposal is to use a massive amount of fresh water, "150ML p.a." (See P 55) or "approx. 100 ML" per year (See P 45), just to irrigate the fairways and greens on this private resort, from the island's limited supply in a time of changing climate patterns, on an Island off the coast of the driest state in Australia. The whole project hinges on this, yet you would only need one season of serious drought to jeopardize the whole enterprise. No annual cost has been indicated for the use of this water, yet alone the pumping and infrastructure required. There is no back up water source of that size on Kangaroo Island, all Islanders are keenly aware of the scarcity of water and water carting in summer is a common and expensive occurrence. I would be interested to know who decides when the Middle River runoff water can be collected for this proposed Golf Course Resort. And surely a healthy river system requires annual runoff to the sea. Otherwise the Middle River will become even more degraded than it is at present.

2. PELICAN LAGOON

The proposed Golf Course Resort lies within the Pelican Lagoon Basin, on land that drains into Pelican Lagoon. **The Pelican Lagoon Conservation Park is a tidal Wetland of International Importance**, a protected area of pristine sea grasses and a known fish breeding area. The Golf Course Resort proposal states that up to 150 Megalitres per year of fresh water will be used to irrigate the 18 fairways and greens, with accompanying use of fertilizers and pesticides. The runoff from this irrigation, be it via high rainfall events or through the porosity of the underlying limestone, will drain into Pelican Lagoon with long term detrimental effects. I urge you to prevent this for the sake of future generations. This is South Australia's asset and should NOT be knowingly damaged or destroyed. I believe the Government of South Australia has a duty of care to protect this internationally important wetland.

3. PIPELINE

That there is no realistic costing or engineering feasibility report into the essential pipeline beggars belief. This is a major project in itself, one that requires significant earthworks and needs to surmount several long hills along 35 km. The fact that all this is put in place for the sole benefit of a private golf course resort is a crying shame when the community at American River has been waiting to have reliable town water for decades. Time will tell whether Programmed Turnpoint Pty Ltd somehow manages to get South Australian taxpayers to foot the bill, either partly or wholly, for this essential piece of their private Golf Course Resort infrastructure.

4. WIND

I can say with some authority that strong winds are a fact of life out here near the Southern Ocean. Nearby Cape Willoughby constantly records the highest wind speeds in the state and the country. Golf balls and golfers will be blown off greens. Driving a tee shot into such wind could prove hazardous. And with the gales come sea spray, salt and driven sand. This is the reason the windswept coastal vegetation is stunted and fragile, and superbly adapted to this harsh environment. **There will be many days, in all seasons, when wind out there will be a major issue.** Little wonder all existing golf courses on Kangaroo Island are situated well away from the south coast.

5. CROWN LAND ENCROACHMENT

I take great exception to the inclusion of Crown Land in this proposed development. **This is specifically a Coastal Conservation Zone, it is a protected, fragile environment**, home to the endangered White Bellied Sea Eagle and Osprey, among other endangered and protected fauna, **and is no place for a golf course**. Those greens and fairways that are currently sited on this Coastal Conservation Zone must be moved back inside the land for sale. Specifically, fairways 6, 12, 13 and 16 and the edge of 17 should **NOT** be allowed on the Crown Land Coastal Conservation Zone.

6. COUCH GRASS

I am a member of Friends of Dudley Parks, volunteering my time to help maintain the Conservation Parks on the Dudley Peninsula. One of our biggest problems is control and eradication of declared weeds. It is a major problem in this mostly native environment, and is easily accelerated by land clearance, fire and importation of exotic plants. Like Couch Grass, which is revealed on P104 of the PER as the grass of choice for the proposed Golf Course Resort's extensive fairways. Couch Grass (*Cynodon dactylon*), is recognized as "the second most important weed in the world". See [http://keys.lucidcentral.org/keys/v3/eafrinet/weeds/key/weeds/Media/Html/Cynodon_dactylon_\(Couch_Grass\).htm](http://keys.lucidcentral.org/keys/v3/eafrinet/weeds/key/weeds/Media/Html/Cynodon_dactylon_(Couch_Grass).htm) It "can rapidly invade cultivated land, cause serious yield losses and it is extremely difficult to eradicate". This is what all that precious water is being pumped half way

across the island for?! There is no way you can contain it to fairways in this windswept environment, and it will germinate from the lawn clippings and kangaroo scat. To see what a choking mess couch grass gone wild looks like, you need only look around Frenchman's Rock in Penneshaw, and along the adjacent foreshore.

7. UNDER SOIL

The area where I live has a very similar geology to the proposed Golf Course Resort. There is not enough topsoil to maintain grass on the limestone out here, and water soaks away very quickly. The proposed resort area is sandy from memory, but no doubt will require the importation of a suitable under soil and top dressing soil for the couch grass (that invasive and hard to eradicate weed). This will inevitably lead to the importation of other exotic weeds in the soil, and possibly worse contaminants. And the limestone underlying it, whilst permeable, is nonetheless solid, requiring a mechanical rock bore for every fence hole that needs digging. This can significantly add to the cost of even simple structures, yet alone trenches and irrigation lines, and yet there is no mention of this in the 162 page submission.

8. ELECTRICAL POWER

I am extremely concerned about the large amount of non-solar power required for this Golf Course Resort proposal. All this greenhouse gas emitting power being used to pump huge amounts of KI's scarce fresh water to irrigate invasive couch grass in a contrived resort which impinges on a protected and fragile Coastal Conservation Zone flies in the face of the "connected to unspoiled nature" Brand Kangaroo Island values. The substation itself is a significant percentage of the overall estimated budget, which I strongly suspect is set ridiculously low.

9. TIGER SNAKES

The Black Tiger Snake, *Notechis ater*, grows to about 1.4 m in length and occurs throughout the island. Tiger snakes are dangerously venomous, with extremely potent neurotoxic (nerve-poisoning) venom. The species is often active on cool days and may be reluctant, or too cold, to move when approached. They are attracted to wet environments because they appear to prey heavily on frogs. **And yet the KI Tiger Snake was not mentioned once in the report.** Even though all that fresh water will attract frogs, and consequently Tiger Snakes. And fences won't keep them out. Their habitat is threatened by this development, although I strongly suspect numbers will increase greatly over time as a result of the continuing irrigation and presence of a dam.

10. ECHIDNAS

The Echidna, or Spiny Ant-eater, *Tachyglossus aculeatus*, also occurs throughout the island and was not mentioned in the report. I have them here from time to time, a wonderful yet mostly solitary animal of ancient lineage. They are very strong diggers and could easily destroy a golf green overnight in their search for sub-surface insects. Their habitat will be threatened by this development, yet the damage they can cause could be catastrophic to a commercial "world class" golf links.

11. KANGAROOS

I have real concerns about the culling of native animals, especially kangaroos, as they are what overseas visitors to **KANGAROO ISLAND** hope and expect to see here. They are part of the unique native environment, and the culling of them could seriously tarnish the image of Kangaroo Island as an international tourism destination across the whole KI Brand spectrum, not to mention the nightmare public relations scenario which would seriously affect the proposed Golf Course Resort itself.

12. GREG NORMAN GOLF COURSE DESIGN, AND GOLF

The world and Australia is oversupplied with Golf Course Resorts, it is hardly a unique selling proposition. If this resort were to be established on KI, it would be competing with all these other similar resorts, many of which are designed by Greg Norman's company, an entity that packages "exciting world class" golf courses in exotic locations as a business model. And we are the recipients of this fanciful sales pitch. I am not surprised at the recent failure of the Greg Norman designed \$750m Dunes golf resort at Port Hughes in South Australia, http://www.golfindustrycentral.com.au/news_/view-news.php?cat=21&url=http://www.adelaidenow.com.au/why-normans-750m-dunes-golf-resort-failed/story-e6frea6u-1226426207048, and I wonder at the ongoing struggle that nearby golf course resorts such as Wirrina Cove has to stay viable, even though it has wonderful facilities overlooking the rugged coast of Gulf St. Vincent. <http://wirrinaresort.com.au> I also believe the demographic for golf is shifting. It is an ageing clientele, younger generations worldwide are too time poor and thus less interested in spending whole days playing golf.

13. EXPECTED RESIDENCY AND REAL ESTATE

This submission proposes an average nightly guest residency of 60+ people for every single night of the year. I have serious doubts that this is even remotely achievable. How was this optimistic number arrived at in the report? And a passing look at properties for sale on Kangaroo Island at the moment shows this market is extremely depressed, with a lot of properties across the island for sale long term with no buyers and falling property values. It's what makes the land for this proposed Golf Course Resort so cheap. But there is no way that the proposed houses to be built adjacent to the course will sell in any numbers. It is a long way from any shops or services out there, in a harsh, windy environment. It is not the Gold Coast, nor even Port Hughes.

In summary, I find this Golf Course Resort proposal is ill conceived and ecologically unsound. I suspect it is a contrived money making exercise with no real long-term viability. Compared to Southern Ocean Lodge's development, which is a model of how to do it right, this proposal is rapacious of the environment and a burden on the finite resources of Kangaroo Island.

We live in difficult times, with a state government that is facing extraordinary job losses in manufacturing, mining and energy. The temptation is to do anything for a good news story of growth and job creation. And here is seemingly the perfect package, delivered to you as a 'fait accompli', which looks irresistible. I warn you to be wary, this Golf Course Resort proposal has the very real potential to become a damaging and costly White Elephant.

My suggestion is, if you want to develop that parcel of land, forget the golf course, pipeline, dam, electrical substation and the residential buildings. Instead concentrate on restoring the overgrazed land to a pristine coastal fringe environment using only local Kangaroo Island native flora. And build a top quality, smaller Eco-Resort, set well back from the Coastal Conservation Zone **and complying to KI Council building height guidelines**. Model it along the lines of Southern Ocean Lodge and tilt it at a 'top end' clientele. It will be closer to the eastern end of the Island, with Cape Willoughby, Antechamber Bay, Penneshaw, Eastern Cove, American River and Pennington Bay all within easy reach. It would then be in keeping with Brand Kangaroo Island core values and could be a boon to the island, unlike this Golf Course Resort proposal with which we are currently saddled.

I strongly and respectfully urge you to reject the proposal.

Yours sincerely,

A handwritten signature in black ink, appearing to read 'Scott Hartshorne', with a large, sweeping flourish underneath.

Scott Hartshorne

Dudley Peninsula, Kangaroo Island

Mackenzie, Alex (DPTI)

From: suzi1956@optusnet.com.au
Sent: Monday, 29 June 2015 3:41 PM
To: DPTI:KI Golf Course
Subject: Kangaroo Island Golf Course - submission

To - The Minister For Planning

C/o Robert Kleeman, Manager for Development Assessment

Department of Planning, Transport and Infrastructure

GPO Box 1815

Adelaide, SA, 5000

From – Mrs Sue Holman, Lot 20 Douglas Drive, Kangaroo Island, SA

PO Box 755, Kingscote, SA, 5223

29/06/2015

Re – Submission – PER Kangaroo Island Golf Course

I was one of the few hundreds of residents that attended the public meeting on 25th August 2014 and, from the general feeling I got at that meeting and subsequent lack of information being available since, I, like many others, believed the Golf Course was still in the early stages of planning – or had been dropped altogether. I was surprised and horrified when I found out there had been two supposed ‘public meetings’ recently – neither of those were publicised obviously and therefore, I hear, were poorly attended. I can assure you the reason for the poor attendance at those meetings was not due to the apathy of local people but because they just were not informed those meetings were going to be held.

I moved here to live amongst the wildlife and beauty that is Kangaroo Island – I am not against tourism, but we do not need such an invasive development that will only attract people from a certain type of back ground – i.e. Golfers – and therefore I can’t see that any money they may spend here would adequately compensate for the destruction caused in the building of it and the on-going costs to islanders by way of the strain on our already struggling power system and our minimal access to good clean water, to name but two areas that will be severely impacted.

Although I live several kilometres away from where the golf course is proposed to be constructed, the negative impact of such a huge development on this tiny Island will be felt heavily by all who live here – including the wildlife. As a wildlife rescuer/carer, I am very concerned that, although we were assured at the meeting last August that ‘nothing would be done regarding the kangaroos, they would be left alone’ as they are an asset to the tourism of Kangaroo Island and unique to KI. Now there are proposals not only to cull several hundreds or thousands of Kangaroos but possibly by aerial shooting !!! This concerns me and many other islanders greatly for several reasons –

*Aerial shooting is notoriously inaccurate leaving a high percentage of animals injured and suffering.

*As the sex of the animals that are shot cannot be determined from the air there would be many orphaned and traumatised Joeys left behind.

*The general activity of aerial shooting will disturb all other wildlife possibly causing panic and/or leaving young (birds in nests particularly) and as KI has the largest population of breeding White Bellied Sea Eagles in SA, and the property has a coastline, it is quite likely that there are these endangered birds breeding/nesting in that immediate area.

*Local farmers stock may become traumatised and/or accidentally caught up in the shooting.

It seems to me that the developers are doing everything possible to keep information away from the public, by putting very small ads in the local paper with no explanation of the reason for the meeting so by keeping things 'on the quiet' they will get their planning application through with no fuss or obvious objections from locals.

It also seems to me that, once again, big money speaks and is heard above all logical and reasonable objections that would otherwise halt such an unsuitable development on this pristine island.

I can only hope that logic and care for the environment and wildlife will shine through and this proposal will be either stopped altogether or at least have suitable solutions to the concerns of everyone who lives here – not only myself. We need to have complete transparency from the developers and one can only assume that, the reason for keeping their plans close to their chests, is because they knew the reaction they would likely have got from a properly run public meeting or they have something to hide. I am disgusted by a company that behaves like that – we don't encourage that sort of behaviour on this island. If they worked more closely with the locals, a lot of the issues could possibly have remedies found that would mean both developer and locals were happy and then there would be less negative feeling to someone coming in and throwing their weight around to make a lot of money.

If this does go ahead, I would like to see solar/wind power used as an alternative to drawing off our already ancient, decaying and unreliable power source. With water supply, instead of costly laying of a pipeline, they could have underground rainwater tanks built under the foundations of the buildings which would also have nil impact on the local infrastructure.

Yours Sincerely

Sue Holman

0408 790 850



FREE Animations for your email [Click Here!](#)

Major Development Application Kangaroo Island Golf Course Resort Submissions



Tell us what you think about the following aspects of the Public Environment Report.

Submissions may be made available for public inspection and would be included in the proponent's Response Document (that will be released for public information at a later date). Please indicate below if you object to your submission being made available in this way.

Name COLIN HOPKINS Address 46 DAUNCEY ST, KINGSCOTE
Telephone 0408 393 991 Email colin.hopkins@elders.com.au

Overall, what do you think about the proposed Kangaroo Island Golf Course development?

A very positive project for the area, & KI generally - further after an ongoing relationship with this piece of land for > 30 years, I would suggest it is the best possible use for the land.

Do you have any specific comments on the following?

Tourism and economy (Tourist visitation, job creation, value adding to local business etc)

Generally, golfers are tragedies & masochists ~~and~~ but also 'greens' players - a course of this nature will add another dimension to the Islands tourism attractions - and generally golfers have ~~an~~ extra disposable income

Environmental (native vegetation and animals, landscape, cultural heritage etc)

Due to the steep & (precepitous) nature of the access to the water line, there will be absolutely minimal impact on coastal birds & animals. Further given the degraded nature (box thorn onion weed & Lincoln weed) of the site, this alternative use will be a major improvement



Government of South Australia
Department of Planning,
Transport and Infrastructure

Infrastructure and services (Power and water use, delivery of services to the site etc)

The site is somewhat removed from the main thoroughfare(s) access will need to be upgraded, but this is discretely away from the highway - power + water use to be organised

Buildings and design (Building location, design and architecture, landscaping etc)

by developer
Would suggest people MAY be able to see it from the main road, and the sea, however it will be of minimal ^{visual} impact,

Traffic and access (safety and access, car parking etc)

Are there any other matters you would like to raise?

Please pay attention to the balance of residents who did NOT record a protest, there is a solid level of positivity within the community to see this project succeed

Please indicate your preference below:

Please make my submission public

Please do not make my submission public

Written submissions commenting on the PER are invited until 5pm, Tuesday 30 June 2015 addressed to:

Minister for Planning c/-
Robert Kleeman, Manager
Development Assessment (Investment Management)
Department of Planning, Transport and Infrastructure
GPO Box 1815
ADELAIDE SA 5000

or via email to: dpti.kigolfcourse@sa.gov.au

Further information

Call – 1800 PLANNING – press option 1

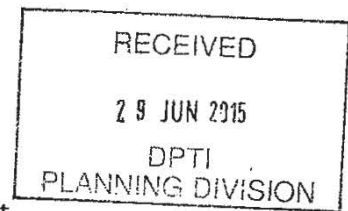
Visit – sa.gov.au/planning/majordevelopments

Email –



Government of South Australia

Department of Planning,
Transport and Infrastructure



TO: The Minister for Planning
c/- Robert Kleeman, Manager Development Assessment
Department of Planning, Transport and Infrastructure (DPTI)
GPO Box 1815
Adelaide SA 5000

FROM: Linda Jenkins, 3196 Hog Bay Road, Pelican Lagoon, Kangaroo Island
PO Box 723 Kingscote SA 5223 (Please send response to this post box)

RE: Submission - PER Kangaroo Island Golf Course Resort

DATE: 29 June 2015

WHY AM I WRITING THIS ?

From my perspective as a fourth generation Kangaroo Island resident and rate payer, I am very concerned.

I am married to James Newcomer (a.k.a. Indiana James). We are self-employed, living and working at 3196 Hog Bay Road, a four acre farm house block with a local history dating from early settlement era of the 1880's. We have invested everything we have to enhance and retain the heritage features of this historic property, which we have renamed "Boomerbank" because of the huge male kangaroos (boomers) here on the 'bank' of Pelican Lagoon. The proposed 'high end' golf course resort with 'three to four star' accommodation (which most would not consider 'high end'), pro shop, club rooms, planted fairways, greens and supporting infrastructure is of great concern to me.

This project was a presumptuous State election promise made by the Labour Party Premier on the day before an election, without first consulting Kangaroo Islanders or considering how this could detrimentally affect the existing landscape and people already living here. The proponents information in email communications with my husband and in the PER offer me little reassurance. Referred to variously as the Pelican Lagoon Golf Course, the Pennington Bay Golf Links, and most recently the Kangaroo Island Golf Course Resort has been confusing locals since the Premier's announcement.

THE PROPONENT'S CHOICE OF LOCATION & PLANS

To have chosen this site for a golf course is absurd. The cost to build, manage and sustain an artificial development of this scale on this dry, very often cold, windy, hostile and impossible coastal landscape, should be enough to bring this proposal to a halt. Several of the proposed 'Management Plans' read like a high risk drain on the island's existing natural environment, eco-tourism industry, water supply, already inadequate electricity supply and SA taxpayers money.

AFFECTS OF KILLING KANGAROO ISLAND GRAY KANGAROOS

The proposed 'Kangaroo Management Plan': for the golf course resort from the proponent/developers who claim to be eco-conscious/friendly (NO HARM LOGO) is a demonstration of how inconsistent and contradictory their intentions are. At the first public information evening in Kingscote on 15 August 2014 Justin Trott declared that they intend to do nothing about the kangaroos on the landscape, in fact that they like the kangaroos presence on the golf course as an attraction. Now their plan is to kill large numbers of Kangaroo Island Gray Kangaroos to make way for a golf course!

The Kangaroo Island Tourist Industry is built on clean, green, eco-consciousness. The island's kangaroo is unique and is used as a logo for many award winning KI tourist businesses. The island is promoted world-wide by SA Tourism as 'Nature's Island' and 'The Jewel in the Crown for SA Tourism'. Killing our icon to make way for a golf course will surely send a negative message to tourists, especially international tourists. This kill will damage Kangaroo Island's existing major tourist industry. Some of us remember the problems that emerged a decade ago from the 'koala cull' idea, which was eventually abandoned due to foreign rebuke. The South Australian tourist industry should be very concerned about any such proposal. Alternatively, the building and maintenance of an ugly 'roo proof' fence around the golf course will add another large expense to this apparently bottomless budget.

POSSIBLE POLLUTION FROM FERTILISERS & PESTICIDES

What could be the impact of drainage pollution to the pristine sanctuary of Pelican Lagoon, less than three kilometres down slope from the proposed golf course?

WATER SUPPLY

Kangaroo Island has an inadequate water supply. Therefore there is probably not enough water to also sustain a 'high end' golf course resort, especially its irrigation requirements. As regards the proposal to pipe, pump and store Middle River Dam overflow from the other end of the island in high rainfall years, what would be intended for dry years when the dam doesn't overflow? Does this high maintenance project secretly intend to draw on the island's inadequate water supply during dry years? Additionally, will the proposed pipeline be buried or above ground? If buried, hard won native roadside vegetation will be destroyed. If above ground, the pipeline will be an ugly intrusion to the roadside. As far as locals using the pipeline for their own needs, residents along this route have already established their own water catchment systems and so are unlikely to want to pay for more water.

ELECTRICITY SUPPLY

The electricity supply on Kangaroo Island is already inadequate. The proposed power substation for the golf course resort is intended to draw on the existing island supply. Although it is proposed to install some solar power for clubhouse and accommodation lighting and heating, I am concerned about the enormous draw on island power to pump water to maintain a project of this scale in this landscape. If there is to be a replacement of the subsea power cable to the island, when will that occur and who will pay for it? Instead of a promise for the future, a cable upgrade should happen before any electricity-guzzling major development is approved and commenced on Kangaroo Island.

MONEY

The financial budget as presented in the PER is not transparent - \$14 million capital expenditure? Is this enough money? If not, where will remaining money's come from? Large amounts of taxpayer money will probably need to be invested for this promised development to be completed. How much taxpayer money could be spent to support a badly planned major project.

DAMAGE TO MY LIFE, WORK & PROPERTY

Several sections of the proposed development can be seen from our house block and also from Hog Bay Road. The power and water (if above ground) infrastructure, while not in view from the golf course itself, as proposed would be in view from the south and east sides of our property! The water pipeline is also planned to cross the north boundary of our property along Hog Bay Road, the facing front of our house block. Above or below ground, this is likely to include removal of large roadside trees and the native middle story, exposing our property to the noise and visual impact of Hog Bay Road, the only truck route from the ferry terminal to Kingscote. This would clearly devalue our heritage property and destroy our efforts over the past five years to restore and improve it. Living and working at our location, I dread the southeasterly prevailing winds that will blow constantly in spring and summer to bring fine dust and noise to our house and studios during the development process.

A POSSIBLE FUTURE

Please consider what would happen if this inappropriate and high risk proposal (in my opinion) fails, goes into receivership and is abandoned part way through completion. Could the bankrupt proponents be held accountable for damage to Kangaroo Island's natural environment, ecotourism businesses, and nearby landowners property values? (An example is Port Hughes on the Spencer Gulf, York Peninsula, just across the water from Kangaroo Island).

What then for a landscape first discarded as useless by farmers, then a place where tour guides once took internationals to see mobs of unique kangaroos, and now the dug up ruins and invasive weeds (turf grasses) of a failed corporate idea?

cc- Wendy Campana, Commissioner for Kangaroo Island c/- Kangaroo Island Council

Mackenzie, Alex (DPTI)

From: Giselle Jennaway [mamalionesse@gmail.com]
Sent: Tuesday, 30 June 2015 8:04 PM
To: DPTI:KI Golf Course
Subject: Kangaroo Island Golf Course

I protest against this development in the strongest terms. As the world becomes overrun with bland development, Kangaroo Island remains a reasonably undamaged nature based holiday alternative. What is charming and appealing about this backwater is its under-developed nature. The appreciative international tourists are fine. The respectful nature-loving campers are fine. The international backpackers are fine. They all come to appreciate the nature that is still to be found here and stay for the most part in small, privately run accommodation. They disperse across the island. When you start building large resorts, you get a different flavour of tourist who comes to experience the familiar flavour of a resort in a new and novel setting. They come to consume and leave again rather than to appreciate. The promotion of Kangaroo Island has already led to more obnoxious campers joining the throngs of appreciative ones. The locals find themselves picking up considerable quantities of discarded rubbish from beaches and roadsides when they are here. The planet is already over-run with over-sized development. We don't want that here. Let the resort-goers go elsewhere. And as for aerial-culling of kangaroos. That is distasteful in the extreme. The international visitors LOVE the wildlife. That will be shocking PR when it gets out.

This email represents the views of at least 7 island residents I have spoken to today.
regards,
Giselle Jennaway

Major Development Application Kangaroo Island Golf Course Resort Submissions



Tell us what you think about the following aspects of the Public Environment Report.

Submissions may be made available for public inspection and would be included in the proponent's Response Document (that will be released for public information at a later date). Please indicate below if you object to your submission being made available in this way.

Name Luke Kauppila Address PO Box 602, Kingscote
Telephone 0438 806 889 Email kihire@bigpond.com

Overall, what do you think about the proposed Kangaroo Island Golf Course development?

I am very supportive of the golf course development and the increase in diversity it will bring with regards to tourists as well as the economic development it will bring to KI in the construction/development as well as the ongoing employment opportunities.

Do you have any specific comments on the following?

Tourism and economy (Tourist visitation, job creation, value adding to local business etc)

- a whole 'new' type of tourist will visit KI with golf as their primary interest.
- Employment opportunities for builders / trades (needs to be all local) as well as in hospitality and green keeping traineeships

Environmental (native vegetation and animals, landscape, cultural heritage etc)

I see no negative environmental impacts it is low to the ground & in keeping with the natural topography. Kangaroo Management is necessary and a positive to reduce environmental degradation. This development will bring greater public environmental awareness & appreciation.



Government of South Australia
Department of Planning,
Transport and Infrastructure

Infrastructure and services (Power and water use, delivery of services to the site etc)

A very innovative use of water resources during peak flows. Possible future use of water at American River would be welcomed, but only if Dam capacity is adequate

Buildings and design (Building location, design and architecture, landscaping etc)

Building Design & locations are stunning "World class" and not imposing on the natural beauty. Development is not visible from Pennington Bay or the Road - Fantastic !!

Traffic and access (safety and access, car parking etc)

Current traffic levels shouldn't be a problem - may in the future require a turning lane from Hogg Bay Road ↗ should be developer funded not KI Council responsibility.

Are there any other matters you would like to raise?

KI desperately needs private development of this caliber & quality. The golf course will be successful & open up the Airport. The Airport upgrade is crucial to the success of the Golf course and vice versa.

Please indicate your preference below:

Please make my submission public Yes

Please do not make my submission public

Written submissions commenting on the PER are invited until 5pm, Tuesday 30 June 2015 addressed to:

Minister for Planning c/-
Robert Kleeman, Manager
Development Assessment (Investment Management)
Department of Planning, Transport and Infrastructure
GPO Box 1815
ADELAIDE SA 5000

or via email to: dpti.kigolfcourse@sa.gov.au

Further information

Call – 1800 PLANNING – press option 1

Visit – sa.gov.au/planning/majordevelopments

Email – dpti.kigolfcourse@sa.gov.au



Government of South Australia

Department of Planning,
Transport and Infrastructure

Janine Mackintosh Artist

Minister for Planning,
The Hon. John Robert Rau, LLB, MP
Attention: Robert Kleeman, Manager
Development Assessment (Investment Management)
Department of Planning, Transport and Infrastructure
GPO Box 1815 ADELAIDE SA 5000

PO Box 17, Kingscote
KANGAROO ISLAND
South Australia 5223
T 08 8553 8294
www.janinemackintosh.com
enquiries@janinemackintosh.com.au

DEVELOPMENT ACT 1993

PROPOSED KANGAROO ISLAND GOLF COURSE RESORT

RELEASE OF PUBLIC ENVIRONMENTAL REPORT (PER) FOR PUBLIC COMMENT

Dear Mr Rau and Mr Kleeman,

I am writing to submit my serious concerns regarding the proposed Kangaroo Island Golf Course Resort. I strongly urge you to demonstrate good governance and reject Programmed Turnpoint Pty. Ltd.'s proposal. My main objections are:

- the extravagant use of precious, limited, unreliable water for irrigating greens 80km away;
- the impact of fairways on the Crown Land **Coastal Conservation Zone** and the **Pelican Lagoon Basin**;
- the misfit of the development with Kangaroo Island's branding (manicured vs wild landscapes); and
- the high chance of it failing and the island being burdened with a white elephant.

Firstly, I was sorry I missed seeing the one small ad in *The Islander* about the two information sessions. I was clearly not the only one, as I heard the attendance was abysmal, which is very unusual for Kangaroo Island. It can only be blamed on the extremely lame (box-ticking?) attempt at engaging with the community. I'm concerned this will result in a lack of submissions identifying the flaws and huge deficiencies in the PER.

I'm a Kangaroo Island resident, with five property titles on the south east of the island (to the east, west and north of the proposed development), so I'm very familiar with the site. I earn my living as an artist and sell my artwork at Southern Ocean Lodge; their guests also visit my open studio so I often have the opportunity to talk to them about their impressions of the island - no one has ever mentioned the lack of a championship golf course. I'm an Ambassador for Brand Kangaroo Island and member of the Kangaroo Island Industry & Brand Alliance. I'm not "anti-development". What I'm against are developments that are environmentally irresponsible and a poor fit with Kangaroo Island's unique characteristics, which local residents and visitors from around the world treasure - a wild, untamed natural environment.

I don't believe the Golf Course Resort proposal meets the criterion of an authentic Kangaroo Island experience - it is imposing a tamed, manicured monoculture of introduced grass (a pest weed species), which requires high water, high energy and high chemical use. It is not **"Zero Harm' and entirely eco-friendly."**

Golf courses are not unique, they're everywhere - there are already 77 Greg Norman golf courses, with 37 more in development. (<http://www.gngcd.com/>). Kangaroo Island is unique because it doesn't have condo-style golf courses (or fast food chains, shopping malls or theme parks). Kangaroo Island's international reputation is based on wild landscapes, that's why people want to come here. And it's why I welcome initiatives like the new multi-day walking trail and the Kangaroo Island Marathon. They showcase our beautiful natural assets to the world, but with low negative impacts.

Need for the Proposal

I question that this project can be developed for \$14M. Where are the figures? As a comparison, an 'off-the-shelf' transportable Sarah Home for an island housing estate site, which already has power and sewage connections is \$400,000. \$14M divided by \$400,000 is 35 homes. Yet this proposal includes earthmoving on a grand scale, vegetation and limestone removal, turf and irrigation systems for a championship standard course and practice facilities (and Greg Norman's design fee), a giant covered dam (lined with imported clay), weed removal, revegetation, dune stabilisation, fencing, infrastructure for water supply (a 35km pipeline!!!), electricity, telecommunications, stormwater, effluent disposal, roads and 80 carparks, signage, solar power and generators, desalination plant, pumps, a maintenance depot, architect fees, a 'major' two storey clubhouse with a restaurant, pro-shop, spa, 70 guest lodges, up to 40 private villas, nine staff accommodation units and the golf superintendent's dwelling. And don't forget ferry freight... All that for \$14M? It's ludicrous! Or suss.

And if they're relying on the sale of the 40 private villas to fund other aspects of the development, the abysmal state of the island's real estate market should be taken into consideration.

The SA Power Network quote alone is \$1.9M and that doesn't include the associated civil works eg. trenching, conduits, conduit installation (Appendix J). That's more than 13% of the budget gone just getting the powerline in. And where's the quote for the 35km water pipeline? And a feasibility report? Programmed Turnpoint Pty. Ltd. themselves describe the pipeline as the 'linchpin' of the project. How can islanders be expected to embrace a project when we don't even know if the major linchpin is feasible?

I now understand why I hear locals referring to the proposal as "A huge fantasy project with more absurdity involved than most." "Beyond ridiculous." "So preposterous as to not be worth any consideration." And after time spent away from their own businesses reading the long (but deficient) PER and making submissions "Could easily do without these intrusive and ridiculous schemes!" etc.

And where are the figures to support a "growing trend in golf tourism that sees a burgeoning market in golf"? I'm led to believe otherwise, it's more a case of oversupply, a glut eg. 'Gilded Age of Golf Course Design Dead' <http://www.golf.com/courses-and-travel/gilded-age-golf-course-design-dead> and 'Fore! No, Make That Five! 5 Reasons Golf Is in a Hole' <http://time.com/money/2871511/golf-dying-tiger-woods-elitist/>

The Fleurieu Peninsula's dismal and quickly dating 'Wirrina Resort' and incomplete 'The Links at Lady Bay' developments do not fill me with confidence. And the Greg Norman 'Dunes' golf resort at Port Hughes on Yorke Peninsula, which went into receivership, is even more horrifying ('Why Greg Norman's \$750m Dunes golf resort failed' <http://www.adelaidenow.com.au/news/why-normans-750m-dunes-golf-resort-failed/story-e6frea6u-1226426207048>). Kangaroo Island does not need to be burdened with another white elephant and I think there's a very high chance of that happening if this shoddy proposal is approved.

Southern Ocean Lodge's success is referenced in the proposal but that development has a relatively small footprint and didn't include thirsty water pipelines and power poles. It receives extraordinary accolades without multistorey buildings and grass fairways (or introduced species of any kind). The wild landscape itself is its huge unique drawcard, there is no broad overlay across the landscape of imposed human whims and follies. There's no need to shoot overbreeding animals or to create giant compounds to exclude them. And their guests have plenty to interest them, without golf.

"Of concern is the potential indirect impact on coastal birds, in particular Osprey, White-bellied Sea-Eagle and shorebirds, associated with the increased human activity." This is simply not acceptable. How is that "'Zero Harm' and entirely eco-friendly."? This reminds me of Queensland's Sanctuary Cove Golf Course, where the logo features a brolga bird that no longer exists in the area because of the development.

Planning and Environmental Legislation and Policies

Protecting the environmental assets of a **Coastal Conservation Zone** should not include planting, watering, fertilising and poisoning introduced grasses. How is that “Zero Harm’ and entirely eco-friendly?”

Environmental Issues

“A major consideration for the project is the management of high kangaroo numbers and grazing pressure, which is likely to increase with the increased availability of feed and water under an irrigated golf course scenario.” There is currently a NRM discussion paper on the overabundance of kangaroos and wallabies (<http://www.environment.sa.gov.au/haveyoursay/kangaroo-island-big-issues>), this development would simply exacerbate the problem. Kangaroo Island is already dealing with koalas overbreeding on the defunct Blue Gum plantations (which can’t be shot because of the backlash we would receive, so less effective and very expensive sterilisation is the only answer <http://www.naturalresources.sa.gov.au/kangarooisland/plants-and-animals/native-animals/koala-management>). We don’t need kangaroos and wallabies overbreeding on lush couch fairways. Culling could easily become a public relations disaster and impact on all Kangaroo Island businesses.

Infrastructure

“A championship golf course requires the provision of regular and effective irrigation while the pumping of this irrigation and operation of the accommodation proposed requires power levels that are challenging both logistically and financially.” I don’t believe that a high water, high energy, high chemical use development meets the “clean & green” Kangaroo Island brand. How is that “Zero Harm’ and entirely eco-friendly”? And rivers are meant to have “surplus water” flowing out to sea, as we have learnt from the Murray River catastrophe. Living on an island makes you very aware of the finite nature of resources. Water (and rainfall) is a big topic of conversation on the island. Outside of the towns the community relies on rainwater they collect themselves in tanks and dams; if we run out in dry years we have to pay a fortune for additional supplies to be trucked in. Middle River water called “surplus” today, may be considered vital to other projects in the future, such as growing food to feed ourselves. Kangaroo Island lacks an irrigated horticultural industry (see Fig below) because of the limited water supply; it is almost impossible to find local fruit and vegetables in the shops. Long-established island industries have low water use eg. pastured sheep for lamb, wool and cheese, honey, eucalyptus oil, non-irrigated cereal crops. We do not have vast stores of ground water. We do not have water fed from giant river systems to the north. To extravagantly waste our precious water (which is predicted to become more erratic with climate change in the future) irrigating vast stretches of lawn on poor sandy soils is grossly irresponsible.

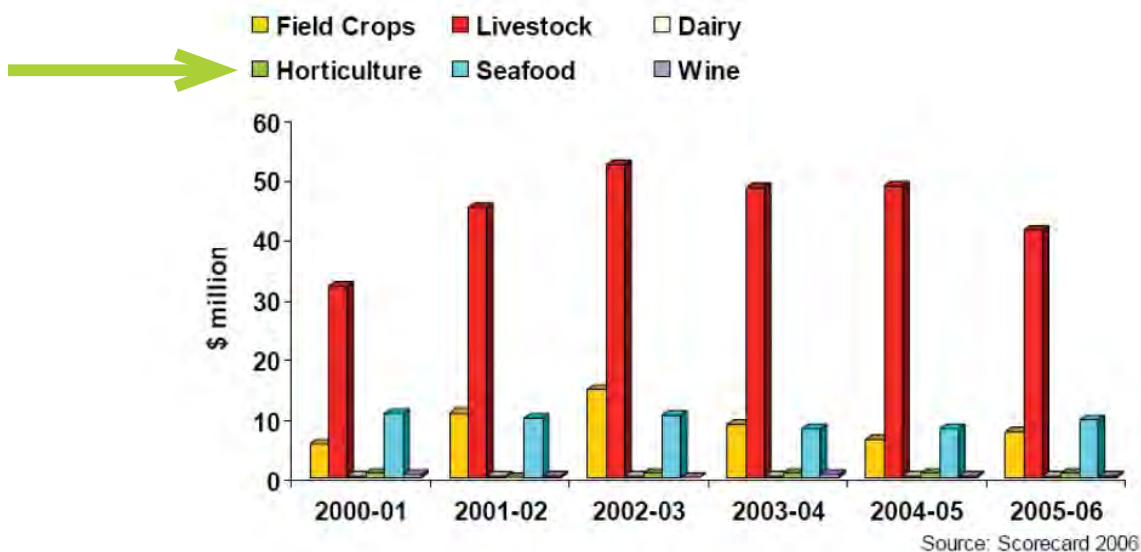


Figure 2. Farm gate value of primary production on Kangaroo Island
(Source: Food SA Kangaroo Island Regional Food Scorecard 2005–06)

Kangaroo Island lacks a horticulture industry (in green) due to a lack of water.

KI NRM State of the Region, Vol 1, page 16, 2009

“The proposal will see the construction of 200mm diameter pipeline from the tapping point at Playford Hwy and Milk Track corner. This will be of an (unquantifiable) benefit to land holders along the pipeline route on Hog Bay Road.” Will the landholders along the pipeline have to pay for the privilege of access to it, even if they don’t use it? Is there even enough water for additional projects along the pipeline? And a case of “so near but so far” for American River, which has been crying out for water for years.

3.1 The nature of the proposal and location

“The proposal is located on the south coast of the eastern part of Kangaroo Island and whilst being predominantly sited on degraded grazing land it also uses its abutting coastal zone for four of its proposed golf holes. In this regard the course will allow a golfing experience that takes the player to the ‘edge’ of spectacular coastal scenery whilst maintaining the key environmental assets of the location.” The fairways and greens do not need to be in the **Coastal Conservation Zone**. They don’t need to play the game right to the ‘edge’ of what is a very sensitive area. Keep the golf course within the private degraded grazing land.

“The proposal for golf includes a **significant demand** for water which is to be supplied from Middle River Dam and piped to the site from a connection with the existing water supply pipeline. This water will be supplied on a seasonal basis when overflow conditions are present. Upon pumping to the site the water will be stored in a dam prior to its various applications.” What happens in dry years? Droughts are predicted to occur more frequently. Will the “memorandum of understanding” with SA Water be legally binding? Will they campaign for more water access later?

“It is important to note that on the advice of both environmental consultants, the proposed walking track along the coastline and atop the cliffs from the Eastern boundary to the Western boundary has been removed from the proposal due to the potential erosion and habitat destruction that could arise from its existence.” How is a walking track more destructive than removing all existing biodiversity to plant a monoculture of pest grass species?

3.2 Land Tenure and ownership details

I strongly object to a private resort utilizing Crown Land in the **Coastal Conservation Zone** - particularly planting introduced grasses, which need irrigating, fertilising and poisoning at the margins to control. We have seen exotic grasses escaping from gardens in places like Penneshaw. It grows metres deep, outcompeting local coastal plant species and choking Little Penguin burrows. Little Penguins have also been known to become entangled in the weedy grass and die (DEWNR staff personal communication during the 2013 survey). And there is a colony at the proposed site.

3.3 Constraints;

1. Approvals – in terms of timing, level and **degree of scrutiny** and cost of process. It does not take much scrutiny to see that this proposal is badly flawed. What degree of scrutiny do they expect?
2. Water – in terms of cost, quality, quantity and reliability of supply. Exactly!
3. Power availability – in terms of cost, accessibility, reliability, and availability. Yes, \$1.9M+ just to get a powerline in. Plus the civil works, plus solar power, plus generators...
4. Kangaroo Management and control – in terms of population control and ongoing management. Will shooting kangaroos be acceptable to tourists, particularly Asian tourists? I can see the headlines already, that the driving range is really a roo shooting range!
5. Labour availability – in terms of skilled labour sourced locally v’s mainland. Will locals be trained? There’s only mention of a guidebook. Or will off-island labour be imported?
6. Transport linkages (airport, ferry and fare costs) – in terms of accessibility for tourists which are timely and cost effective. This challenge should not be underestimated.
7. Weather – in terms of reliability and frequency of ‘non-play’ days. Yes, ‘non-play’ days will be frequent. The south coast of Kangaroo Island is very windy, most of the time. The site has no protection and will be blasted from every direction, throughout the year. The nearest weather station to the proposed golf course is Cape Willoughby, which has the highest mean wind speed of all SA weather stations (see table below).

Cape Willoughby - Mean wind speed (km/h) - consistently windy every month of the year

Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
25.3	25.3	24.1	24.5	25.0	27.6	28.8	29.1	27.6	27.5	25.7	25.3
<i>Annual</i> 26.3 (Recorded by the Bureau of Meteorology over the last 42 years)											

Cape Willoughby - Maximum wind gust speed (km/h) - and crazy wind gusts throughout the year

Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
93	87	100	137	128	113	126	124	117	109	117	102
<i>Annual</i> 137 (Recorded by the Bureau of Meteorology over the last 11 years)											

Cape Willoughby - Mean maximum temperature (°C) - and the wind keeps it cold throughout the year

Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
21.7	21.9	20.7	19.1	17.0	14.9	14.2	14.5	15.9	17.6	19.2	20.6
<i>Annual</i> 18.1 (Recorded by the Bureau of Meteorology over the last 48 years)											



“Real-time Extremes” often shows Cape Willoughby to be currently the windiest place in the country. Although today (22 June) Macquarie Island, halfway to Antarctica, is one knot windier.

Below is a quote from a travel writer who was good-spirited enough to joke about the crazy wind - but then again, she wasn't trying to play golf: “The Kangaroo Island south coast line is as brutal as can be; ... If you can open your eyes wide enough without getting coastal wind retinal burn, you are in for a mighty treat... It's God's industrial washing machine. Complete with God's industrial dryer. If it's any indication, the tour guide told us that we may get blown off the board walk. Uh huh. The wind blows straight through your head, teeth aching, eardrum shattering magnificence. How any creature exists out here is beyond me but tucked in amongst the rocks are the cutest little New Zealand seal pups and their parents. They have tiny ears so maybe they couldn't hear Mach III winds blowing?” 7 August 2014 (<http://www.inkandcleaver.com/travel/kangaroo-island/>)

The Kangaroo Island Industry & Brand Alliance “Open All Year” project (http://www.authentickangarooisland.com.au/sites/default/files/brand_fact_sheet_for_operators_1506.pdf) has clearly identified the winter slump as its major economic challenge (yet in summer we can't cope with the visitor numbers!). Playing golf in winter on the freezing windy south coast of Kangaroo Island would be almost impossible to sell as a desirable activity. St Andrews in Scotland is held in high esteem because of its history as “the home of golf” not because people prefer to play in the freezing wind and rain.

I would add to the constraints list – limestone rocks! Are they only on the surface? How much top soil will need to be brought in? And where from? Because *Phytophthora* is a major biosecurity concern.

3.4 Site layout plan

Fairways 6, 12, 13 and 16 and the edge of 17 should NOT be allowed on the Crown Land **Coastal Conservation Zone**.

3.8 Other infrastructure requirements and availability

Water “Refer Figure X.” Where is Figure X? The List of Figures, page 154, go from 1 to 17. (For a minute I thought I was going to find the elusive costing and feasibility report for the “linchpin” pipeline. No.)

4.1.1 Primary Production Zone

“In this zone there is no inconsistency between the proposal and the zone with regard to ‘Tourist Accommodation’ apart from the possibility that there may be some exceeding of the **height limit of 6.5 m above natural ground level.**” Kangaroo Island has had a height limit of 6.5m for many years, for good reason. Mutlistorey, obtrusive, ostentatious buildings do not belong on Kangaroo Island. I fail to see how the design reflects the “bush spirit of Kangaroo Island.” I have a Bachelor of Design and 20 year’s experience working in the industry, I know waffle when I hear it. *This* west-facing two-storey villa would be at home on the Gold Coast or an urban marina...



(Appendix H - Aplin Cook Gardener)

4.1.2 Coastal Conservation Zone

“...conserve the natural features of the coast including visual amenity, landforms, fauna and flora...” “Development should be located away from fragile coastal environments and significant habitat or breeding grounds.” A golf fairway is not “relatively low intensity” it is a 100% removal of the existing flora and fauna and the introduction of exotic grass species that could cause extensive weed issues throughout the region. None of the golf course should be allowed in the **Coastal Conservation Zone**. And what happens when echidnas and goannas start digging up the fairways and putting greens? An echidna could easily destroy a putting green in a few hours.

4.3 Kangaroo Island Natural Resources Management Plan

1. Consider ways of improving landscape condition and connectedness;

“...while on site water will assist in minimizing animal stress during drought periods.” Minimizing stress? Other parts of the proposal acknowledge that artificial water supply will cause animals numbers to breed excessively, yet here it’s presented as a positive?

2. Consider ways of increasing the capacity of the community and the environment to adapt to the challenges of climate change; A high water and high energy use development does not meet the challenges of climate change.

5.2 Local and State benefits of the proposal

“...it is expected that a relatively small percentage of visitors to the complex will use the accommodation and facilities wholly for golf.” If that is so, why not just build the accommodation (although a more sensitive design) and plant the landscape with local plants, which don’t need irrigating, fertilising, mowing and poisoning. Encourage activities like birdwatching instead, it’s an enormous and rapidly growing market segment, “about six times the industry-wide rate of growth” as discussed in this United Nations article ‘*Bird-watching can help boost ecotourism industry, says UN environment agency*’: <http://www.un.org/apps/news/story.asp?NewsID=41970#.VYoeaa3SHk> saying: “\$8-12 million is spent annually by tourists wishing to see White-tailed Eagles on the Isle of Mull [Scotland].” Kangaroo Island is perfectly situated to capitalise on this untapped and sustainable market. Harming our endangered coastal birds (such as White-bellied Sea Eagles) with a golf resort, would be the equivalent of killing the goose that lays the golden egg. Consider the economic value of the extinct Kangaroo Island Dwarf Emu if it still existed?

“Extensive areas of regularly maintained indigenous planting” is literally tinkering at the edges.

“It is to be noted that the search for an appropriate site included an over-fly of the bulk of the Island’s coastline. No other site offered the selection criteria.” What about Penneshaw? Extend the existing golf course. Water and power are accessible, it’s on the eastern end of the island where a perceived lack of accommodation exists and the benefit to the local businesses will be much greater. Daytripping golfers can even come on the ferry for the day without a car (like they do for the monthly Farmer’s Market). The adjoining cleared land is FOR SALE. It’s not as windy, it’s not on a delicate **Coastal Conservation Zone** or the catchment of the **Pelican Lagoon Basin**. And the views across Backstairs Passage to the mainland are absolutely gobsmacking!!!

6.6.2 Kangaroo numbers

“Fencing (e.g. around the golf course perimeter; around native vegetation patches to be restored or around revegetation areas).” So that means fencing across the Crown Land of the **Coastal Conservation Zone**, making it inaccessible to the public. Southern Ocean Lodge has no fences and the public are free to walk along the coast in front of the lodge. Our Kangaroo Island Walking Club will be doing just that on 4 July. And an unsightly perimeter fence around the whole golf course? A compound? So it becomes the Kangaroo-free Kangaroo Island Golf Resort. It would have to be a very substantial fence to stop kangaroos and wallabies going under or over it.

6.6.3 Substrate, hydrological impacts and surface drainage

“Golf construction in the coastal dunes system will include significant erosion mitigation initiatives including extensive grass and tussock planting to ensure ongoing dune stability.” Constructing a golf course on coastal dunes is ludicrous. It is a **Coastal Conservation Zone**!

6.6.4 Conservation of significant flora

“Kangaroo Island Mallee (*Eucalyptus phenax ssp. compressa* ... Clearance of this association will generally be avoided...” What does “generally” mean? How many trees?

6.6.5 Conservation of significant fauna

“The coastal zone adjoining the project area is suitable foraging and breeding habitat for White-bellied Sea-Eagles and they have historically been known to nest on the coastal cliffs... Impact to this species is likely to be in the way of noise disturbance during the construction of the proposed golf course and increased human activity along the coast line.” This is precisely why the golf fairways should NOT be allowed onto the Crown Land **Coastal Conservation Zone**, just so that golfers can “play to the edge”. “Should White-bellied Sea-Eagles be found to utilise the area, a buffer zone should be adopted to minimise disturbance and the effects of human activity on breeding outcomes. Dennis et al. (2011) recommends a buffer zone of at least **2 km** around active nests. A general buffer zone around the coast is recommended given the number of coastal bird species sensitive to disturbance. Vehicle and visitor access around the coast should be limited and restricted to defined locations.” How can vehicles mow the grass of fairways that are within a few hundred metres of the coast? Would those five fairways not be played if Sea Eagles were seen in the area, breeding for months and raising their young? A constant stream of golfers slowly making their way along fairways would mean the Sea Eagles would abandon their nests and the eggs/chicks would die. I belong to the Kangaroo Island Walking Club - on several occasions our walk plans have been re-routed. DEWNR would not allow our group (of a dozen or so people) to walk within 2km of White-bellied Sea Eagles. This is the respect they deserve.

It should be noted that when Chris Baxter’s “*Birds of Kangaroo Island*” book was recently launched, the Kingscote Town Hall was packed - the island community cares about its birds. The Board of “Birdlife Australia” (representing 75,000 members) recently approved the formation of “Birdlife Kangaroo Island”. And VERY importantly, “Birdlife International” have given Kangaroo Island status as an IBS (Important Bird

and Biodiversity Area). <http://www.birdlife.org/datazone/sitefactsheet.php?id=23940> For a government keen for strategic regional development to be based on their recognised unique and authentic strengths - a golf course is clearly at odds with that.

6.6.8 Noise and light pollution

“It is **not** envisaged that light emitting from the development will have **minimal impact** of the **nocturnal fauna**.” What? This sentence isn’t making sense. The PER doesn’t record the vulnerable Bush Stone Curlews or Fairy Penguins, which are both active at night. The **Pelican Lagoon Basin** also provides habitat for protected species of migratory bird species listed in the **Japan–Australia Migratory Bird Agreement** and the **China–Australia Migratory Bird Agreement** (Caring for Our Country, Business Plan 2012-2013 Site Investment Guide). Do we know the effect that light pollution may have on migrating birds?

6.6.11 Fauna management and golf course activity

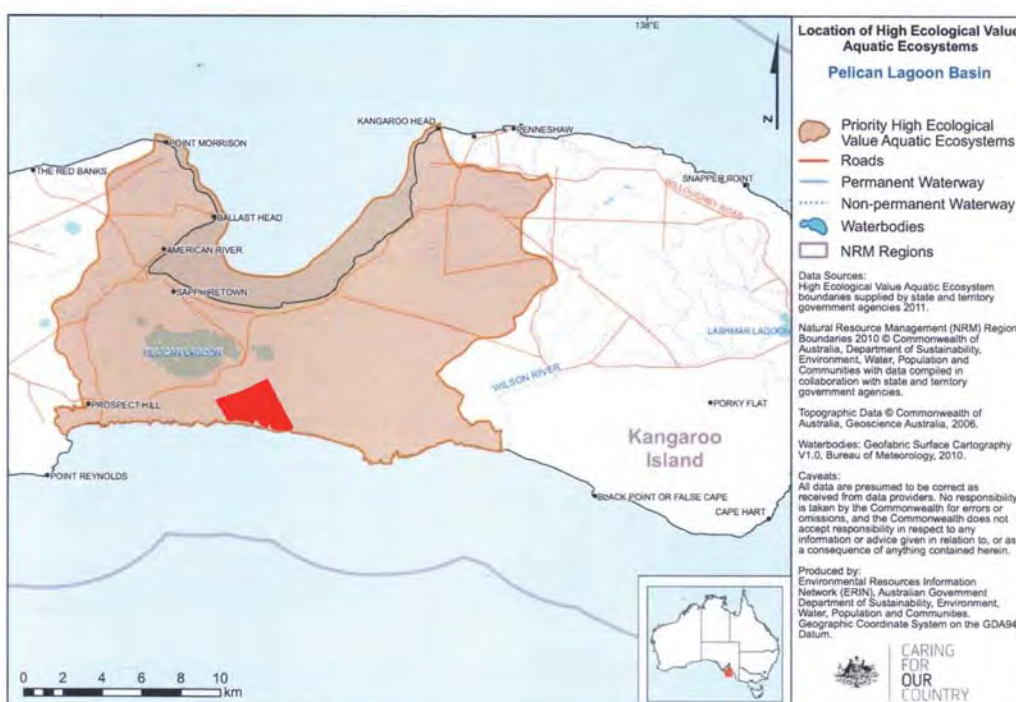
“...it is recognised that the current kangaroo/wallaby population and the proposed golf course are **conflicting**.” YES! Clearly. Along with goannas, echidnas, birdlife... The PER failed to mention the abundant Black Tiger Snakes. I’m used to encountering these large highly-venemous snakes sunning themselves on my lawn but I doubt the tourists would be. How would they be “managed”? And Cape Barren Geese have been moving east, their poop could be everywhere. How would they be “managed”?

6.7 Coastal Environment

“The proposed links golf course is fundamentally comprised of couch grassed fairways and tees...” It took until page 104 for the proposal to admit what species it was introducing over vast areas: Couch grass (*Cynodon dactylon*), which is a serious weed that can grow from seed, rhizomes, stolons and stem fragments. It is “*One of the most serious weeds of world agriculture.*” and “*Difficult to control and several sprays are usually required.*” See http://www.herbiguide.com.au/Descriptions/hg_Couch.htm

6.8 Marine Environment

“The golf course will require from time to time the application of **herbicides, pesticides, fungicides and fertilisers** to ensure ongoing healthy grass growth and the optimal playing surfaces at all times of the year...will result in **minimal** if any **groundwater contamination**.” The site is part of the **Pelican Lagoon Basin**, water within this basin flows into the **American River Aquatic Reserve** (see below, the site added in red). The promised “minimal contamination” is not acceptable!



“The Pelican Lagoon Basin contains 274 surface water courses... and a localised regional groundwater flow system **with very high recharge potential due to the high permeability of the largely limestone strata in the basin**... Established to protect breeding and refuge areas for invertebrates and fish, and habitat for waterbirds and the Australian sea lion. The lagoon is also an important fisheries habitat, in particular the extensive seagrass meadows, which act as a **nursery** for King George whiting garfish and salmon... dominated by seagrass meadows, they also include rare sponge gardens, algal mats, and limestone and algal patch reefs... the Pelican Lagoon Basin supports more than 60 bird species, including more than 30 that are listed as endangered, rare or vulnerable. **Key Threats** to the site include land and coastal development and associated runoff, grazing pressure, weeds and pest animals, and tourism.”

What is the point of declaring an area to be a Marine Park and a **“Priority High Ecological Value Aquatic Ecosystem”** (marked in pink) if a golf course can then be plonked in the middle of it? Decisions should be based on science! And the longterm health of the region. Listen to your own departments:

http://pir.sa.gov.au/data/assets/pdf_file/0019/65413/13_AqResWeb.pdf

9.1.2 Landscape & Access

“... while plant materials will be comprise **mostly** from a selection of locally occurring indigenous shrubs, grasses and groundcovers...” Mostly? They all need to be local.

9.2 Visual effects

“Combined with strategic plantings of **predominantly** indigenous vegetation the clubhouse will in effect disappear into the landscape.” Again, they all need to be local.

10.1 General

“The supply line running along Hog Bay Road will offer numerous opportunities to nearby land owners to tap into the water pipe during periods outside the overflow and purchase water allocations at the nominated SA Water rate.” Does the golf course pay SA Water for its water usage for years to come? And if so, what rate? Islanders who also have to pay for their own water infrastructure (eg. tanks and dams) and also have to pay for additional water to be trucked in, would not be happy to learn of an off-island company getting free or cheap water. And has SA Water approved the use of more water to other landowners outside of the overflow period? If so, how much? And for what purposes? What if someone decided they wanted to grow rice somewhere along the pipeline?

Water Supply “Furthermore, the environmental flows **vital** to the ecological systems that thrive downstream of the Middle River dam will not be prejudiced by the proposed take-off of water during the Winter period.” Where is the evidence that the reduction in environmental flows will have no impact? How will it be accessed? Who will decide how much water is enough to support this rich riparian landscape, the tallest waterfalls on the island, the vital habitat for the endangered Kangaroo Island Glossy Black Cockatoo...? Stealing water from this unique natural environment to water grass fairways 80 km away is not good governance.

10.1 Water

“- Reducing peak flows and runoff from hardstands in the environment simultaneously providing for infiltration and **groundwater recharge**,” If water is going to recharge the groundwater, it will presumably carry “herbicides, pesticides, fungicides and fertilisers” with it into the **Pelican Lagoon Basin**, and **American River Aquatic Reserve**.

11.1 Construction plan and staging

“It is likely that the construction of the 35km water pipeline will take in the order of 60 to 75 work days to complete...” Really? 583 - 466 metres per day? Along a major road with the necessary traffic restrictions, avoiding infrastructure and protected roadside vegetation, under connecting roads, through water culverts, roadside barriers, reinstate the curtilage (?) Again, where are the costings and feasibility report?

Appendix K - Enigmerase

“To prevent the spread of species associated with the management of the golf course especially the grasses for fairways, tees and greens it is recommended that the grasses not be allowed to produce seed heads... It is also recommended a “spray” surround be established around the areas planted with golf course grass to prevent creeping into the native vegetation.” How would this be enforced? As I said above (6.7) it is very difficult to control. What happens when chemical resistance inevitably occurs?

“Landscape areas should be planted with locally indigenous plant species to prevent the escape of garden varieties to the surrounding native vegetation.” How would this be enforced? Weeds threaten Kangaroo Island’s unique ecology and inadequate resources are available for their control (1.5 paid staff).

“The native vegetation removal should be reduced...” as per Enigmerase’s recommendations, page 17
Would this be enforced?

Appendix S - Kangaroo Island Council Development Plan

“Middle River Dam provides water to Kingscote and Parndana and **operates at capacity** during summer periods. During times of significant drought this system **cannot cope with demand** and subsequently other sources must be utilised. Council must work with State authorities and private developers to secure a reliable, safe and sustainable water supply for industry, the community and visitors to the Island. In addition, **new development should incorporate maximum on-site water capture and storage** (such as using larger water tanks) to alleviate the problems of water supply.” How is piping 150ML per annum of Middle River water 80km to irrigate a golf course acceptable? In approving this proposal, the State Government would be making a bad situation worse, when the Council has already asked for assistance to improve our future water security.

“3. **Development should not be located in delicate or environmentally-sensitive coastal features such as sand dunes, cliff-tops, wetlands or substantially intact strata of native vegetation.**” That should include golf course fairways and greens intruding into the **Coastal Conservation Zone**. Developments that rely on pouring chemicals onto poor soils in the catchment of the precious **Pelican Lagoon Marine Sanctuary Zone** should be rejected. A large portion of the golf course slopes down toward the sanctuary, chemical runoff is inevitable. In June 2013 the south coast of Kangaroo Island experienced the biggest rain event ever recorded, it was just a few kilometers west of Pennington Bay. The entire district was officially declared to be a natural disaster zone, roads were flooded and closed for more than a year. The PER does not appear to take these sorts of extreme events into consideration (despite climate scientists predicting they will happen more often), when chemical runoff into the **American River Aquatic Reserve** would be a foregone conclusion.

“4. **Development should be appropriate to land capability and the protection and conservation of water resources and biodiversity.**” Not irrigated greens intruding on White-bellied Sea Eagle habitat.

“5. **Development should be designed to maximise conservation, minimise consumption and encourage re-use of water resources.**” Not irrigated greens.

“6. **Development should not take place if it results in unsustainable use of surface or underground water resources.**” Because the water supply is already operating at capacity in summer and unable to cope in drought years.

“28. **Development should be designed and sited to minimise the loss and disturbance of native flora and fauna, including marine animals and plants, and their breeding grounds and habitats.**”
eg. Sea Eagles, Bush Stone Curlews, Fairy Penguins, Western Whipbirds... the lagoon marine nursery...

“2. Land outside of townships and settlements should primarily be used for primary production and conservation purposes.” Couch grass fairways on a **Coastal Conservation Zone** is not conservation. And **herbicides, pesticides, fungicides and fertilisers** draining into a sensitive aquatic reserve is madness.

“7 Development should: (c) be landscaped with **locally indigenous plant species** to enhance the amenity of the area and to screen buildings from public view.” Not just ‘mostly’ or ‘predominantly’.

Tourism Development

“1 Environmentally sustainable and innovative tourism development.” High water, energy and chemical use developments are not “environmentally sustainable”. And a condo-golf course is not innovative, there’s a glut of them worldwide.

“18. Tourism development, particularly in remote areas should be designed to **minimise energy and water demands**” Therefore not irrigated greens.

“17. Tourism developments should not exceed a building height of **6.5 meters** above natural ground level.” The plans flagrantly exceed that height.

In summary, I strongly urge you to reject this proposal on the basis that it would be an extravagant, wasteful use of the island’s limited water resources (which could be put to better use in the future), and that a high water, high energy and high chemical use development is not “clean & green” and does not meet the demands of planning for climate change. The proposed development would be a severe intrusion onto the vital **Pelican Lagoon Basin** and **Coastal Conservation Zone** and would have a detrimental impact on its biodiversity, particularly endangered coastal birds and the marine nursery. The chances of it becoming another white elephant are extremely high (the \$14M budget is fanciful to start with). A “cold, windy roo shooting range” public relations disaster could effect the whole island economy. This shoddy proposal is grossly deficient in detail, and not a sound basis for any decision-making to take place. The plan is clearly not in keeping with the wild, untamed, unique, natural characteristics of Kangaroo Island, which underpins its international reputation. And there are alternatives.

Yours sincerely,



Janine Mackintosh
22 June 2015

Mackenzie, Alex (DPTI)

From: Catherine Murphy [c.murphy@internode.on.net]
Sent: Saturday, 27 June 2015 1:54 PM
To: DPTI:KI Golf Course
Subject: Attention Mr Robert Kleeman

Dear Minister

As a permanent resident/ratepayer on Kangaroo Island, I am writing to express my opinion about the KI Golf Resort.

I can see from reading DPTI's Environmental-Public on-line report that a significant amount of hard work has gone into its assessment.

However, I would request that you consider the following factors as well:

There are many, many sensitivities around development in this area, including considerations of water management, waste water disposal, kangaroo management, flora retention, economic viability and social impacts/importance.

My question is: While there are MANY pages of paper in this report involving whole of government departments who have thoroughly assessed and analysed each of these issues, I wonder WHO will be monitoring and REPORTING on the ACTUAL processes if this development receives approval? How will the development agencies be held **ACCOUNTABLE?**

Kangaroo Monitoring, fencing and culling: I have personally been astonished to be held up on Hog Bay Road at Pelican Lagoon by a large MOB of kangaroos crossing from one side to the other during daylight hours (at least 25 roos). I was lucky to see them and stop in time. There are huge numbers of kangaroos in this environment. So, if monitoring and fencing do not work, what **processes have been established for CULLING?** I can't find any detailed reference to this. I certainly know that culling **kangaroos on Kangaroo Island** will create a huge political backlash.

WATER AVAILABILITY: There is no indication in the Report that if 150 ML of water is drawn from Middle River Dam during winter that islanders will have sufficient water for summer, in a climate change environment and drier conditions. This month, I find I have collected at least 20mls less rainwater than in June last month and the predictions are for a dry winter/Spring. My tanks are not full. This is an indication.....

Waste Water Run Off: WHO will be regularly monitoring water quality at Pennington Bay and Pelican Lagoon to ensure that the Resort's wastewater and Septic unit is operating as described in the report? The NRM Report indicates there are no existing watercourses on site or aquatic environments on site and that proposed waste water and sewerage treatment methods will ensure no point source pollution. This is a reading of the Act that is narrowed to exclude the pristine and unique marine environment at Pelican Lagoon and Pennington Bay. These environments are precious and need to be protected into the future and can only be protected if there are people on the ground doing so ie; monitoring regularly.

JOBS for Islanders: It is disturbing to read that operational development will exclude the Head Hotel/ClubHouse Manager, Course Superintendent and Golf Manager as these talents will, in all likelihood not be available on the island. I don't see how that can be asserted without employment ads testing the waters.

Tourism Opportunities: I didn't find any references to Golf Course Management being restrained from offering in-house tourism opportunities such as bus tours etc etc. This will surely impact on local tourism operators if left unchecked.

INVESTMENT: How will the developers be held accountable for the possible waste of investment monies (millions) made by South Australians, IF this development doesn't succeed? I didn't see any figures to support the assertion that golf tourism is increasing in popularity while golf club memberships are in decline. It was just stated, but not backed up any figures that I saw. There are many, many golf resort developments in Australia and across the world competing for this market. Kangaroo Island would need to be offering something really special.

I wasn't impressed by the Design Infrastructure Drawings included in this Report.

This is a difficult decision for a Minister to make. I hope you're going to make the right decision.

Regards
Catherine Murphy
10 Dune Road, Emu Bay, SA 5223

**SUBMISSION IN RELATION TO THE PUBLIC ENVIRONMENTAL
REPORT FOR KANGAROO ISLAND GOLF RESORT**

RE: WATER USE AND ALLOCATION IN RELATION TO PRIMARY
PRODUCERS IN THE MIDDLE RIVER CATCHMENT

This submission is not in outright opposition to the proposed golf resort development, but rather to point out what appears to be inequity of water resource allocation in relation to farmers who live within the water catchment area of the Middle River.

Primary Producers who live in the catchment of the Middle River, i.e. upstream of the Middle River Dam, are not allowed to create more stock water storage dams as a measure for drought-proofing their properties. The digging of irrigation dams in the catchment is not allowed. Even applying to build a family home on a property in the Middle River catchment can only be allowed if there is an existing footprint and that dwelling is removed or decommissioned. In other words a farmer who wishes to build a home and live with his family on their rural property in the catchment within a Section that does not have an existing dwelling is unable to do so.

It has been stated that the golf course can take 'excess' water from the reservoir during winter that would otherwise be going over the spill up to 150Ml per year. Our major concern is that Primary Producers, not just here on Kangaroo Island but many places throughout the world, will need to brace themselves against decreasing rainfall due to global climatic changes. Allowing farmers in the Middle River catchment to

build larger or more stock water storage dams is a wise measure to prepare for undetermined but inevitable changes to weather patterns and rainfall.

According to the Natural Resources Management Plan 2015-2025 Discussion Paper No. 4 'Wise and Productive Use of Water' the current total potable water supply (from all sources) averages to 871 Ml per annum. This will increase (one would presume by the installation of further collection devices) to 1114Ml in 2050 (one also assumes that calculations take into consideration the per annum decrease in rainfall expected by 2050). Demand from increasing population, etc, is expected to increase to 1096Ml per annum by 2050. The report also states that 'for both drinking and non-drinking quality water, sufficient supplies exist and no shortfalls are expected to occur before 2050'.

The Public Environmental Report for Kangaroo Island Golf Resort states that 'the water supply is being sourced from the Middle River Dam and provided by South Australian Water (SAW). The supply is based on that amount of annual requirements for the new golf course (approx. 100 ML.) SAW can supply this volume with no detriment to the existing supply because of increased water harvesting capability. This appears to suggest that the figure of 1114Ml in 2050 as quoted by the Natural Resources Management Board includes the amount of water required by the golf resort in its calculations and forecasted ability to install further water collection devices.

Therefore, if there is going to be enough water resources, even under the worst forecast changes in relation to climate change, there seems no logical reason why a golf resort should be granted permission to take water, while at the same time Primary

Producers of food (surely a much greater priority in any shape or form) should have this ability denied.

Contrary to this analysis stands the current status quo under the KINRM Board Plan 'sustainable use limits' which reasons that Primary Producers in the Middle River catchment are not allowed to increase their water-storage capacity as the catchment is already 'beyond the sustainable use limit'. This limitation has been set despite what is stated in the Public Environmental Report for Kangaroo Island Golf Resort that 'during the wet season when the Middle River Dam overflows, only a very small percentage (less than 10%) is actually captured. The remainder of this water flows down the catchment and eventually out to sea'.

If it is indeed accurate that the Middle River catchment is already beyond the sustainable use limit then the Kangaroo Island golf resort would not, and should not, be allowed to proceed. If this is not the case (which by all the information and analysis above appears to be the actual situation), there seems no logical reason why Primary Producers should be denied precedence over a golf resort or indeed why both parties cannot be equitably accommodated.

In conclusion this submission is asking for an equitable allocation of the water resources for current users in light of decisions being made about this proposed new user – i.e. the Kangaroo Island golf resort. Primary Producers in the Middle River Catchment would like the current water resources restrictions lifted to allow

- (1) the building of new and/or larger stock dams to mitigate against future changes in climate to drought-proof primary production.

(2) approval for home dwellings to be built within any of the Sections in the Middle River catchment

(3) consideration of the building of irrigation dams.

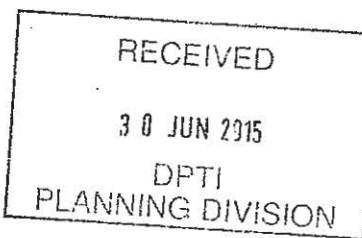
Note of Interest: As of today's date, 30th June, 2015, the Middle River is only just managing to creep into a slow flow and is normally in full flow by the end of May. The Bureau of Meteorology has predicted that 2015 will be a low flow year for the Middle River. As climate changes the likelihood of experiencing low flow years will increase.

We thank you for this opportunity to be involved in the consultation process in relation to the proposed Kangaroo Island golf resort development and hope that our opinions are considered and enacted upon resulting in a favorable outcome for all parties.

Yours faithfully,

SIMON & NAOMI MURTON

DUNCAN SA 5223



TO: The Minister for Planning
c/- Robert Kleeman, Manager Development Assessment
Department of Planning, Transport and Infrastructure (DPTI)
GPO Box 1815
Adelaide SA 5000

FROM: James E. Newcomer, 3196 Hog Bay Road, Pelican Lagoon, Kangaroo Island
PO Box 723 Kingscote SA 5223
moob: 0408 600 243

RE: Submission - PER Kangaroo Island Golf Course Resort

DATE: 26 June 2015

INTRODUCTION TO THIS SUBMISSION

The following submission independently scrutinizes Part C of the PER in detail. The numbered sections and lettered paragraphs herein are cross referenced on my annotated version of Part C of the PER (attached).

I have been asked why I have chosen to do this.

My wife and I have lived on Kangaroo Island since 1995 and now live at 3196 Hog Bay Road, on 4 acres which we purchased in 2010. Since then as "sole operators" we have established an "old fashioned" cottage industry in visual arts, relying on the uniqueness of our efforts, the historical value of the property we have restored and the remote beauty of the place in which we live. We have received much continuous positive feedback for our efforts at contributing to the history and uniqueness of our location. Our property is in full view of the proposal itself, as well as being in full view of the proposed electrical power and water infrastructure on Hog Bay Road and along the "unnamed road" easement. The PER is unclear about the exact location of the proposed pipeline but it would appear to pass across or immediately in front of our property. (See Map 1 attached.)

My credentials are that I hold a Bachelor of Science in Geological Engineering and a Teaching Credential in Elementary Education. I am a registered geologist in the American Association of Petroleum Geologists and spent 14 years in the oil and gas industry at working and middle management levels, with considerable experience in exploration operations, risk evaluation and contracts. I have been registered as a Primary and Secondary Education Teacher in South Australia. In 1992 I became a naturalized citizen of Australia, having migrated permanently in 1986. In 1996 I chose to follow a career as a sculptor.

Known as "Indiana James", since 1996 I have established my practice with awards and works in public and private collections.

I attended in full the Public Meetings held by the Department of Planning, Transport and Infrastructure at Penneshaw on 15 June and at Kingscote on 16 June, 2015. My count of total local attendance for these meetings was 18 visitors to Penneshaw and 29 to Kingscote. This small percentage of the approximately 5000 residents on Kangaroo Island

could be interpreted as apathy on the part of the local public, but the meetings themselves were minimally publicised to the extent that a majority of Kangaroo Islanders were then and still are unaware of the project, not to mention the specifics of the project as presented by the PER. On the days of the meetings, little or no indication was placed outside of the meeting spaces to indicate their occurrence, and in fact at 2:00 p.m. in Kingscote I and two more long-term local ratepayers had to ask and then be led by a member of council staff to the meeting room. Small adverts of the meetings were only in the local weekly paper and were not accompanied by any editorial or explanatory text. It could be interpreted that these meetings were held only to meet consultation requirements and intended as few local participants as possible. An evening "information evening" would have drawn many more people, as seen at Kingscote on the evening of 25 August 2014 when the proposed golf course was first presented by Justin Trott, a meeting attended by hundreds of islanders.

FORMAT FOR THIS SUBMISSION

This submission is completely cross referenced to Part C. of the PER as follows: the section numbers and paragraph letters of the following text correspond to the numbers applied in the left hand margins of the attached copy of Part C. of the PER.

Three explanatory maps (Submission Map 1, Submission Map 2, Submission Map3) are also attached and referenced in the text. These were compiled from map data within the PER onto standard topographic map sheets for the area.

Also annotated in this way are typographic errors as T (5 in total) and grammatical errors as G (10 in total). This may appear pedantic, but serves to illustrate the lack of care on the part of the proponent in preparing the PER, and in fact indicates that the PER was not proofed (and possibly was not read) in full by the proponent !

1. PROMISED PLANS

The PER foresees many "plans" that have as yet not been produced, including: a Kangaroo Management Plan, a Waste Management Plan, Integrated Pest Management Plan, a 'sound nutrient management plan, an Environmental Management Plan, a 'fertiliser management plan', and a "comprehensive environmental and landscape implementation strategy in consultation with council and NVR will be formulated" and later in the PER "A comprehensive environmental and landscape implementation strategy in consultation with DEWNAR will be formulated". This looks like the classic Department of Redundancy Department, with additions!

2. KANGAROOS, WALLABIES & POSSUMS

a. The Kangaroo Island gray kangaroo (recently considered a sub-species of the mainland western gray kangaroo having adapted following approximately 7000 years of separation from the mainland), is a darker, furrier, heavier and more physically powerful animal than the mainland western gray. The ignorance of the proponent concerning this particular animal is demonstrated by five references in the document to "herds" of kangaroos (p.44, p.66, p.101). Were cattle farmers to hear persons refer to their herd as "a flock of cows"

they would certainly consider these people "city folk", or were sheep breeders to hear their animals referred to as a "herd of sheep", their attitude would be the same. Kangaroos come in "mobs", not herds, and those who deal with these animals daily would have to see the proponent as ignorant and naive. Further, this subspecies of kangaroo is one with which the proponent has no experience. It is powerful, dominant, potentially dangerous, and iconic representative of the island's name and tourist industry. The idea that potentially thousands of these animals be killed to make way for an international tourist attraction is inappropriate.

b. The recent slaughter of at least 18 kangaroos of all ages (see attached 'Correspondence with Justin Trott') was first witnessed by a tour van full of Asian tourists. These people and their local guide called in at a nearby residence distraught and in tears. How would an international community regard the wholesale killing of hundreds to thousands of kangaroos on Kangaroo Island?

c. Among the corporations highlighting the kangaroo in their logo, to name a few, are Kangaroo Island Sealink, Tourism Kangaroo Island, Southern Ocean Lodge, and the national air carrier Qantas. The wholesale destruction of this iconic animal for the sake of a golf course will certainly have a negative impact on tourism for Kangaroo Island, if not for the entire nation.

d. When I asked Justin Trott my only question at the public information night on 25 August 2014, which was "What do you intend to do about the kangaroos on the site of the proposed golf course?" His answer was nothing was to be done, that kangaroos are an attraction to tourists and therefore would be an asset to the proposal. Mr Trott confirmed this by email. (see attached 'Correspondence with Justin Trott'.)

e. The promised "Kangaroo Management Plan" is currently postulated to include fencing and culling (i.e. killing) which is conducted beyond the confines of the proposal. Although referring to this fauna as "iconic" and "an asset", in the same document these animals are considered for destruction. (In fact, culling is only mentioned three times in the entire PER.) The proposed plan is to be formulated after discussion with nearby landowners and National Parks, and with his approval of this development will effectively be signed off by the Governor of South Australia. This idea is unconscionable and naive. The negative impact on the island's 'Clean Green & Pristine' image would have far-reaching effect. The reference on p.144 of the PER to "aerial control and culling measures" is particularly disturbing - does this imply killing kangaroos from helicopters?

f. The only real option here is to simply fence, or for aesthetic reasons wall, these animals out of the entire proposed site. In this there would be obvious difficulties on the southern perimeter, especially in the Coastal Zone. Further, fencing kangaroos from the site of the golf course will inevitably restrict their range and increase the pressure on surrounding lands, thereby affecting the health of both the kangaroos and vegetation outside the course.

g. Fauna underestimated by the proponents include the "rare" (p.87, p.94) brushtail possum. While in fact rare in South Australia, this species is predominant on Kangaroo Island and considered a pest by many local gardeners and most primary industrialists. While not currently numerous on the site of the proposal, possum scat was observed by the consultant biologists. The proposed plantings and accessible water will eventually draw this

species in great numbers to claim the flowers, leaves and roofs provided. Fencing or walling will not restrict these animals. They bite. They are incredibly tough, and are the most resistant mammal to poisons known. This animal is the subject of voluminous research as a result of its feral pest status in New Zealand, where no control measures have been effective. It can be concluded that the brushtail possum cannot be controlled short of shooting them on site as they come onto a property. This alternative is obviously untenable in the contexts of a resort facility and a 'rare' species.

3. POWER INFRASTRUCTURE

a. As founders of a local business which was set up by us as a "cottage industry" that highlights the pristine and "old-fashioned" realities of our remote location at Pelican Lagoon, the idea of an electrical transmission substation including a communications tower and line of power poles to support an above ground three-phase infrastructure within sight of our property and Hog Bay Road is disconcerting to say the least. (Refer to Map 3 attached.)

b. The assumption on the part of the proponent that the only landscape to be improved is that which specifically comprises the proposed golf course, while degrading the cultural and visual amenities of lands outside the perimeter of the proposal, is short sighted and not in the best interests of the island in general.

c. The proposed "above ground" electrical substation and adjoining power line at the Hog Bay Road intersection with 'unnamed road' (stobie pole CS180) easement would be highly visible from Hog Bay Road and adjoining properties. This route is entirely open rolling grassland. While the proponent claims to be minimising visual impacts of infrastructure installed solely to provide three phase power on the golf course itself, no care is indicated concerning the visual impact of infrastructure on lands off the course. The burial of this infrastructure should be provided for in the PER.

d. Further, such a burial would relieve the significant fire risk imposed by another line of electrical poles in this grass fire prone area. In fact, the power pole known as "Octopussy", which is one pole west of the proposed substation, caused a grass fire in February 2014. Years earlier grass fire was caused along Hog Bay Road by the pole (CS180) at the site of the substation that crossed Hog Bay Road towards Pelican Lagoon before it was extinguished. During the Easter holiday period in 2013, a very serious grass and bush fire for which the probable cause was a power pole occurred west of Penneshaw. It is curious that on p.147 under 12.2 Fire and evacuation management systems of the PER the use of the 'unnamed road' easement, which is earlier in the PER indicated by the proponent for improvement as a road to access the power infrastructure, is not cited for evacuation purposes, rather that guests will be retained on the golf course under any fire conditions. This seems to be a critical oversight by the proponent.

e. Inspection of CS180 where the proposed substation would be connected uncovered works already begun at the base of this pole. Has formal approval for project already been given by SA Power? Documentation in Appendix J does not indicate this. Further, the map in this Appendix J (reproduced and applied to Map 3 attached) indicates a route along the 'unnamed road' easement, while the letter indication in Appendix J from SA Power that indicates an ability to supply and gives a preliminary cost estimate refers only to a different

route along Davies Road. This conundrum is deepened by the fact that the date on the SA Power route map predates that of the letter of intent! Justin Trott has repeatedly declared that Davies Road will not be used for this purpose, rather that 'Unnamed Road' will be used and improved to some degree. (This discrepancy was pointed out to Mr. Trott by the writer at Kingscote, 16 June 2015). Having recently walked this entire 'Unnamed Road' route, it was learned that in fact this route is not a 'road' in any context, rather a fence line. This may indicate that Mr. Trott has not been on the ground along this route.

f. The statement on p.218 of the PER that the substation "will have benefits to the community" is in direct conflict with the statement on p.218 that "It is not expected that the Kangaroo Island community will benefit from the flow-on effects of the SAPN installation".

g. Evidenced by the frequent long power outages on Kangaroo Island since 2011, the electricity supply via the existing undersea cable is currently insufficient. There are no immediate plans to replace this cable, so an additional major draw on this already inadequate supply appears unwise.

4. WATER & WEATHER, INDICATIONS FROM GEOLOGY & GEOMORPHOLOGY

a. The site of the proposal is characteristically very dry, and at the time the National Weather Service has this year declared the onset of another "el nino" event. At the same time, climate change is recognised to be characterised by "extreme weather events". The proposed location has been and will continue to be increasingly hostile to habitation.

b. Firstly, the onset of "el nino" casts concerns as to the availability of water from Middle River Dam during overflows (subject to the maintenance of environmental flows downstream), which the proponent has asserted will be the only times that water will be accessed for their project. What will the result be for the proposal during winters when there are no excess overflows at Middle River Dam? (Referred to wrongly as 'Middle River Creek' on p.70 of the PER.) This risk is real and one which has not been considered in the proposal. Further, the "agreement" referred to in Appendix I to the PER is a single page letter of intent, without details or any mention of a pipeline, connective infrastructure or pumping stations to lift the water over Prospect Hill. Yet p.129 of the PER includes "South Australia Water who will design the water connection". A local professional recently reported conversations with employees of SA Water during which these employees had no knowledge of any such agreement and considered it "ridiculous". Further, in the eventuality of such a pipeline, who will have responsibility for its maintenance, SA Water or the proponent? Lastly, will landowners on the route of the pipeline be required to pay an access rate regardless of whether they use water from the pipeline, a policy of SA Water? The PER offers no reassurance or guarantee against such charges. The idea presented that American River might access this water fails to deal with the cost of construction for the 9 kilometers of pipeline necessary to provide this, nor what would occur during times when water simply wouldn't be available.

c. The proposal lies in the direct catchment to Pelican Lagoon, a State designated sanctuary 2 kilometres to the northwest. (See Map 2 attached.) Both the proposed on site dam to contain of 100+ MGL from Middle River Dam and the constant application of this water over fertilisers and pesticides on the golf course constitute risks to Pelican Lagoon,

especially in the event an extreme torrential rainfall. This catchment consists of a number of small closed dry 'lagoons' downstream from the proposed dam, in which the absence of surface calcrete and the fine clay/iron-rich sediment indicates that they have filled with water in ancient time. These features are probably the result of subsurface solution, causing 'sink holes'. The absence of surface drainages throughout the subject area supports the presence of subsurface limestone solution via groundwater movement, causing 'karst' topography. In short, both the travel of water through this type of geomorphology and its destination are highly unpredictable.

d. Geologically, the underlying rock of the Bridgewater Formation is poorly known at the proposed site. Only one nearby well bore contains a lithologic log (Appendix R). There is however ample exposure of these underlying sediments in the coastal cliff faces immediately south of the site. A detailed geological study of these exposures should be required as it would reveal the likelihood of any irrigation or storm water from the golf course reaching the lagoon via underground ('phantom') drainages. On p.108 of the PER, the statement "Drilling investigations will be required" is at odds with the subsequent statement that such investigations will not be performed. Also, the water holding ability of the proposed dam is only considered from the evaporation point of view. Water loss through the bottom of the dam is not considered in the PER, nor is the application of a bottom seal specified. The unevaluated stratigraphy of the Bridgewater Formation immediately beneath the proposed dam is concerning in terms of whether an adequate seal exists.

e. The large 'blowouts' of mobilized sand, which are evidenced as white areas above the cliffs in the Coastal Reserve south of the proposal, are indicative of the strong southeasterly winds that blow off the Southern Ocean during spring and summer. The affect of these winds may have been underestimated or overlooked by the proponent as no quantified wind data is presented in the PER, despite its availability from the Cape Willoughby light house records. If ground-breaking of the unconsolidated sand under the buildings planned for the course occurs in spring and summer months, which is likely, prevention of sand movement may simply not be possible and stabilisation measures will fail. Further, the statement on p.107 "dunes which consist of calcite outcrops" displays an ignorance of coastal geomorphology - dunes consist of sand, never of calcite outcrops!

5. VEGETATION SURVEYS & INTRODUCTION OF GRASSES

a. The proponent was notified of particular weed infestations in my email communication of 3 September 2014 (attached). The proponent has also had two consulting firms document these weeds. What is most surprising is that both consulting reports failed to recognise one of the most significant infestations, namely Cape Weed. This is a cause of concern in terms of the thoroughness, and for that matter correctness, of those reports. It suggests that the Department itself should obtain an independent inventory on the site, rather than relying on consulting firms paid by the proponent.

b. The PER foresees the cultivation and planting of "couch grasses fairways and tees, bent grass greens" (p.104 of the PER). Justin Trott has reported greens will be planted with Santa Anna turf. All of these plantings involve introducing potential weeds to the environment.

c. At the public information evening in Kingscote in Mr. Trott stated (and verified by email correspondence with the writer, attached) that no soil would be brought on to the site, but this is not verified nor is this issue addressed in the PER.

6. BUDGET & FUNDING

To what extent might the SA taxpayer be funding this project? Such funding is not apparent in the PER. It is apparent that this project was a campaign promise announced by the current Premier on the day before the last election. As a State declared "Major Project", to what extent is the State contributing to or obligated to cover the costs of this project? Several local road improvements to Hog Bay Road, Davies Road and along the "un-named road" easement are foreseen in the PER. Who is to pay for these improvements, which are not within the proposed land and would not be performed were it not for the current proposal? Davies Road had already at this writing been widened. Did the proponent pay for this work? It appears likely that Council roadworks that would be necessary off the development site are to be funded by the taxpayer, not the proponent.

7. HERITAGE

No aboriginal groups have been consulted. It would appear that (probably in ignorance) the proponent intends to consult only representatives of the Ramindjeri. As the Dreamtime presence of "Karta", Kangaroo Island is significant to several aboriginal groups, and in fact it can be debated whether the Ramindjeri are among these. Further, the 19th Century historical fact that women from the mainland and Tasmania were kidnapped to Kangaroo Island, some of whom remained on the South Coast for seven decades, is ignored by the proponent. Along with the archaeology of the ancient occupation by first Australians, this history should be included in any heritage investigation and should incorporate consultation with the descendants of these kidnapped women. In 2002 such consultation was accomplished during the State Encounter 2002 Festival for the dedication of the "Contemplation Seat" sculpture at Penneshaw, the design and building of which was performed by the writer.

8. BUSINESS MODEL & FINANCIAL RISK

a. The successes at golf courses on which the proponent's business model is purportedly based are touted in many places within the PER, but neither the specifics of these models nor of the proponent's business model are included in the PER documentation. In fact, the Cape Wickham Golf Course on King Island, (developed by Turnpoint and since sold to Duncan Andrews who also owns The Dunes Golf Links on Mornington Peninsula, not used as a model in the PER) is not yet a resort, comprising no accommodation or restaurant, and is therefore not a business model for the proposed venture. The only cost estimates supplied in various sections of the PER is the \$14 million total for project and preliminary estimates for power and water infrastructure. The greatest concern here is the possibility that this total is grossly underestimated, and that this would inevitably lead to receivership, as was the case at Point Hughes on the York Peninsula. Receivership would no doubt obviate the proponent's ability to live up to the requirements of site restoration in the event of failure. This lack of transparency should be eliminated with the inclusion of a detailed business model specifying estimated expenditures and incomes for the entire project.

If the proponent has not already accomplished this detailed business plan, the level of planning to date is insufficient to guarantee success.

b. Examples of this lack of transparency include the cost estimates that the proponent claims to have obtained with assistance from SA Power and SA Water, as documented in Appendix I and J. No cost estimates are included for water or for the transmission pipeline, and the proponent has stalled a detailed cost estimate (quote) from SA Power by not returning the form necessary to cause this (discussion with J. Trott, Kingscote, 16 June, 2015). The PER includes no details concerning labour or materials excavation or construction costs on the course itself. Incomes are simple projections based on the number of clients without indications of a range of possibilities and what changes the maximum and minimum expected incomes might cause. These incomes have increased significantly against those presented by Justin Trott at the public information night in Kingscote last August, where the proposed business model was questioned by several of those in attendance.

c. To judge the adequacy of this \$14 million figure, it might be possible to obtain cost figures from the last State Major Project built on Kangaroo Island, Southern Ocean Lodge. That project did not include any major irrigation/pumping costs or topographic reconfiguration of surrounding lands, and if its actual cost exceeded that of this proposal an underestimation on the part of the proponent could be considered likely.

d. The large number of cost centres involved in the complicated project, each comprising an independent variable that contributes to financial risk, should in the PER be risk evaluated to produce a total risk of success for the project. Were this done, the indicative chance of success might be less than even odds. Because the project is driven by a very large parent corporation, that corporation might well be willing to take a one in four chance of success and easily sustain a failure of this magnitude. But this type of analysis only considers a sustainable loss for the financiers and takes no heed of the impact of the failure on those directly involved on the ground.

e. The stated return on investment of nett 7.5% per annum (p. 115) may look good compared to other investments during what all would admit are global hard times. But if the proposal is considered in terms of unriskened payout time, the \$1.1 million per annum net revenue (Total annual revenue est. - Total annual costs est.) stated on p.114 of the PER would produce a payout period of $\$14\text{MM}/1.1\text{MM} = 12.7$ years! In other words, the money invested is not returned for over a decade. On a riskened basis, this payout would be much longer. Oil and gas ventures, for example, generally require a riskened payout of three years or less to be viable.

f. In conclusion, prior to its approval this project should be evaluated for risk by using the procedures specified by the Wharton School of Risk Management.

g. The economic analysis in the PER contains significant changes to what the Kangaroo Island public was told by Justin Trott at the public information night in Kingscote on 25 August 2014. Mr. Trott then stated (and later confirmed in email correspondence with the writer, attached) that 1) the cost per golf round would be \$50-\$100 as opposed to and increase to \$125 in the PER, that patronage was expected to be 12,000 persons per annum

as opposed to an increase to 22,000 'visitor nights' in the PER, and a permanent staff of 15 as opposed to the increase to "on site employment est. up to 60 persons" in the PER. To make this even more confusing, p.118 of the PER states a "full-time equivalent of 30 persons". On the subject of running costs, Mr. Trott initially gave a figure of \$800,000 per

annum (Kingscote information night 25 August 2014), which he later refined by email (attached) as "only for the golf course operations". This compares to a figure of \$8.4 million per annum in the PER, leaving a ridiculous conclusion that the operation of the golf course is less than 10% of the total running costs! Unfortunately these changes, apparently made mostly to increase the revenue side of the venture, amount to untruths told to a large crowd of islanders one year ago. At this point, most of those in attendance on 25 August 2014 would be unaware of any of these changes.

h. The PER anticipates "upgrades" to transport to the island, specifically an airport upgrade and a new ferry (p.117 of the PER). Locally neither of these projects appear viable at the present time. In fact a new purpose-built fast ferry to Kingscote from Glenelg was recently estimated at \$20-30 million (public information night, Kingscote 25 August 2014) and has subsequently been shelved. Further, due to the State-granted monopoly of the Cape Jervis terminal to Sealink, no competitive service is possible from the closest point of land. In any case, it would make sense to wait for any such upgrades before approving the subject development.

i. The proposed land division and sale to private parties across the eastern side of the project area has nothing to do with a golf course development and should be considered separately by the DAC. This specific site currently contains the healthiest native vegetation within the proposed area. It would appear that this high density "condominium style" subdivision is a land play motivated by profit-only. If developed this housing would be by far the most visible aspect of the project, especially at night. It would involve the policing of a variety of investors and developers, an enforcement which would apparently be left to the operators of a golf course. By example, the failure of the Port Hughes golf development was credited to lack of sales interest in the subdivision included in that project.

9. GOLF BALLS IN THE COASTAL RESERVE

a. The environmental impact of thousands of errant golf balls hit over the greens for the planned 6th, 12th, 13th and 16th holes, (See Map 2 attached) into the steep and relatively pristine coastal reserve, and especially off the 'fairway' over the reserve between the tee-off on the 12th and the green on the 13th holes, is not considered anywhere in the PER. The Coastal Reserve is treated in the PER for all intents and purposes as a 'sand trap'. Recovery of these 'trapped' balls would surely damage the fragile ecosystem in the reserve as well as possibly resulting in injury or loss of life to course staff. Failure to recover these balls would cause a permanent build-up of acrylic waste in the reserve. For this among many other difficulties, not the least of which would be the likelihood of turf grasses invading the reserve, these four greens should not be allowed.

b. It is unclear in the PER whether or how the State has agreed to the use of the Crown Land comprising the Coastal Reserve. Is there documentation agreeing to and specifying the uses of this land?

10. DISRUPTIONS

The proponents plan construction works 6 days a week, 12 hours per day from 6:30 a.m. to 6:30 p.m., and seven day per week operations are not specifically excluded. The noise

P. 10 of 10

and dust, carried on the prevailing southeast winds across Pelican Lagoon, from large trucks (at an estimated 312 vehicular trips per day!) and earth moving machinery will prevail for a period of at least a year and will be heard and felt by a large number of nearby landowners around Pelican Lagoon, all of whom have moved to Pelican Lagoon to enjoy it's isolation. There are no indications within the PER that local residents would be compensated in any way for this disruption to their lives. There is no acknowledgement in the PER of the additional hazards this traffic will cause on the already dangerous Hog Bay Road, with many blind curves, numerous large kangaroos, and a speed limit of 110 km/hr.

CONCLUSIONS

The PER is a poorly constructed inadequate document. The length of the PER is increased absurdly by frequent redundancies in the text. Whole paragraphs are repeated again and again in a "cut and paste, drag and drop" style, sometimes verbatim and sometimes with small changes or additions (see above under PROMISED PLANS). There are also numerous typographic and grammatical errors. Some key areas are not addressed. The concern here is that this lack of care and organisation is indicative of what could be expected in general if the project were to proceed.

Detailed scrutiny of the PER, full attendance at the three public meetings held to discuss this proposal, extensive email communications with the proponent, a solid knowledge of the fauna, geology and geomorphology at the proposed site, and business experience in tourism and evaluation of prospective ventures all lead me to the conclusion that proceeding with this proposal at this time would be unwise. Extensive revisions to the PER are called for before any further approvals of this venture.

Submitted 26 June 2015 by James Newcomer

cc: Wendy Campana, Commissioner Kangaroo Island
Sharon Kauppila, Counsellor, Kangaroo Island Council
Chair, Working Group Committee, Business Kangaroo Island

PER Submission Index - James Newcomer	Pages
1. PROMISED PLANS	2
2. KANGAROOS, WALLABIES & POSSUMS	3
a. kangaroo prehistory, characteristics, 'herd' vs 'mob'	
b. affect of culling kangaroos on tourists	
c. kangaroo corporate logos	
d. reversal of kangaroo management by Justin Trott	
e. Kangaroo Management Plan as stated in the PER	
f. possums & wallabies	
3. POWER INFRASTRUCTURE	4
a. affect on our business model	
b. proponent's concern only with course landscape	
c. visual impacts, requirement for burial	
d. fire risk from power poles	
e. CS180 pole inspection, discrepant route planning	
f. benefits of the 3-phase substation	
4. WATER & WEATHER, INDICATIONS FROM GEOLOGY & GEOMORPHOLOGY	5
a. el nino	
b. availability	
c. possible impact on Pelican Lagoon	
d. underlying geology - implications for water movement	
e. sand mobilisation	
5. VEGETATION SURVEYS & INTRODUCED GRASSES	6
a. surveys omission of Cape Weed	
b. introduction of grass species	
6. BUDGET & FUNDING	7
7. HERITAGE	7
8. BUSINESS MODEL & FINANCIAL RISK	7
a. lack of detailed business model	
b. examples of lack of transparency	
c. adequacy of \$14 million budget	
d. absence of risk analysis	
e. return on investment vs payout time	
f. need for risk analysis	
g. changes to the business model	
h. anticipated transport upgrades	
i. land division & sale	
9. GOLF BALLS IN THE COASTAL RESERVE	10
10. DISRUPTIONS TO LOCAL RESIDENTS	10
CONCLUSIONS	10

MAP COMPILATION 1

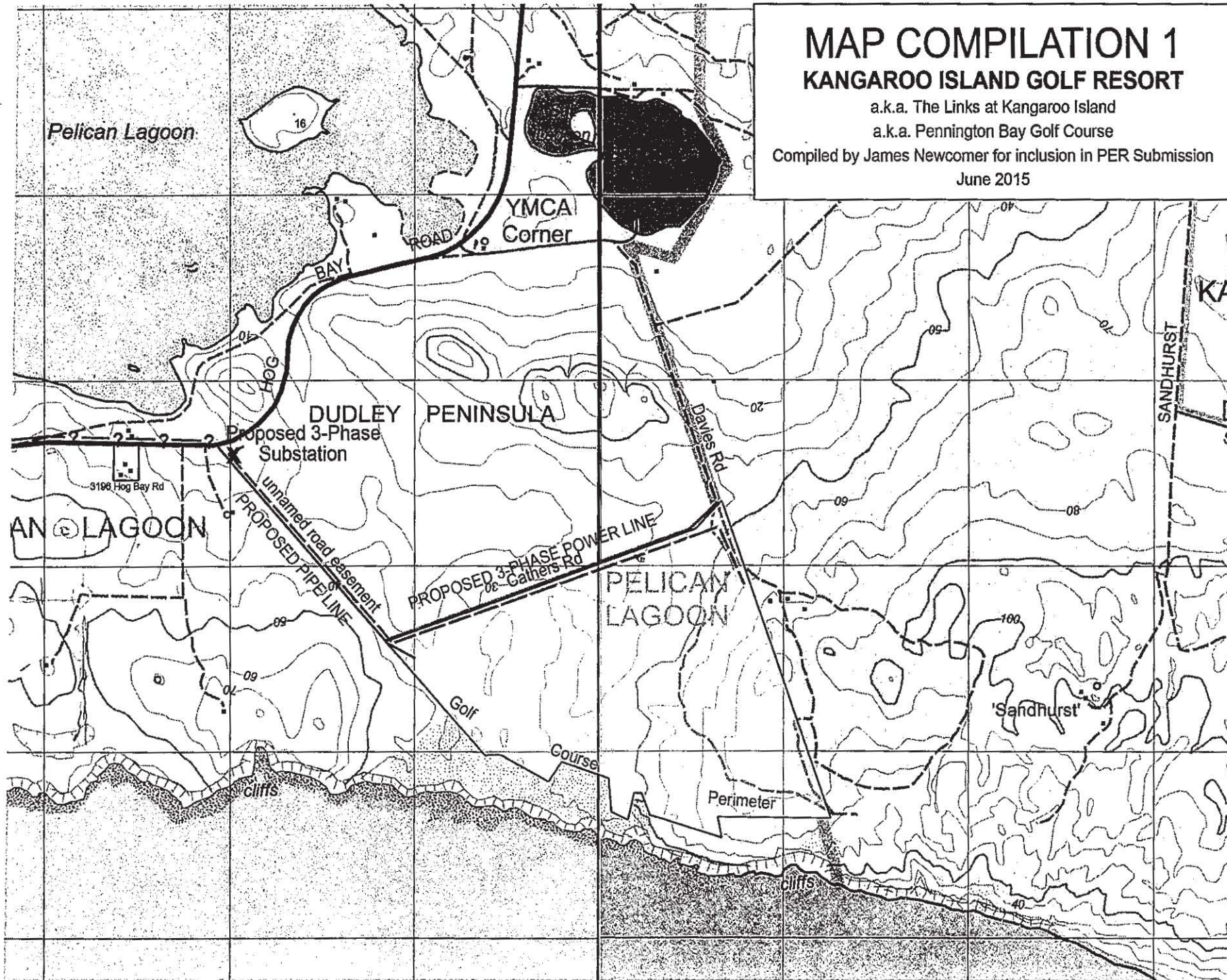
KANGAROO ISLAND GOLF RESORT

a.k.a. The Links at Kangaroo Island

a.k.a. Pennington Bay Golf Course

Compiled by James Newcomer for inclusion in PER Submission

June 2015

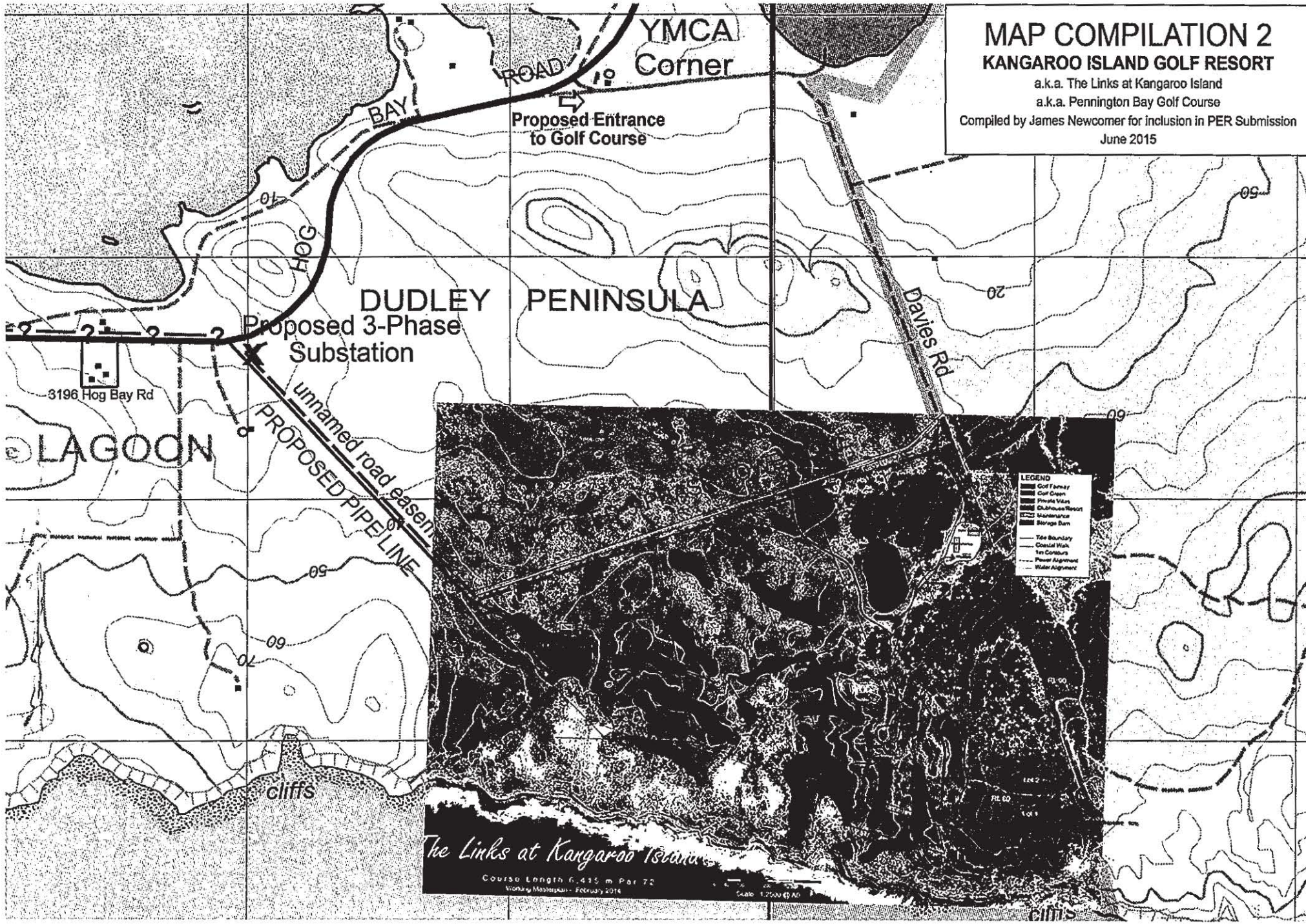


MAP COMPILATION 2

KANGAROO ISLAND GOLF RESORT

a.k.a. The Links at Kangaroo Island
 a.k.a. Pennington Bay Golf Course

Compiled by James Newcomer for inclusion in PER Submission
 June 2015



- LEGEND**
- Golf Fairway
 - Golf Green
 - Private Villas
 - Clubhouse/Resort
 - Maintenance
 - Storage Dam
 - Tide Boundary
 - Coastal Walk
 - Ten Contours
 - Power Alignment
 - Water Alignment

The Links at Kangaroo Island
 Course Length 6,445 m Par 72
 Working Masterplan - February 2014
 Scale 1:2500 @ A4

MAP COMPILATION 3

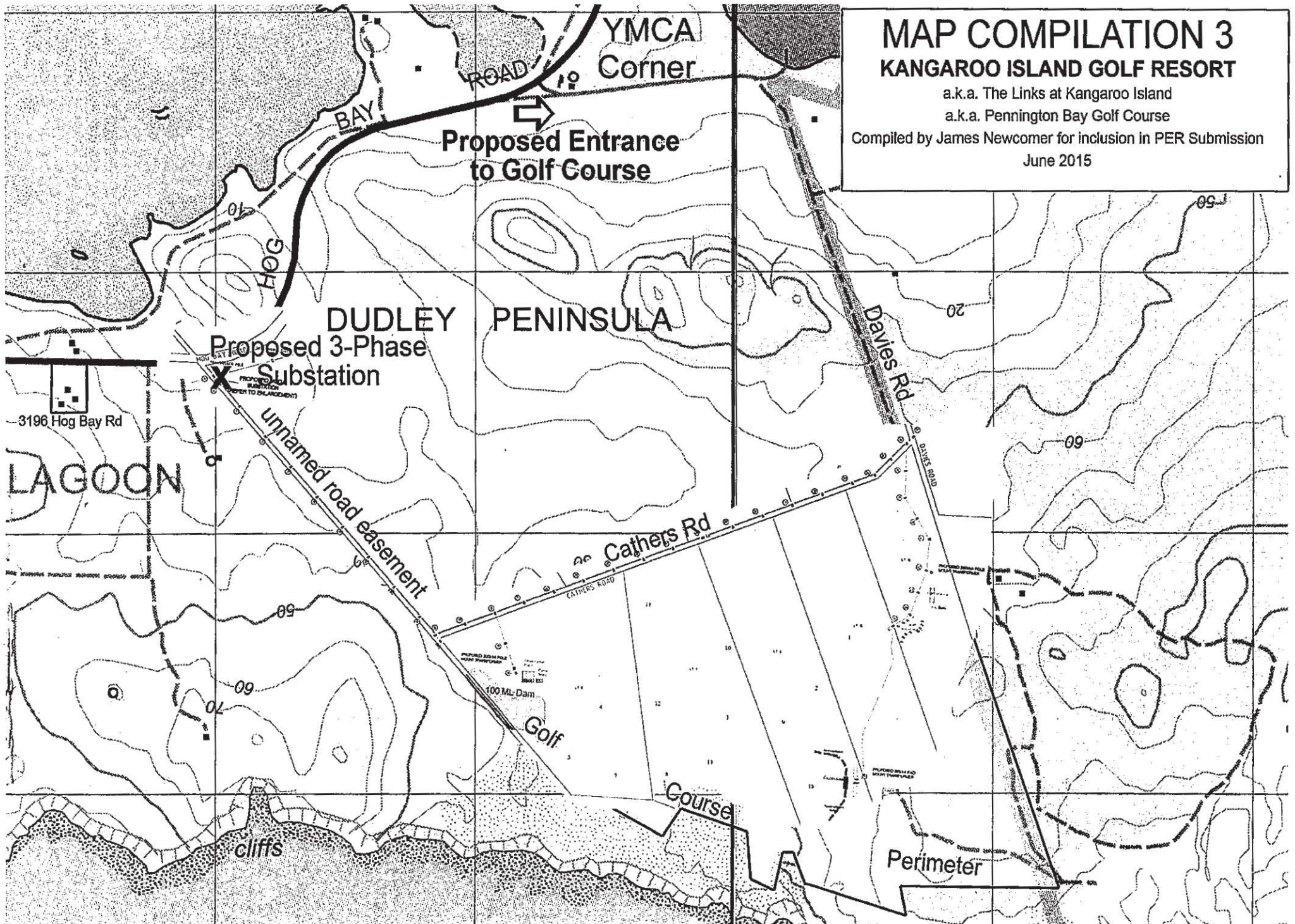
KANGAROO ISLAND GOLF RESORT

a.k.a. The Links at Kangaroo Island

a.k.a. Pennington Bay Golf Course

Compiled by James Newcomer for inclusion in PER Submission

June 2015



**PUBLIC ENVIRONMENTAL REPORT
FOR
KANGAROO ISLAND GOLF RESORT
LOCATED AT
PENNINGTON BAY, KI.**

**Annotated Version for Submission
by James E. Newcomer
3196 Hog Bay Road
Pelican Lagoon Kangaroo Island
29 June 2015
Part C pages 44 - 152 inclusive**

Application

Further to Sec. 46 (6a) of the *Development Act 1993*

For:

- A Golf Course and associated practice facilities, clubhouse and dining facilities;
- Tourism accommodation and staff accommodation facilities;
- A maintenance compound and associated facilities including water storage;
- Residential development;
- Stormwater and sewerage infrastructure for the capture, treatment and re-use of recycled water; and
- Associated infrastructure in respect of water supply, electricity, telecommunications, stormwater, effluent disposal, roads and parking.

KEY TO MARGIN NOTES

**1-10 Reference to specific comments
within Submission text**

**G = grammatical error
T = typographic error**



G

The Greg Norman designed golf course works with the available topography allows maximum utilisation stunning coastal views to the South West and North West. The course is designed on the basis of a classic links layout where the elements play a key role in determining both the degree of difficulty and the overall golf experience. It is singularly designed to take maximum advantage of both the topography and the available views while providing for a wide range of golf expertise. The course is planned to be a serious contender for entry into the world's top 100 courses with two years of opening. This will ensure both its worldwide publicity and its attraction for overseas golfers that carry a profile consistent with that identified the ideal 'experience seeker'. This will guarantee its viability in the world golf tourism market.

2

The location currently hosts a large mob of kangaroos that roam the extensive open areas of the property and surrounds. Indeed, the ready presence and high visibility of this herd is such that Cathers Road is a regular stop off for tourist buses travelling from Penneshaw ferry terminal to and from the western parts of the Island allowing the tourists to see, close hand, a vast number of the animals. It is envisaged that this herd will remain and add to the ambience and attraction of the new golf complex.

There is no comparable golf facility on the Island and the proposal both identifies a gap in the 'hero experience' of golfing in a wild, natural, exposed environment and a significant tourist asset that may be showcased in the Island's tourist portfolio.

The proposal introduces a new visitor experience by the introduction of a world class links style golf course complimented by a variety of high quality accommodation offering a new tourist node in a lesser used part of the Island. The golfing experience is enhanced by immediate access to ancillary attractions intrinsic to Kangaroo Island while the calibre of the accommodation and range of activities on offer invite the visitor to stay longer.

The proposal is an additional diverse activity providing for an identified significant and specific market (golf tourism).

The proposal ensures that environmental and social sustainability of the area and the Island are maintained and improved.

All these elements of the proposal are consistent with the aspirations of the KINLSIP.

Conclusion

The proposal is entirely consistent with the National Landscapes Experience Development Strategy and will deliver an 'extraordinary' tourist development.

4.3 Kangaroo Island Natural Resources Management Plan

T The recently promulgated NRM plan recognises that *"The Island's natural assets underpin the social wellbeing and economic prosperity of all of its inhabitants and their effective, long-term collaborative management is essential to ensuring a viable future for coming generations."*

Broad Objectives

The NRM includes a number of broad objectives against which the proposal is assayed.

1. Consider ways of improving landscape condition and connectedness;

2b The proposal includes a limited amount of vegetation clearing for the purposes of golf course construction, access provision and condominium/villa development. Animal habitat will be enhanced through the planting program as per the recommendations of the proposal's vegetation study while on site water will assist in minimizing animal stress during drought periods.

2. Consider ways of increasing the capacity of the community and the environment to adapt to the challenges of climate change;

The proposal, in the context of land management, involves a far greater intensity of input and attention because of the maintenance requirements of the course itself and the proposed planting schemes that are vital to the project's success. Indeed a significant component of the annual running cost is allocated to course and surrounds maintenance and ongoing landscaping. In this scenario it is contended that the capability of the land to adapt to and manage for change in the climate is appreciably improved than would otherwise be the case.

3. Refine water use limits based on new KI specific data;

4b The water supply is being sourced from the Middle River Dam and provided by South Australian Water (SAW). The supply is based on that amount of annual requirements for the new golf course (approx. 100 ML.) SAW can supply this volume with no detriment to the existing supply because of increased water harvesting capability. Refer appendix G.

E. Installation:

The installation of the system will be progressively and best starting at the Pump Station and moving away to enable progressive operation of the system in accordance with the course staging and construction program.

In general mainline pipework shall be run on fairway edges to minimise surface disturbance, in particular with the larger pipes.

F. Management:

As previously mentioned a Weather Station shall be incorporated into the control system that will automatically adjust the present daily watering times to match the Daily Evapotranspiration Rates for the site. Off peak night time watering will not only affords the most economical energy costs, but applies water at optimum times to combat wind and evaporation effects. This prevents over watering by supplying only what the turf needs.

Programs will respond to the onsite weather station as well as field sensors that will conform to any EMP requirements for the golf course.

Above all else, the irrigation strategy is to water the plant not the soil.

Additionally the software program has the following features:-

- Cycle and soak features that ensure run off does not occur.
- Soil type, slope & location within the site enables specific adjustments to watering schedules and operating times.
- Individual station control provides the most accurate scheduling capability.
- Re-active programs (e.g. to wind speed & direction) as well as pump station failure.
- Water Budgeting allows quick global adjustments of all watering times.
- Daily printouts of watering programs, faults and history.
- Pump Monitoring.

The Waste to Resources Policy 2010 is a tool for South Australian industry and government to better manage waste through its requirements for suitable waste from metropolitan Adelaide to be subject to resource recovery processes and prohibiting the disposal of certain waste to landfill.

In response to this policy it is noted that the policy is pertinent only to metropolitan Adelaide. Despite this it will be adopted procedures for the resort to recycle as far as possible all waste.

A Waste Management Plan is to be established that will:

Land

The site is generally open degraded ex-grazing land that is populated by mobs of kangaroos and Tamar wallabies. It has a range of indigenous vegetation, however, the predominant vegetation is pasture grass and exotic weeds.

Water

4b

The main water source is from Middle River dam which is the principle source of potable water for the Island. The proposal uses overflow water collected during the winter months when such overflow would otherwise be lost. The water will be transported via new pipeline to the property and stored on site in a dam from where it will be dispersed per an irrigation system. The secondary source of potable water will be from rainwater collected from roof tops on site.

Power

The major determinant of the main demand sources for power are the base load needs of the irrigation pumping system and the clubhouse. The total power requirements (minimum 455kVA) were considered unable to be met from renewable energy sources on-site, ie wind power and solar energy.

It was therefore imperative that two other main sources were investigated. These included;

G

- extension of existing power lines from Hogs Bay Road at Pelican Lagoon to the site; and
- the use of multiple diesel generators automated to come on line with demand.

The use of diesel powered generators was ultimately discounted on the basis of long term operational costs.

After extensive negotiations with South Australia Power Networks (SAPN) the decision was made to opt for the connection to the existing grid with various modifications to meet the project's base load needs.

To this effect it is proposed to provide a three phase service with a total maximum capacity of 400 volt, 688 ampere (475 kVA) from the existing 33 kVA line near Hog Bay Road and Davies Road, Pelican Lagoon.

Solar cells are to be installed on site to supplement and reduce reliance on the main power source as proposed by reticulation. This system will cater for all hot water and lighting requirements of the development. This form of renewable energy will be capable of producing 80 KVA. In order to minimise visual intrusion on the landscape through reflection and reflected glare these panels are proposed to be located in the vicinity of the maintenance precinct which is sited in the treed area and visually concealed from off-site viewing.

Strategic Plan the DAPs are primarily focused on projects that can be delivered in the next 3 years. In the case of Kangaroo Island it is noted that the Island's tourism growth over the past 10 years of 32% increased visitation has been mainly driven by the international and interstate market. Among other things the DAP for the Island aims squarely at the market for high yield visitors and the development of interstate and international markets. In these respects the proposal is an ideal 'fit' as it specifically will target international and, to a lesser extent, interstate visitors. It is noted that the DAP highlights the need to address the logistical barriers of a Kangaroo Island holiday to maximize conversion of high appeal: Ease and cost of access.

The proposal is unswervingly consistent with the findings of the moderate growth scenarios of the *Kangaroo Island Futures Authority's* latest report '*Economic Impact of Agriculture and Tourism*' (2014). This KIFA report identifies the critical role tourism, which contributes 25 per cent of the Kangaroo Island's Gross Regional Product (GRP), plays in the economy of the Island. A key component of this report includes the recognition of the need for the development of new tourism experience and accommodation with an upgrade of utilities (power and water). The proposal, with its provisions of championship, links-style golf with extensive lodge and condominium accommodation options matches this criterion and will significantly contribute to the growth of the role of tourism in the local economy.

The Island is heavily dependent on its natural resources and tourist development is, in turn, wholly reliant on the most effective management and protection of the Island's natural assets. It is expected that the Island, as a region, will continue to develop as a pre-eminent sustainable, nature-based tourism destination.

In this context the protection and preservation of the environment that characterizes the site and its surrounds is vital for the success of the project. The existing topography and natural features of the site will be minimally shaped as the proposed course layout will generally follow the existing contours. There will be minimal vegetation clearance and extensive new planting to provide both planting offset and stabilization of possible erosion-prone land where the course nears the coast. The planting program along with the provision of irrigated areas will afford a more amenable habitat to many of the extant mammal species thus ensuring retention of this attractive element of the site. A kangaroo management program is to be instituted through the introduction of specific planting to ensure a degree of control of the existing herd and at the same time allowing this herd to be a distinct component of the overall complex.

2a

The design and siting of the buildings associated with the complex are such as to minimize any offsite visual impact. This is particularly so in respect of the potential views from the coastal walk along Pennington Bay and the view back to the site from the viewing platform atop Mt Thisby some 8 km to the immediate west.

Contribution of the proposal to the Island's future tourism prospects

The proposal will make a significant contribution to the Island's future tourism prospects through the addition of high quality tourist lodging options in an otherwise under-serviced part of the Island (the Dudley Peninsula) and the supplementing of the specific attractions that the Island offers

- The proposal is consistent with the adopted plans and strategies of the local Futures Authority, and the State and Commonwealth tourist planning bodies.

Sustainability

The proposal is sustainable for the following reasons:

- The South Australian Tourism Commission has an adopted Design Guidelines document that describes the key considerations in developing a tourist facility in a sustainable manner (these are addressed in detail above at Sec. 4.4). The Design Guidelines outline a number of actions in site planning that have been used in the design of buildings proposed. Further, all of the buildings proposed are fully responsive to the State's adopted Principles of Good Design 2004 with a range of initiatives being employed to ensure low energy usage and most effective utilization of natural resources.
- Water supply will be provided by a combination of harvested roof water from the proposed buildings and the construction of a new main water connection from Middle River dam by way of a take-off new Kingscote Airport. Water is to flow from the Middle Creek dam during the winter months when the dam overflows and this overflow would otherwise spill to the open sea. This water is to be stored on-site in a significant (100 Megalitre) dam and applied for both course irrigation and potable water after treatment.
- Power is to be principally supplied via a new connection to the existing Hog Bay Road transmission line that runs from the mainland to Kingscote and beyond. This power is to be augmented by extensive solar collection on site. Tanked gas will provide for kitchen and in-lodge cooking needs.
- Sewage and waste water treatment is addressed by using an '*Econocycle*' system which uses a natural, chemical free process to treat sewage and wastewater, converting it to clean irrigation water which will be used to irrigate new planting to be installed away from the clubhouse and lodge precinct.. The system is compact, hardy and reliable, requiring only one service a year. It is highly cost efficient and has the lowest energy consumption of any unit on the market. The system also has powerful odor-absorbing capacity and guarantees no odors.

G

4b

Natural Resources Management Act 2004

Under the *Natural Resources Management Act 2004* (NRM Act), landholders have a legal responsibility to manage declared pest plants and animals and prevent land and water degradation.

Key components under the Act include the establishment of regional Natural Resource Management (NRM) Boards and development of regional NRM Plans; the ability to control water use through prescription, allocations and restrictions; requirement to control pest plants and animals, and activities that might result in land degradation.

A 'duty of care' is a fundamental component of this Act, i.e. ensuring one's environmental and civil obligation by taking reasonable steps to prevent land and water degradation. Persons can be prosecuted if they are considered negligent in meeting their obligations.

- G The Natural Resource Management Plan is of relevance to this project and it incorporates animal and plant control while will enable and facilitate integrated and sustainable natural resource management. It will also engage the community in the development and implementation of animal and plant control programs.

6.3 Flora & Fauna Survey methodology

- 5a All flora species observed were recorded, including the locations of any threatened flora species (if present) and significant weed infestations. Species nomenclature used in this report follows that used in the Biological Database of South Australia (BDBSA) as at November 2014.

Ecological assessment has been carried out by two specialist consultants (*EBS* and *Botanical Enigmerase*). The survey methodology for flora and fauna included:

EBS Methodology

Desktop assessment - Flora and fauna

A review of relevant literature, data and aerial imagery was undertaken for the project site and the immediate surrounds. Information was obtained from the following databases:

- EPBC Protected Matters Online Search Tool
- Bird Atlas
- Atlas of Living Australia
- Nature maps (DEWNR online mapping), and
- Biological Database of South Australia.

The information was used to identify:

- biological surveys previously undertaken in the area
- flora and fauna species known to occur in the area
- conservation significant flora and fauna species likely to occur in the area
- vegetation communities in the area
- key habitat requirements for conservation significant species
- important fauna habitat characteristics.

5a

Field survey

A combined ecology/heritage field survey was conducted from the 11th to the 14th of November 2014. Field investigations focused on ground-truthing and supplementing the data collected during the desktop assessment. The ecology survey also focused on providing a comprehensive site assessment to meet the legislative and supplied Public Environmental Report (PER) guideline requirements, while the heritage field survey focused on the risk assessment and assessing the requirements for a cultural heritage survey.

Vegetation associations and condition

Data was collected as per the requirements of the *Native Vegetation Act 1991*. Vegetation associations were mapped and native vegetation patches were assigned a condition rating based on the Native Vegetation Council Significant Environmental Benefit (SEB) criteria, adapted from Stokes et al. (1998) and

Annotations for Submission by James E. Newcomer

What is this? DWLBC (2005) (see **Error! Reference source not found.**). The condition ratings reflect the quality of the vegetation and the level of disturbance. The extent of impact of the development on the native vegetation was assessed.

Condition	SEB ratio	% Indigenous cover	Overstorey condition description	Understorey condition description	Indicators	NVC Interim Policy (11.2.14)
Very Poor	0:1	<10%	No overstorey stratum remaining.	Complete destruction of indigenous understorey* (by grazing &/or introduced plants).	Vegetation structure no longer intact (e.g. removal of one or more vegetation strata). Scope for regeneration; but not to a state approaching good condition without intensive management. Dominated by very aggressive weeds. Partial or extensive clearing (> 50% of area). Evidence of heavy grazing (tracks, browse lines, species changes, complete depletion of soil surface crust).	Where proposed clearance is considered to be minor and of limited biodiversity impact, e.g. lopping of overhanging limbs only or minor clearance of shrubs in areas otherwise considered as highly disturbed.
	1:1	10-19%	Scattered trees in poor health and/or representing an immature stand.	Almost complete destruction of indigenous understorey* (by grazing &/or introduced plants) - reduced to scattered clumps and individual plants.		Where proposed clearance is in areas dominated by introduced species, the area of native vegetation is largely reduced to scattered trees; indigenous understorey reduced to scattered clumps and individual plants.
	2:1	20-29%	Scattered trees either immature in good health or mature in poor/moderate health. Alternatively, the dominant overstorey stratum is largely intact and is an immature stand (or regrowth), and is generally in poor health.			
Poor	3:1	30-39%	Dominant overstorey stratum is largely intact and is a moderately healthy mature stand.	Heavy loss of native plant species (by grazing &/or introduced plants). The understorey* consists predominately of alien species, although a small number of natives persist.	Vegetation structure substantially altered (e.g. one or more vegetation strata depleted). Retains basic vegetation structure or the ability to regenerate it. Very obvious signs of long-term or severe disturbance. Weed dominated with some very aggressive weeds. Partial clearing (10 – 50% of area). Evidence of moderate grazing (tracks, browse lines, soil surface crust extensively broken).	Where the proposed clearance is of mostly intact overstorey vegetation but there is still considerable weed infestation amongst the understorey flora.
	4:1	40-49%	Dominant overstorey stratum is largely intact and is a healthy mature stand with high wildlife habitat value (e.g. hollows).			

Botanical Enigmerase methodology

The second survey conducted by BE Consultants included the following methodology :

5a

The vegetation on the property of the proposed Kangaroo Island Golf Course Resort was surveyed during October 2014 in accordance with the methodology outlined in *Heard and Channon 1997*. Ten 30m x 30m quadrats were located on the property. The quadrats are located near proposed native vegetation clearance and in different vegetation communities, including cleared land, Figure 2.

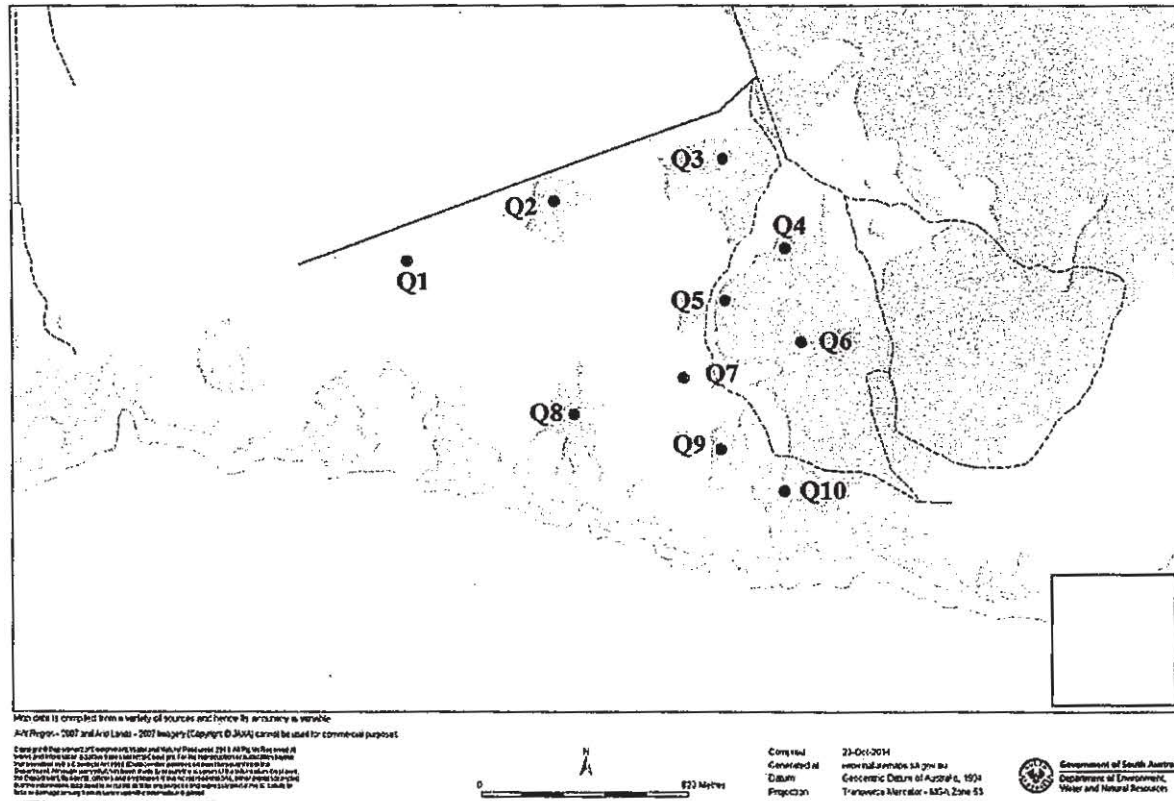


Figure 10- Vegetation Survey Quadrat Locations (Prepared by BE - Appendix K)

6.6.2 Kangaroo numbers

Western Grey Kangaroos (*Macropus fuliginosus*) were recorded in high numbers and Tammar Wallabies are also reported to occur in high numbers. The advent of irrigated green feed per the golf course and access to a permanent water source will increase grazing pressures. Management of kangaroos will therefore be a necessity to successfully restore native vegetation and achieve SEB offsets on site, as well as a reality to maintain a golf course to the desired international standard. A Kangaroo Management Plan will therefore be developed in conjunction with DEWNR and surrounding landholders, identifying the management aims, control strategies to be adopted and any potential issues.

Management options may include:

- Monitoring of kangaroo numbers
- Fencing (e.g. around the golf course perimeter; around native vegetation patches to be restored or around revegetation areas)
- Culling to reduce total population size.

6.6.3 Substrate, hydrological impacts and surface drainage

Much of the site is covered by surface limestone. It is envisaged that mechanical removal may be required to develop the golf course greens where these outcrops occur. This will need to be done in a sensitive manner with consideration of potential heritage issues and stockpiled where there will be no impact on native vegetation. Golf construction in the coastal dunes system will include significant erosion mitigation initiatives including extensive grass and tussock planting to ensure ongoing dune stability.

There is little to no surface drainage across the site due to the poorly consolidated fine to coarse fossiliferous calcareous sands which are estimated to be in excess of 40m in depth and are in areas overlaid by calcrete formations. It is highly unlikely therefore that in the event of any overwatering taking place that this will have any detrimental impact on the ground water system.

6.6.4 Conservation of significant flora

Kangaroo Island Mallee (*Eucalyptus phenax* ssp. *compressa*) is endemic to SA. It has a restricted distribution, occurring in scattered locations on north-eastern Kangaroo Island and the southern Fleurieu Peninsula (DEH 2008). This species had a scattered and patchy distribution within one of the vegetation associations recorded on site (Vegetation Association 5). Clearance of this association will generally be avoided to prevent impact on this species.

6.6.5 Conservation of significant fauna

Of possible conservation-listed fauna six species of significant fauna are known to occur within or in close proximity to the project area:

- Common Brushtail Possum;
- Heath Goanna;
- Hooded Plover;
- Osprey;
- Scarlet Robin and ;
- Sooty Oystercatcher.

Three species were determined as likely to have potential habitat and or potentially occur on site, being:

- Shy Heathwren;
- Southern Emu-wren and the;
- White-bellied Sea-eagle.

Three species were determined as possibly occurring on site:

- Cattle and Great Egrets, and the;
- Southern Brown Bandicoot.

Occurring on site:

2f

The Common Brushtail Possum, listed as rare under the *NPW Act* is an adaptable species and is unlikely to be negatively impacted by the proposed development. In contrast, there may be an issue with possums impacting on revegetation efforts as well as possums being attracted to visitor areas and alternative food sources.

Heath Goanna, listed as vulnerable under the *NPW Act*, are found in heath, open forest, sand dune, coastal and woodland habitats. Individuals require large areas of habitat and termite mounds for nesting purposes. They feed on road kill, birds, eggs, small mammals, invertebrates and other reptiles. An increase in road traffic associated with the development could result in an increase in Heath Goanna road deaths, which could have a significant impact on the local population. It is recommended that any road kill

How would
this removal
reduce the
impact on
the species
?

should be reported to the KI Natural Resources Centre (KINRMB 2014). Speed limit restrictions should be enforced and road kill removed from the roadside to reduce the potential for impact on this species.

Hooded Plover, listed as vulnerable under the *NPW Act*, occur mainly on sandy ocean beaches, with most found around the tideline. The total population in SA is estimated at 540 birds (Natt and Weston 1995), with 220 birds counted on Kangaroo Island in 2012 (Gillam and Urban 2013). Hooded Plover generally prefer beaches backed by dunes rather than by cliffs. Breeding is carried out on ocean beaches; nests are a depression in the sand usually in association with dry seaweed and located above average high tide levels up into the primary dunes. The nesting season extends from August to February. Given the vulnerability of nest sites and the potential for disturbance to shorebirds, it is recommended that human access along the coastline is minimised. Pets (e.g. dogs and cats) should be prohibited from the golf course site.

The Osprey, listed as endangered under the *NPW Act*, typically occurs within coastal waters and estuaries. Osprey are common around rocky shorelines, Island and reefs and breed autumn to spring typically on a high coastal headland, cliff top or offshore Island. Although high rock stacks were not observed along the coastal fringe of the project area, a known Osprey nest has been recorded east of the site. A single Osprey was observed flying low along the coastal fringe directly adjacent to the project area. The breeding population in South Australia was estimated at 52 pairs in 2005. Breeding sites on Kangaroo Island are considered vulnerable to human disturbance. The main threat to the Osprey is considered to be loss, degradation or alteration of habitat for urban or tourism development. Ospreys typically shy away from human contact and can be easily flushed if disturbed around either the nest and/or during foraging behavior. The noise and activity during construction, and human activity during operation of the golf site could result in this sensitive species no longer utilising the general area and abandoning nearby nesting locations. Protecting breeding habitat by establishing buffer zones around both active and non-active nest sites will aid in minimising impact to this species. It is therefore recommended that a buffer of 1000 m be adopted around known Osprey nests during sensitive breeding times. If the species is found to utilise the immediate area around the golf course (e.g. for nesting or foraging), then further management measures may be necessary.

The Scarlet Robin, listed as vulnerable under the *NPW Act*, on Kangaroo Island is intermediate between the two subspecies: *Petroica boodang boodang* (South-East SA, Mount Lofty Ranges, Southern Flinders Ranges) classified as state Rare and *Petroica boodang campbelli* (Eyre Peninsula) classified as state Vulnerable, and that on the southern tip of Yorke Peninsula which has not yet been identified to subspecies level. In this case, the precautionary principle is adopted with the population of Scarlet Robin on Kangaroo Island defined as being the one with the most significant conservation rating of vulnerable. Direct impact on this species may be caused by the removal of suitable habitat; impact should be minimised in the way of limiting the removal of potential habitat for this species (which is represented by Association 4: *Eucalyptus oleosa* / *Eucalyptus gracilis* / *Eucalyptus rugosa* mallee).

The Sooty Oystercatcher, listed as rare under the *NPW Act*, is strictly coastal, typically found within 50 m of the coastline. It prefers rocky shores but can also be observed on coral reefs or sandy beaches near mudflats. The Sooty Oystercatcher breeds in colonies generally on the ground amongst pebbles or shells on rocky shores or cliffs. Given the sensitive nature of the Sooty Oystercatcher, it is recommended that disturbance along the coastline (which abuts the project area), is minimised.

Annotations for Submission by James E. Newcomer

T The only rated species observed on the property are tree species which maybe as a consequence of the high browsing pressure from kangaroos.

2b It is clear that the primary initiatives required to establish plant recovery and rehabilitation include management of the local of kangaroo/wallaby populations and possibly a controlled burn of large areas of the project site. Aligned with these proposals is an extensive planting program that would be part of both the golf course landscaping and the meeting of any requirements of the Native Vegetation Council Policy in providing for clearance off-sets required based on the condition of the native vegetation to be cleared and whether or not there may be threatened species present.

Access to the property is along Davies Road from Hog Bay Road. Parts of this road are narrow and overgrown with native vegetation. The native vegetation will require clearance in accordance with the Kangaroo Island Council Roadside Vegetation Management Plan to enable construction and operational vehicles to access the site.

6.6.8 Noise and light pollution

Light and noise associated with construction may have short-term impacts on fauna utilisation of the area. The nocturnal species present will adapt to noise and light associated with the golf course operations.

As noted by the environmental consultants the Tammar Wallaby and Common Brushtail Possum were noted during surveys as being mostly active at night and stayed within the native vegetation.

The development is proposed to occur outside the areas habited by the majority of nocturnal animals and as a result the impact will be extremely minimal.

G It is not envisaged that light emitting from the development will have minimal impact of the nocturnal fauna.

6.6.9 Weeds, feral animals and plant pathogens

Weeds

The most significant weed issues present were African Boxthorn (*Lycium ferocissimum*), Bridal Creeper *Asparagus asparagoides f. asparagoides*, Lincoln Weed (*Diplotaxis tenuifolia*) and Onion Weed (*Asphodelus fistulosus*). Active control works have been undertaken for African Boxthorn, with the plants left in-situ in large piles prior to burning.

2a

It is noted that much of the project site including all plant associations, has to a greater or lesser extent weed invasion. This is due to previous grazing regimes and clearance for cattle and the current high level grazing by the herd of kangaroos/wallabies. The vegetation survey of the quadrats by BE consultants identified 18 introduced plant species within the quadrats of which 3 are proclaimed. It was generally noted that many of the weed species were located in areas frequently occupied by kangaroos.

The introduced weed species, particularly the proclaimed species, will outcompete indigenous plant and in the instances of Bridal Creeper *Asparagus asparagoides f. asparagoides* African Boxthorn *Lycium ferocissimum* and Lincoln Weed *Diplotaxis tenuifolia* can have a highly destructive effect on the opportunities for any existing indigenous small plants and shrubs to regenerate.

The advent of land development of the project site in the form of a golf course, practice facilities, buildings, access and infrastructure will introduce a significant level of land use and land management that does not presently exist. In this regard three standout effects of increased human habitation of the development include:

- Active weed control. The success of the development will be heavily dependent on the consistent presentation of a championship-level golf course. This, in turn, is reliant on an environmental management plan (EMP) that includes initiatives to ensure effective maintenance of the golf course and its surrounds. In particular there is an emphasis on control of invasive weed species, especially those listed as proclaimed which presently infest parts of the project site to the detriment of indigenous plant species. It is also noted that recommendations incorporated in the ecological assessment reports for controlling fairway grass spread will be adopted in the EMP.
- Kangaroo management and control. Much of the degradation in evidence on the site is due to heavy grazing by numerous kangaroos and wallabies. An adopted EMP, of necessity, includes measures to control kangaroo numbers on the site. It is noted that the introduction of irrigation and new grasses for fairways, tees and greens will attract a greater number of the mammals to the site to the detriment of the quality of the course and surrounds. Initiatives to counter this attraction and reduce current numbers are therefore seen as essential components of any EMP.
- Proposed landscaping of the golf course and surrounds will comprise of extensive indigenous planting which will assist in the suppression of weed invasion.

Annotations for Submission by James E. Newcomer

Feral Animals

There was one feral cat (*Felis domestica*) recorded during the BE survey.

Pathogens

Phytophthora is a parasitic fungus that lives in the soil and attacks the roots of plants. Although there are many different species, cinnamomi is the most frequently associated with dying vegetation. In South Australia, dieback caused by Phytophthora has been found in a number of sites that are within high rainfall areas, including Kangaroo Island (TSA 2000).

There is no record or sign of Phytophthora occurring on the site, however Kangaroo Island is classified as a high risk area and as such its control is detailed further in the EMP (refer Appendix N).

6.6.10 Road related fauna death and bird strike

The primary fauna species likely to be impacted upon along the roads leading to and within the proposed Kangaroo Island Golf Course Resort road network is the kangaroos.

The implementation of speed limit restrictions (day and night) and the limiting of vehicle activity at night will mitigate against fauna road kill.

It was noted in BE's report that birds strike windows for three reasons;

1. Birds see a reflection of the trees, sky and landscape but do not see the window;
2. Lights attract the birds at night; and
3. Birds see their reflection, attacking it during breeding season.

With these considerations in mind the following building design initiatives are included;

- Windows design slightly so they are slightly tilted downwards, slightly off vertical. The window as a result will reflect the ground and not the landscape.
- Install double-hung windows, which have the screen on the outside of the glass.
- Detailed window design to minimise the full see through attributes of the building.

6.6.11 Fauna management and golf course activity

2b, d
Direct
contradiction

The project views the presence of native fauna as a vital component of the development. This is because a significant number of international guests are expected to visit the site and these visitors will inevitably expect to find the eponymous kangaroos on site. Indeed, the kangaroos and wallabies in particular are envisaged to be a hallmark of the site.

However, it is recognised that the current kangaroo/wallaby population and the proposed golf course are conflicting. This is because the likely damage of such present numbers would cause to the playing surfaces, revegetation programs, and visitor safety and amenity.

It is acknowledged that the number of kangaroos and tammar wallabies and associated grazing pressure is only likely to increase under an irrigated scenario where kangaroos have access to green feed and a permanent water source.

Both environmental consultants have acknowledged that the management of kangaroos will be a necessity to successfully restore native vegetation and achieve SEB offsets on site, as well as a reality to maintain a golf course to the desired international standard. A Kangaroo Management Plan should be developed in conjunction with DEWNR and surrounding landholders.

6.6.12 Fauna access around and through the project

2e

A predominant biodiversity measure to be undertaken is a kangaroo management program. This will invariably include fencing of perimeter area to deliberately limit kangaroo and wallaby numbers on the property. This initiative will possibly result in a significant increase in kangaroo numbers on abutting properties and roads.

However the introduction of extensive revegetation works in combination with an overall property management plan including a rigorous golf course maintenance regime will provide fauna linkages throughout the site. This will invariably attract feral animals however, these will be controlled as part of the ongoing operational management plan of the site.

6.7 Coastal Environment

5a The project site, on account of its history and cattle grazing and its current high population of grazing kangaroos and wallabies, is in a degraded state. In particular, the coastal dunes, limestone, and calcrete formations associated with the heathland shrubland communities are significantly prejudiced by invasive weed infestation.

Apart from the advent of the golf course on its own, two principle initiatives will act to substantially arrest this degradation while rehabilitating extensive areas in all three formations.

These are the;

1. Implementation of a kangaroo management plan
2. Extensive revegetation works, particularly in the coastal dune areas where proclaimed weeds are to be removed and their soil stabilisation capabilities replaced with pioneer plants including shrubs, grasses and groundcovers.

5b The golf course is to be constructed on these land formations. The proposed links golf course is fundamentally comprised of couch grassed fairways and tees, bent grass greens, a limited number of constructed hazards, natural hazards (e.g. sandy wastes), and abutting rough landscape zones. Each of these elements comprising the overall golf course require maintenance to a greater or lesser degree. This maintenance and the plant material afford significant stabilising and rehabilitation opportunities to previously extensive areas of degraded land.

The physical integrity of the golf course is dependent upon the stabilised coastal environs where golfers experience a combination of the proximity of the savage sea shore and the dramatic landscape of the cliffs, exposure to the raw elements, with a strong sense of isolation.

4e This ability to play golf "on the edge" is seen as a fundamental attraction of the project. The initiatives to be taken to ensure the ongoing viability of the coastal golf holes include extensive measures to stabilise and remediate sand drift within the dune system. In short, sand drift is incompatible with the planned execution of the golf holes within the coastal dune areas.

On account of the elevated location of the coastal golf holes in relation to the sea shore, it is not envisaged that any expected rise in sea level will have an impact on the project.

Following recommendations of both environmental consultants, the coastal walk proposal is removed from the overall proposal.

6.8 Marine Environment

The site is made up of two distinct formations; The Bridgewater formation and the Saint Kilda Formation. Both formations consist of quaternary sands and are often interspersed due to the nature of wind driven deposition. The Bridgewater formation generally comprises poorly consolidated yellow pinkish-brown fine to coarse fossiliferous calcareous sand that may be locally capped by calcrete. The Saint Kilda formation consists of undifferentiated marine sediment that is calcareous, fossiliferous sand and mud of intertidal sand flats, beaches and tidal marshes.

The subregion is predominantly formed from windblown quaternary age sediments and the surface topography is generally undulating with jumbled dunes and long dunes fronts in areas of deep sand. Shallow stony soils on calcrete deep sands dominate these land types and these are loamy and calcareous throughout and as a result there is little or no surface drainage.

4d ————— Geological investigations have concluded that;
'The absence of a confining layer of low porosity sediments and depth to groundwater indicates that any excess surface irrigation within the development site would be insufficient to infiltrate to the water table. Subsequently, there would be no local rise in groundwater levels or groundwater mounding inducing increased recharge to groundwater systems and discharge to receiving environments.'

The combination of the existing geology, the surficial dunes of deep sand and the strict irrigation and fertilising regimes proposed will ensure that the risk of nutrient leakage per drainage to the marine environment will be at a minimum.

The proposal includes on site waste water treatment resulting in a class of water discharge entirely suitable for irrigation of golf landscaped areas. It is such irrigation which is planned to meet the transpiration requirements of the plant mass in these irrigation areas. This ensures minimal if any contamination of ground water.

Water for golf course irrigation is predominantly from on-site dam water filled from the Middle River Dam. As such it holds a high class of classification and is not seen as any source of contaminants.

1 The production of a healthy turf grass sward, essential to a championship golf course, will require nutrient inputs from fertilisers. A sound nutrient management plan is required in this instance to ensure the supply of nutrients to the turf meets turf requirements while minimising any environmental impacts. At the project site slow release and controlled release fertilisers are to be incorporated into the fertiliser management plan (as described above at **Sec 4.5**). These fertilisers will decrease the risk of ground water contamination when compared to soluble based fertilisers. Furthermore, the testing of the nutrient levels of the soil profile will be adopted as part of the course management plan. Data on the essential elements of plant growth in the soil is used to determine the exact quantities and ameliorants which are required for optimum results. In this regard soil and leaf testing is undertaken regularly to ensure the plant is maximising its inputs.

Annotations for Submission by James E. Newcomer

It is proposed to implement the latest in irrigation technology whereby advanced systems will be employed to distribute and monitor water usage across the site. In particular the irrigation distribution will be applied only to meet the transpiration requirements of the plant thereby limiting the amount of water reaching the underlying groundwater table.

The combination of the existing geology (see above), targeted irrigation and appropriate fertiliser application with soil and leaf tissue testing will result in minimal if any groundwater contamination.

4c&d The golf course will require from time to time the application of herbicides, pesticides, fungicides and fertilisers to ensure ongoing healthy grass growth and the optimal playing surfaces at all times of the year. The application of these chemicals are predominantly surficial and are strictly applied in accordance with industry best practice. On account of its coastal location, chemical application will be at a minimum and hold a high degree of rain and irrigation fastness thereby improvising its targeted effectiveness.

6.9 Geology and Soils

4 6.9.1 Geology

In the vicinity of the development area, both the Quaternary sediments of the Bridgewater Formation and the Saint Kilda Formation have both been identified from drill hole logs from ground surface to a depth of greater than 40 m. None of the drill hole logs have indicated complete intersection of these formations by identifying a deeper unit (Alcoe and Berens, 2012) hence the total depth of these formations in the area is unknown.

The Bridgewater and Saint Kilda Formations consist of Quaternary sands and are often interspersed due to the nature of wind driven deposition. The Bridgewater Formation generally comprises poorly consolidated yellow pinkish-brown fine to coarse fossiliferous calcareous sand that may be locally capped by calcrete. The Saint Kilda Formation consists of undifferentiated marine sediment that is calcareous, fossiliferous sand and mud of intertidal sand flats, beaches and tidal marshes.

The Bridgewater Formation has been logged on site in an abandoned drill hole as calcareous sand and variably consolidated sandstone with fragments of limestone. The lithological log gives an indication of the stratigraphy to be encountered in drilling investigations (Refer Appendix R).

4c The surface drainage patterns follow the site contours with the low point of the site being located in north-west corner of the site at the termination of Cathers Road. An off-site ridge running North-East to South-West some 700m to the North of Cathers Road prevents any surface drainage from the project site to Pelican Lagoon and the marine environment in that vicinity.

Geological investigations have concluded that;

4d

'The absence of a confining layer of low porosity sediments and depth to groundwater indicates that any excess surface irrigation within the development site would be insufficient to infiltrate to the water table. Subsequently, there would be no local rise in groundwater levels or groundwater mounding inducing increased recharge to groundwater systems and discharge to receiving environments.'

It is emphasised that water and its availability is the 'linchpin' to the project. The water for the project is accordingly regarded as precious and limited. After extensive and detailed research the decision is taken to meet the water requirements of the project primarily through piping from the Middle River dam. The arrangement for such water acquisition is both limited and expensive on account of distance and the 'window' of time during which water can be supplied. Each and all of these factors accentuate value of the saved water. In light of this situation it is considered imperative that the application of the water resource to both irrigation and domestic use is carefully managed. This is especially so in respect to irrigation of the golf course where the latest apparatus for the most precise application with minimal wastage (flow away) will be utilised. In short water leakage to sub surface drainage will be at a minimum due to the irrigation regime and its precision.

6.9.2 Erosion and soils

4e

The areas in and around the southern boundaries of the project site are mainly comprised of dunes which consist of calcite outcrops. A combination of the prevailing winds and kangaroo grazing have rendered this part of the site marginally unstable and leaves the area subject to potential sand drift and blow outs. It is imperative for the physical integrity of the golf course in these areas that erosion processes are controlled. Such controls include indigenous shrubs, grasses and groundcovers plantings and kangaroo management. In certain instances it will be necessary to fence off replanted areas of the site where erosion sensitive areas are considered moderate or high. The construction of the golf course, accompanying landscaping and its subsequent ongoing maintenance regime will result in a substantial reduction in the occurrence of sand drift and blow outs.

Calcrete, also called Hardpan a calcium-rich duricrust, is a hardened layer in or on a soil. It is formed on calcareous materials as a result of climatic fluctuations in arid and semiarid regions. Calcite is dissolved in groundwater and, under drying conditions, is precipitated as the water evaporates at the surface.

Calcrete outcrops may cause problems for cultivation on account of an impermeable calcrete layer prevents water from draining properly, which can keep roots from getting enough oxygen. Salts can also build up in the soil due to the lack of drainage. Both of these situations are detrimental to plant growth. In addition, the impermeable nature of calcrete outcrops prevents plant roots from penetrating the bed, which limits the supply of nutrients, water, and space so they cannot develop normally. Finally, calcrete outcrops can also cause the surrounding soil to be basic. The basic soil, along with calcium carbonate from the calcrete, can prevent plants from getting enough nutrients, especially iron. An iron deficiency makes the youngest leaves turn yellow. Soil saturation above the caliche bed can make the condition worse.

In the context of the golf course layout, the existence of these outcrops is seen, in a number of instances, as an opportunity to introduce a "natural" hazard into the golf design. These will be an intrinsic part of the golf course and contribute significantly to the overall character. In the instances where they are retained, they will be left untouched. In other instances where they may intrude upon planned grassed fairway, the areas of calcrete outcrops will be hoed and blended with topsoil and subsequently planted.

6.10 Groundwater and Site Contamination

A hydrological report has been prepared providing a summary of the local hydrology of the site to inform drilling investigations in the supply of likely available water sources for the proposal. (Ref Appendix R). The scope of work in this report includes:

The scope of work input to this report is:

- research and collation of available hydrogeological literature;
- a review of drillhole data; and
- the production of maps with relevant data.

The report found that in general the groundwater resources across Kangaroo Island are limited in both quantity and quality with good quality groundwater available only in short supplies. The project site is no exception. In regard to ground water it is found that;

"The south coast has the thickest cover of the Bridgewater Formation, logged near Flour Cask Bay, and good quality groundwater may be found where higher recharge occurs. It is unlikely that this will be located within the development site as the lowest salinity groundwater occurs in the southwest where that highest rainfall occurs and drillhole data does support this...Throughout Kangaroo Island water wells predominantly have yields of less than 1 L/s, which will not accommodate the needs of high volume use. Supplies suitable to meet the demands of golf course irrigation and the related facilities will need to target brackish aquifers with higher yields of over 3 to 5 L/s and a bore field with a balancing storage will likely be required to meet desalination and distribution flow rates."

4d

Drilling investigations will be required to confirm groundwater suitability and variability across the site in terms of salinity and yield for consideration as a desalination water supply option.

The report is quite specific in relation to groundwater available on site in so far as it states "Groundwater data, presented on Figure 1, shows drillholes in the site vicinity intersecting high salinity water at 12,000 to 17,000 mg/L to a depth of 40 to 60m. Yields are either undefined or very low with the deepest bore yielding less than 0.5 L/s...Relatively good quality groundwater of 1,000 to 3,000 mg/L has been found at shallow depth, with no yields recorded, approximately 3 km north of the site. These wells most likely access alluvium of limited groundwater supply and suitable for stock watering rather than larger water requirements."

This latter site was visited with the aim of establishing water yield. Discussion with the owners revealed that the yield was less than adequate to meet the demands of the project, whilst its longevity was determined to be highly problematic. In short, the groundwater was found to be highly saline and in extremely limited quantities which very low rates of yield. There was no evidence on any contaminating factors in past or current use of the land leading to groundwater contamination.

In view of the known history of the site and its use for broad acre grazing and its subsequent retirement from active agriculture some 20 years ago, there is no evidence of contamination sources and therefore a preliminary site investigation conducted by a site contamination consultant in accordance with the National Environment Protection (Assessment of Site Contamination) Measure 1999, was not undertaken.

6.11 Sustainability and Climate Change

6.11.1 Power

The proposal, in its conception, planning and design is wholly shaped with specific objectives and strategies aimed at reduction of greenhouse gas emissions.

The proposal is principally based around the provision of a championship golf course. The fundamental nature of this land use is dependent on three main elements; appropriate land; water availability for turf establishment and maintenance; and power for both the effective dispersal of the irrigation and operation of the golf resort.

The major determinant of the main demand sources for power are the base load needs of the irrigation pumping system and the clubhouse. The total power requirements (minimum 455kVA) were considered unable to be met from the principle renewable energy sources on-site, i.e. wind power and solar energy.

It was therefore imperative that two other main sources were investigated. These include;

- extension of existing power lines from Hogs Bay Road at Pelican Lagoon to the site; and
- the use of multiple diesel generators automated to come on line with demand.

The use of diesel powered generators was ultimately discounted on the basis of long term operational costs. However a generator will be included in the overall site infrastructure as a back up to sudden power loss from the elected power sources.

After extensive negotiations with South Australia Power Networks (SAPN) the decision was made to opt for the connection to the existing grid with various modifications to meet the project's base load needs.

Annotations for Submission by James E. Newcomer

- Use of timber from certified sources;
- Minimum use of pressure treated timber;
- Use of high efficiency heating and cooling equipment, lights, appliances and water fixtures;

6.11.4 Waste and material management

1

A Waste Management Plan is to be established that will:

- Assess the wastes being generated;
- Determine current disposal costs;
- Identify options for waste management which are economically and environmentally suitable; and
- Include a component of staff education so that all are aware of waste minimisation.

Further, the recycling initiatives will include:

- Scrap metals and batteries to metal recycling yards;
- Glass through the local council or recycling centre;
- Cardboard or paper through the local council or contractor ;
- Motor oil and hydraulic fluid to be treated via a WaterStax system or similar to be reused on course.

The materials used for the built form will be sourced from the Island itself and the mainland. In particular, significant quantities of the in-situ limestone, which is to be quarried and milled on site, will be used for the purpose of lower wall and feature cladding on both the clubhouse and lodges. Where possible all other building materials will be resourced from local suppliers on the Island.

6.11.5 Environmental management initiatives for long term sustainability

The proposed development is planned to be an eco-friendly initiative. To ensure that such a claim (upon which the resort will be heavily marketed to its interstate and international clients) holds substance a range of management plans and strategies are to be incorporated to ensure long term sustainability of the resort. These include the most effective application and monitoring programs in course maintenance; the active promotion of power saving and carbon footprint minimisation to both staff and guests; an ongoing revegetation program as part of a carbon offset; and the promotion of walking and passive recreation. Local food and produce will be promoted to reduce the environmental costs associated with transport and shipping apart from emphasising "the Kangaroo Island" brand.

7.0 ECONOMIC ISSUES

7.1 Economic analysis and benefits

From an economic perspective the following statistics are basic budgeting elements of the proposal:

- Golf course construction and building development: est. \$14 million.
 - Local contribution: est. \$6 million.
 - Full operational accommodation rate: est. 22,000* visitor nights p.a.
 - Golf usage: est. 20,000* rounds p.a.
- * These figures are expected to increase by up to 25% with the advent of airport and ferry upgrades.

- Average cost of golf per round est. \$125.00 (current day values).
- Average spend per visitor including accommodation, but excluding golf, is envisaged to be \$320.00-\$350.00 per day.
- On site employment est. up to 60 persons.
- Total annual revenue est. \$9.5M
- Total annual costs est. \$8.4M

Annotations for Submission by James E. Newcomer

8e The long term economic viability of the project has been examined and on the basis of the projected figures for accommodation rates and golf rounds per annum it is envisaged that the prime investment in the project will return a nett 7.5% per annum (at current day rates). This does not allow for revaluation and inflation 'creep' in base asset values. An identified key driver of both this current proposal and other major developments on the Island is visitor access to the Island and the cost of such travel.

The operational development will generally engage locally based staff as the Island will provide a steady recruitment source. This will have the effect of minimising the high turnover rates experienced by many tourist developments. Island residents will be employed and trained as appropriate. Furthermore, there will be an inevitable flow-on effect to the Island in total. These positive economic effects will be experienced in goods and services where for example, local transport will be required, maintenance supplies and services and food and beverages will be directly supplied from the Island and sold on site to visitors.

The exception to this may be the importation of the head hotel/clubhouse manager, the course superintendent and the golf manager. The talents and capabilities of these individuals will, in all likelihood, not be available on the Island. On-site accommodation for resort staff is provided as part of the development proposal. It is expected that a majority of resort staff will reside off-site generally in the townships of Penneshaw, Kingscote and the settlement at American River all within some 35 km from the site.

The revenue (visitor 'spend') will have an obvious overall 'multiplier effect' calculated at between 2.0 and 2.5 based upon analysis of specific industry contributions as derived from "*THE ECONOMIC IMPACTS AND BENEFITS OF TOURISM IN AUSTRALIA - A GENERAL EQUILIBRIUM APPROACH*". (Refer appendix L)

The proposal will provide much needed high-end accommodation options on the eastern end of the Island, (i.e. the Dudley Peninsula). Set in an environment that typifies the spectacular coastal scenery that is iconically Kangaroo Island the proposal will result in the creation of a highly viable tourism opportunity whilst offering a top calibre accommodation base from which to explore the attractions throughout the Island. In this regard it will invariably be of significant enhancement to the tourism opportunities of the Island.

It is an adopted strategy by KIFA in its tourism planning to attract greater overnight stays. The proposed accommodation provision of the resort will go in some way to meeting an identified demand for high end accommodation. This is particularly relevant to the current situation to international and interstate 'day trip' visitors from the mainland partly on the basis of a lack of upper end accommodation. The proposal is identified as having the strong likelihood of converting 'day trippers' to extending their visits to more than one night.

7.2 Tourism and investment opportunities

The principle basis for establishing a world-class golf facility and residential component at the location is to provide not only golf in a quite isolated, scenic and natural setting but also to afford a high-end level of accommodation from which golfers and other guests can both explore the Island as a whole (by car or escorted bus touring) while having direct access to spectacular coastal walking tracks for which the Island is renowned.

T
8a
The proposal is unique on the Island and aims specifically to capitalise on golfers, either individually or in groups, from both Australia and internationally, whose desire is to play or high quality golf courses located in situations marked by dramatic scenery and ambience. The combination of on and off-site wildlife, coastal scenery, the remoteness, challenging golf in an exposed links-style environment and being on an accessible part of Kangaroo Island is regarded as being highly attractive to this particular golf market. This is typified by similar golf complexes that have been relatively recently developed throughout Australasia including Barnbogle in Northern Tasmania, Cape Kidnappers and Kauri Cliffs on the North Island of New Zealand and, more recently, Cape Wickham on King Island, Bass Strait. The business model for such developments has been imported from the long-established and proven golf tourist market of the United Kingdom and Ireland where areas on these Island's coastlines afford golf in wild, natural and open conditions whilst the ancillary drawcards include direct experience of specific local cultures, e.g., the Maori heritage associated with the Bay of Island (Kauri Cliffs, NZ), Galway Oyster Festival (Connemara, Ireland), cool region wines in Northern Tasmania (Barnbogle), etc.

Can 3-4 star be considered as high-end, high class or high quality ?

The proposal plans to create high quality lodge and 'condominium' style accommodation. Apart from targeting and identified need for such accommodation on Kangaroo Island there is, through this initiative, a positive strategy to retain visitors for longer than is currently the case. This is particularly so with reference to international visitors who, for the most-part, are limited to either a bus day-trip from Adelaide or a one or two day stay allowing restricted access to the full range of tourist attractions on the Island. In particular, the larger condominium style accommodation units are proposed to specifically cater for family groups where one or two members may have a golf interest while the other family members can use the facility as a base to enjoy both the immediate off-site attractions, (e.g. wildlife and coastal walks, and the wider, more distant tourist drawcards of the Island).

In summary, the location of the proposal, with its high class accommodation and golf facilities, provides a distinct addition to the range of attractions on the Island while being fundamentally consistent with the brand equity of 'Wild, Rugged, and Coastal'.

The front up investment in the proposal is estimated to be \$14M. This in itself is regarded as a major singular investment in the Islands tourist development. The proposals status as a Major Project by the State Government recognises the significance of this investment. As previously mentioned, the multiplier effect of such direct investment is estimated between 2.0 and 2.5.

The advent of the planned est. 22,000 visitor nights per annum will have substantial beneficial effect on the provision of small local business that will provide goods and services to meet the demands of the onset of this new Island patronage. For example, local beekeepers would be expected to provide the honey to meet a new demand and sales volume of the Island's unique produce could be legitimately expected to leap. A similar situation will prevail for other Island micro businesses.

8h

The increase of visitor numbers to the Island facilitated by the proposal will have two major economic effects on the Island. These are seen as a heightened demand for improved access to the Island. (e.g. the proposed airport upgrade and new ferry). The current services and their schedules would be unlikely to service the new demand. Therefore it is confidently anticipated that both these initiatives will be undertaken resulting in the ground being laid in the creation of circumstances most favourable for the high growth scenarios in the KIFA strategic tourist plan which see a growth scenario for tourism of 7.9% p.a. and 86% over an eight year period with the doubling of visitor expenditure.

Secondly, the proposal will provide another tourist precinct to the Island. Being sited on the Dudley Peninsula on the eastern part of the Island the operation of the facility will add to the attraction of the Penneshaw, American River and Kingscote tourist precinct. This will have inevitable spin offs to the local suppliers of goods and services in the area.

7.3 Mitigation strategies in case of project failure

In the event of the project ceasing during the course construction, the following exit strategies would apply;

8a

- Inventory is to be taken of all work carried out, work completed, work in progress and tasks to be done to carry out to completion.
- Vegetation clearance is to be halted immediately with notation made of new plantings and offsets audited for NRV requirements including any potential cash payment as obligated contribution.
- Stabilisation measures to be carried out to all exposed areas of the site which would otherwise be threatened by erosion. This is to be completed prior to site evacuation.
- Remove critical golf course infrastructure items such as irrigation pump stations and control systems.
- Demobilisation of construction compound and associated infrastructure including power and water connections.
- Remove and cease all kangaroo management control measures.

Does this imply bringing the former kangaroo population, a regular attraction for this site, back to life?

8.0 SOCIAL ISSUES

8.1 Employment opportunities

8g
conflicting number
?

The proposal will generate significant local employment opportunities. During construction phases it is expected that the site will engage up to 60 persons including course construction and erection of the buildings, maintenance facilities, dam excavation and landscaping. At full operation it is estimated that the overall complex will employ up to the full-time equivalent of 30 persons including hospitality, golf operations, housekeeping and hotel management, course maintenance and landscaping. The facility's development will be relying on the local community to supply both skilled and unskilled labour to meet the labour demands of the project.

8.2 Tourism opportunities

The proposal will create an impact on the existing tourism and recreation services including opportunities. The existing services to be impacted include:

1. Travel to and from the Island. The introduction of some 22,000 visitor nights per annum at the resort represents a significant and telling impact on proposed tourist growth scenarios and the present ferry and air transport schedules may not be able to accommodate this increase.
2. The introduction of some additional visitor nights represents a direct injection of some \$9.5 million into the Kangaroo Island economy per annum. The KI gross regional product was estimated to be \$217 million in 2011/12 (source *Econosearch - Economic Impact of Agriculture and Tourism – 2013*) with tourism representing some \$45.0 million or 25% of contribution to the Island's GRP. In 2011/12 figures the advent of the resort therefore alone represents an increase of some 21% to the overall tourism contribution to GRP. It is to be noted that this is without the multiplier effect of 2.0 to 2.5 that will permeate the overall Island economy.
3. The additional visitors will also increase demand for a range of tourist services including hire cars, personal drivers and guides outside of the resort, dining facilities in both the major settlements and chief tourist attractions, local produce including local wines, foodstuffs, Island souvenirs, fishing and wildlife excursions, amongst other services.

In summary, the resort will be a new tourist node generating a need for a wide range of tourist ancillary services that will inevitably open up opportunities for increasing tourist services particularly in the eastern part of the Island.

8.3 Likely impacts on surrounding land use and amenity

There is no conflict envisaged with adjoining primary production activities for the following reasons:

- Golf will be the principle broad acre land use and it is adequately buffered from abutting properties so that no impact or effect will be caused by the activity.
- The built component and its concomitant human activity will be far removed from abutting properties so that any potential conflict will surrounding primary production activities will be minimal.
- Surrounding land is used for low intensity grazing, indigenous bushland and coastal precincts. Each and all of these activities will have no conflict with the proposed uses on the project site.
- There will be an increase in traffic on Davies Road due to visitor and staff vehicular movements in private cars and buses. This will have some impact on residents of Davies Road.

The golf and lodge accommodation is located at a central position of the overall site. As such this component is situated at a middle site elevation that offers extensive on and off-site vistas and is sited to be directly abutting and physically connected to the golf course.

8i

G

The proposed land division of 5 new lots is located at a higher site elevation between 200 and 400 metres to the east of the clubhouse/lodge accommodation precinct. Each of these new lots has a building footprint included to ensure effective dwelling siting in minimise potential indigenous vegetation clearance and to ensure the buildings are erected below distant off-site view lines. It is proposed to include specific covenants on the new titles that will directly control building height and cladding materials.

G

In summary, there are no envisaged interfaces problems between the land division and the surrounding land.

G

This is not applicable as there will be no foreseen sensitive receiver's resident on site during construction and operation.

10.0 INFRASTRUCTURE

10.1 General

The site is currently without any available infrastructure. The following initiatives are proposed to meet the infrastructure requirements:

Gas: - Storage tanks for holding on-site LNG are to be provided in close proximity to the clubhouse/lodge accommodation precinct. Gas is proposed to be used specifically for in-house kitchen use and will be periodically recharged from LNG transport to the site.

Electricity: - connection to the existing grid with various modifications to meet the project's base load needs. It is proposed to provide a three phase service with a total maximum capacity of 400 volt, 688 ampere (475 kVA) from the existing 33 kVA line near Hog Bay Road and Davies Road, Pelican Lagoon. The main application of this power source will be in the operation of the irrigation pumps and the power requirements of the Clubhouse/Lodges and residential buildings on the eastern allotments.

Solar cells are to be installed on site to supplement and reduce reliance on the main power source as proposed by reticulation. This system will cater for all hot water and lighting requirements of the development.

Sewerage: - This will be treated and disposed of on-site through the use of 'Econocycle' technology described more fully in 5.7.7.

Stormwater management: - Careful site design is to be used to ensure ground surface stormwater is channelled to supplement landscape irrigation in the vicinity of the clubhouse/lodge precinct.

Waste management: - Requirements for waste will be met through on-site collection, assembling waste at a specific point on-site, transport to a council operated collection point and disposal by council either on the Island or on the mainland.

Communication systems: - It is planned that the building precincts of the site will be fitted with telecommunication technology to match the most recent advances in electronic telecommunications.

Power Supply

3e
G

Discussions with South Australia Power Networks have resulted in an offer to provide a developer funded substation near the intersection of Hog Bay Road and Unnamed Road. The substation is proposed to transform the power taken off the grid from Hogs Bay Road and affording the power supply to the site through a combination of above and below ground infrastructure.

- 3f The provision of the developer paid substation will have benefits to the community in the immediate region through the provision of additional power supply which would otherwise not be available. The substation will be designed in such a way so as to allow it to be expanded if the demand is warranted.

Water Supply

The water supply line from the tapping point at the Playford Hwy -Milk Tack corner will generally follow the Hog Bay Road alignment. In this regard it is noted that Middle River Dam water that would otherwise overflow and go out to sea, is to be used to supply the project's irrigation dam during the winter months. Furthermore, the environmental flows vital to the ecological systems that thrive downstream of the Middle River dam will not be prejudiced by the proposed take-off of water during the Winter period. The supply line running along Hog Bay Road will offer numerous opportunities to nearby land owners to tap into the water pipe during periods outside the overflow and purchase water allocations at the nominated SA Water rate. The form of this pipe will be a 200mm diameter pipe in accordance with SA Water specifications and guidelines. This initiative is outlined in more detail below **Sec. 10.2.**

Hard waste disposal

The waste disposal requirements of the proposal may require an extension to Council's land waste disposal facilities. At this point it is envisaged that present capacities will be able to absorb the expected waste generated.

Firefighting

Water storage will be available for firefighting purposes around the golf course via the irrigation system and around the resort buildings per roof rainwater collection tanks. The water will be pumped to ground sprinklers in the vegetation around the resort buildings and to roof-mounted sprinklers with hose reels located strategically around the grounds. The residential lots will be required to dedicate an on-site water storage available for firefighting purposes and such storage will be met from roof water collection.

As the site is well served by the Telstra Mobile Phone network it is envisaged that golf players will be able to directly communicate with emergency services in the event of emergencies arising on the course.

Hog Bay Road is the main east-west highway that provides access to the Dudley Peninsula south of Pelican Lagoon and links to Penneshaw 16km to the east and Kingscote 38km to the north-west. The main access to the site from Hog Bay Road is via Davies Road which is a 2.3km heavily vegetated single lane unsealed road which intersects Cathers Road. It is proposed to widen this road to provide two lanes and such widening and additional road construction will result in limited vegetation reduction abutting the existing road. This intersection represents the north-east corner of the site. Cathers road traverses the northern boundary of the site and is a double lane unsealed road of 1.9km in length. Emergency vehicles can access the site via Davies and Cathers Roads and in extreme circumstances may be able to use the unnamed road on the western

Annotations for Submission by James E. Newcomer

boundary of the site allowing access direct to Hog Bay Road. Emergency access to the residential lots is via the proposed made road and a 3m wide made track on their eastern side. It is noted that the existing planting in this eastern part of the site has a number of areas that are open and grassed allowing for relatively easy vehicle movement. The future of such open areas is uncertain as they are partially a result of extensive kangaroo grazing and a kangaroo management plan may drastically alter this situation.

A dominant theme of the overall resort will be the eco friendliness of the facility. In this regard a Smart Energy Management System linked to a Property Management System that controls power supply and usage in occupied/unoccupied accommodation lodges and various areas of the clubhouse/guest areas and staff quarters will be installed and energy saving lighting and appliances will be used wherever practicable.

- 4b The power and water infrastructure installation will be undertaken using best practice design and construction. This is particularly so in regard to the installation of South Australia Water who will design the water connection between the site and the take-off point near the intersection of Playford Hwy and Milk track while South Australia Power Network (SAPN), which will be engaged to install the power connection from Hog Bay Road as described above, will provide all works in accordance with the appropriate latest Australia standards as well as adopted best practice design and construction standards.

Solar PV cell panels are to be installed in the maintenance/staff quarters area. Maximum power generation from this source is expected to be 80 Kw per day. In order to increase efficiency it is proposed to use photovoltaic modules equipped with a moveable mounting and a control system allowing the modules to precisely follow the course of the sun. Using an algorithm based on astronomical data the solar panels track the sun in line with not only the time of day but also the time of year and the precise geographic location of the photovoltaic installation. As a result of this initiative the panel's energy yield is more than 35% efficient than fixed systems. The proposed system is similar to that located at Kingscote Airport and installed by the Shire of Kangaroo Island.

- 3f It is not expected that the Kangaroo Island community will benefit from flow-on effects of the power SAPN installation other than the generation of employment opportunities during its construction phase. The exception to this may be the individual use of the proposed developer paid substation for local properties.

The water supply installation will have ancillary benefits for landholders on and close to Hog Bay Road, including American River residents, who would have a limited opportunity to tap into and purchase water during those times when the golf course is not collecting its requirements during the winter months. This would obviously be subject to the approval of the controlling water authority. There will also be employment benefits and opportunities during the line's construction and on-going maintenance.

10.2 Water

- 4b Extensive consultation with South Australia Water has been undertaken and agreement has been reached in so far as a memorandum of understanding has been reached to supply the site with 150ML of off-peak water supply during the months of mid-May to mid-October. This is subject the Middle River Dam overflowing during this period and adequate environmental flows are maintained downstream.

It is not part of this development proposal to extract any ground water.

In consultation with SA Water the design and specification will be such that future users will be able to access this water from the pipeline without any undue implications on the golf development. SA Water pre-approved contractors will be commissioned to undertake the pipeline works in accordance with the applicable conditions and specifications.

Ground water investigations were undertaken across the site and within the local area to determine if there would be sufficient water resources available for the development. It was quickly ascertained that what limited supplies there were, they would not necessarily be in sufficient amounts to sustain the development in the long run, not to mention the impacts it may have on the existing ground water resources for the local users. Investigations into desalination were also quickly dismissed once the environmental impacts and power requirements were evaluated.

Since the development is accessing water which would otherwise flow out to sea, there will be no negative impact on current users in the district. Furthermore, with the supply and delivery of the developer funded mainline infrastructure to the site, many potential users will have access to a water resource not currently available. The provision of this pipeline passes American River Road which leads to the small township of American River some 8 km west and could potentially provide a significant resource for future growth.

Water to the site is primarily supplied from two sources; roof collection of rainwater; and water supplied to and stored in the on-site dam. Apart from these main sources there is rainfall to the areas of the site not built upon and in the context of the scarcity of water on-site a range of techniques are proposed to ensure the most efficient use of rainwater run-off.

It is noted that Water Sensitive Urban Design (WSUD) is mainly concerned with urban situations while the project site is located in a relatively isolated rural setting with little or no reference to an urban locale. Nonetheless there are a number of its principles and objectives and techniques which may be pertinent to the proposal. These include:

Principles

- Conserving water resources through reuse and system efficiency;

- 4b The proposal is to build a 200mm transfer line from the transfer station near Milk Track and Playford Highway south to the site some 35km away. This water will be discharged into a 100+ ML storage Dam on site which will store the water for use during the peak irrigation time of year from November to March.

The water supply to the storage dam will include a separate closed tank for the purpose of storage of water for the potable supply. As a result of long detention times in the transfer pipeline the water will most likely lose its chlorine residual and be classed as non-potable. As a result additional treatment will occur on site to return the water to potable standard prior to distribution to the buildings and facilities. Programmed will, with support and advice from SA Water, develop a re-treatment process to comply with Australian Drinking Water Guidelines in accordance with the Department of Health requirements.

- 4d Water evaporation from the proposed storage dam may be a problem particularly during the warmer months while wind generated evaporation is regarded as a year-round issue. Various measures to control this loss are currently being investigated with the optimal approach currently seen as the provision of a surficial polyethylene membrane (floating cover) resulting in an evaporation mitigation rate of approximately 90%. It is stressed that evaporation is presently a developing technology and that at the time of dam construction and filling with water the most overall beneficial technique will be employed to ensure minimal loss.

Wastewater

A number of options are being considered for the treatment of wastewater on site with the Econocycle treatment system being the preferred method of processing at this stage of the development. Subject to further approval during detail design, the overall treatment system will collect wastewater from all areas of the development and will be treated in a series of localised, compact, state of the art wastewater treatment package units with all effluent (treated to Class B standards as per SA Reclaimed Water Guidelines, 1999) directed to the various holding tanks located around the site for irrigation purposes.

The wastewater unit works on the combined principles of primary settling plus aerobic and tertiary treatment. As can be seen in the diagram below all wastewater and effluent enters the tank through the inlet shown on the left hand side of the tank. This settles into the septic zone.

Towards the top of the baffle wall which separates the septic and aeration compartments, there is an outlet which enables the effluent to trickle into the aeration treatment zone. From here the effluent is filtered over a mass of growth media plates. The growth media acts as a bacteria breeding ground which provides a very important and proficient function of the wastewater unit. The growth media enables the sewerage to break down.

Once the organic impurities have been absorbed within the aerobic culture of microorganisms, the water passes to the clarification zone. At this stage the water has been recycled into clean, clear, odourless water. The clarification zone is the secondary sedimentation process.

10.3 Power

South Australia Power Networks are the responsible authority for providing power to the Island and as such have been consulted in relation to providing the necessary power requirements of the development. The existing supply of power is along Hog Bay Road and is a 33 kV line located at the intersection of Hog Bay Road and Unnamed Road. It is proposed by SA Power to install a developer funded sub-station and telecommunications tower at this location, i.e., the intersection of Hog Bay Road and the unnamed road. (see SA Power plan) .From this modular substation, an 11kV overhead power line will be provided down Unnamed Road for 1.3km to Cathers Road. At this point the 11kV power line will continue eastwards along Cathers Road with a 200kVA pole mounted transformer located at the pump shed and maintenance shed locations.

Although Davies Road, which is heavily treed with Mallee Scrub vegetation, provides a shorter distance to the Clubhouse precinct and would present a cheaper alternative, the decision has been made to utilise the unnamed road easement. There is no vegetation clearance required for the provision of this overhead power line infrastructure up to the maintenance shed via this route and it will keep intact a significant amount of high quality Mallee Scrub.

4b&c
T Furthermore, to minimise the impact on the Mallee vegetation within the development, an underground power supply from the maintenance compound to the clubhouse precinct will be provided and a 315kVA pad mounted transformer will be located to supply the clubhouse, accommodation lodges and villa unit allotments. There will be a marginal visual impact from the proposed power line construction along Hog Bay Road and in the immediate vicinity of the take point at hog Bay Road and the unnamed road.

4g During initial investigations it was highlighted that the Island would be unlikely to receive a mainland power line upgrade and as such would need to rely on existing supply lines and/or renewable energy sources. It was pointed out that during the summer months when air conditioners are running at their maximum, the Island experiences the occasional black out.

Investigations into wind and solar were evaluated for their efficiency and practicality on the site. Although feasible, wind turbines were quickly ruled out due to the effects on fauna and the impact on view sheds from neighbouring lands. The use of latest technology photovoltaic cells was considered an important element of the project and the location of an 80 kW per diem system has been located in the maintenance precinct out of view.

? Further investigations by SAPN, revealed that the system would have enough capacity to service the development but only if another sub-station was commissioned nearby to transform what would otherwise be unusable power. This substation is capable of being expanded to service other users if required.
This requires explanation

In the event of a power fault or blackout, diesel generators will automatically come on line to provide the necessary power back up required to run the development.

10.4 Access

- 10 During the construction phase of the project, it is expected that machinery will be limited to operating between the hours of 6:30am and 6:30pm Monday through to Saturday. It is not proposed to have the site open for construction on Sundays unless special circumstances make it necessary to do so. It is the conclusion of the traffic management consultant that the estimated peak usage of up to 26 vehicular trips per hour during these times are not expected to adversely impact traffic movement on Hog Bay Road. Furthermore, the full time construction workforce will result in negligible trip generation during the construction phase of the project. With a reliance on a number of local trades to facilitate the construction of the project, the reliance on the Sealink ferry will be significantly reduced thereby minimising the number of freight movements to and from the site.

The traffic management consultant, Infra Plan have concluded that during the operational phase of the project, it is estimated that the proposed facility will generate during weekdays;

- Up to 14 vehicular trips during morning peak hour
- Up to 17 vehicular trips during afternoon peak hour (or 1 every 3 min) and is this considered low.
- 170 daily trips.

During Weekends;

- Up to 26 vehicular trips during peak hour (or 1 every 2 min)
- 260 daily trips.

Annotations for Submission by James E. Newcomer

It was the considered opinion of the traffic consultant that no major reworks were required on the existing road networks. However, it should be noted that this was a desktop study and it is anticipated that during the detail design phase of the project, some minor modifications will be required to Davies Road to eliminate bad sight lines and improve localised road grades.

- 6 — [It is not the intention to provide a turning lane from Hog Bay Road as highlighted by the consultant's report, however discussions will be had with council regarding the road infrastructure requirements of the overall development including the Hog Bay Road – Davies Road intersection.

As noted in the traffic consultant report no major upgrade in road works are proposed. It is the intrinsic nature of the proposed development to keep the rustic feel of the entry experience down Davies Road. Apart from some minor regarding works to improve drainage flows and some minor earthworks to improve site lines, it is not the intention to fully seal this road. Further discussions with council will be had to formulate a suitable design response that is in keeping with the local area.

- 6 — [The main access to the site is via Davies Road which intersects with Hog Bay Road and runs south to the subject site to its north eastern boundary. This unsealed road is heavily vegetated and therefore would be unlikely to be used in times a fire. An alternate route via Cathers Road which runs along the sites northern boundary, is located in the far north-western part of the site and utilises the existing Unnamed Road easement which runs north to Hog Bay Road. Although presently unformed, this easement will be utilised to provide water and power services to the site and as such will necessitate its formation for maintenance vehicles. Once formed this access track will provide a much needed alternate emergency access/egress point to the facility. The use levels on this route will be minimal so as not to provide any negative impact on local road safety.

The provision for a Helipad, although not part of this proposal, can be easily provided for in emergency situations through the use of the golf course environs and in particular the many tees located throughout the course with the driving range in particular playing a key location point in emergency access/egress.

The proposal has provided for 80 on-site parking spaces and is deemed by the traffic consultant to be sufficient for this facility. In the event that additional car spaces are required, sufficient land provision is available to meet these demands.

The majority of guests have been considered to be interstate and overseas visitors and thus will be arriving by plane with a low reliance on private cars. The vast majority of these guests therefore will be transported to the site via shuttle buses, the parking of which is deemed sufficient to park up to 6 buses.

It is the considered opinion of the traffic consultant that sufficient sight distance (in excess of 210m) is deemed to be available at the junction of Davies Road with Hog Bay Road. Furthermore, based on this information and the minimal vehicular traffic generated by the development, the traffic consultant has determined that no turn lanes are warranted from Hog Bay Road.

Annotations for Submission by James E. Newcomer

Infrastructure upgrades relating to lighting and signage at Davies Road/Hog Bay Road junction, pavement treatments and stormwater/drainage works from Hog Bay Road to the golf course will be assessed during detailed design of the upgrade works to this area and will be in accordance with state and local guidelines, regulations and specifications as required.

Although not part of this formal development application, consideration was given to the provision of a walking trail along the southern coastline which linked the existing walking trail near the eastern boundary to that of the western trail. However, it is the strong recommendation from the environmental consultants, that no pedestrian or vehicular access be permitted along the southern coastline on the count that this would adversely affect local fauna habitat.

Although not opposed to the provision of such a linking trail, the proposal has eliminated it from the current development application and will discuss this at a later date in consultation with council and local groups.

9b Apart from facility guests and staff, there is no provision to allow public access into the Crown leasehold land. Patrons as they arrive will check in via the hotel lobby or pro shop located in the clubhouse and as such will be guided by the signage and formed pathways to the various locations around the facility. Access into the Crown leasehold land will be afforded only to the golf patrons and maintenance staff who will be playing and maintaining 3 greens (6th, 12th and 16th) and 3 sets of tees (13th, 14th and 17th). Access to and from these areas will be confined to the pathways provided or the maintained turf areas of the tees, fairways and greens.

A comprehensive environmental and landscape implementation strategy in consultation with DEWNAR will be formulated to enhance and maintain those parts of the Coastal leasehold land being utilised. This will include but not limited to;

9b

- the seed collection and propagation of locally occurring plant material suitable for revegetation works
- provision of tree/plant guards to protect against vermin
- detailed weed management programs to control the emergence and eradication of noxious weeds
- signage and erection appropriate fencing to prevent access to sensitive parts of the site which may be subject to further erosion and deterioration

11.0 CONSTRUCTION AND OPERATION

11.1 Construction plan and staging

A detailed EMP is contained in appendix O which highlights and sets out various risks which need to be assessed before, during and after the construction phase of works. The various items which are detailed further include;

- Pre-construction planning and design including environmental and risk assessments;
- Environmental Management Plan including best practice documents and segment environmental control plan;
- Land Disturbance including erosion measures, management of contaminated stormwater, de-watering work sites, dust control, management of stockpiles and batters, working in waterways and floodplains;
- Noise and Vibration including operating hours, vehicles and equipment, traffic, noise abatement and vibration;
- Waste minimisation;
- Contaminated material and wastes including solid inert wastes, putrescible wastes, low level contaminated soil and prescribed wastes;
- Other environmental issues including emergency procedures, air quality, litter, storage of chemicals and fuel, road cleaning, protecting infrastructure;
- Inspections, monitoring and audits.

1 Specific reference to each component of works will be covered off in detail following a thorough review of the EMP with council and other responsible authorities.

unrealistically optimistic It is anticipated that once the development approval is given by the Governor (estimated to be around June/July 2015), the works will immediately commence on securing the detail design and documentation of the water infrastructure pipeline from the Middle River Dam together with the upgrading of the Power infrastructure along Hog Bay Road.

It is anticipated that these works could take up to 9 months to complete before the tendering of these works could be sought.

It is likely that the construction of the 35km water pipeline will take in the order of 60 to 75 work days to complete and given the timing of these works it is hoped that the water supply should come on line around June 2016.

Once water and power are connected to the site, golf course finishing works can be accelerated with an estimated completion around December 2016. In concert with the golf course construction, the resort clubhouse and stage 1 accommodation (consisting of a combination of lodges and suites) could conceivably commence around January 2016 following the detail design and documentation of the building. It would be hoped that the clubhouse could be delivered within a 12 month time frame from the commencement of construction.

Subject to demand, the second and or third stage of the resort accommodation will take effect and is hoped that this will immediately follow the completion of stage 1.

- 8i At the first available opportunity following the power and water connectivity the allotments for private villa unit developments will be placed on the market for sale and expressions of interest. It is anticipated that this would occur in early-mid 2016. It is expected that the build out of these allotments would take place over a 5 to 6 year time frame for the majority of the lots.

11.2 Extent and scope of works

The nature of Links Golf is reflected in its dramatic use and occupation of the natural terrain and landscape. This is quintessential to the links experience and often results in unique land forms that would not be experience in courses created by the hand of man. To this end the skill of the architect is to lay out a course which respects this natural land formation without its manipulation through the use of heavy vehicles and the like. The site is gifted with vast areas of natural sand dunes and valleys in which golf holes readily appear. As such the amount of earthworks will be insignificant and be limited to the levelling of greens and tees and in most cases will involve not much more than 0.5m +or- from the existing levels.

- 4e The most significant earthworks will be associated with the construction of the clubhouse and accommodation lodges. It is the intention to partly bury the built form into the large sand ridge which addresses the golf course and the Great Southern Ocean to the south-west. By burying the buildings in this way, they will appear to be less imposing and most importantly sit well below the natural vegetated ridge lines which lay beyond to the east.

Additional earthworks will be involved in the construction the main entry and feeder roads which will utilise wherever possible existing pathways and tracks. This will mitigate against the need for additional vegetation clearance.

11.3 Transport, storage and disposal of materials

The construction of the dam will be a significant source of limestone road base and as such will be utilised across the site in various forms from road construction, cart path construction, landscape paths in and around the development etc. If deemed appropriate and feasible in its quantity and application, limestone blockwork from the excavated sites of the dam and clubhouse precinct suitable for the building construction will be investigated.

Wherever possible, local building materials will be sourced from the Island and include timber, plaster, roofing materials, glazing supplies and the like. In the event the supplies are not available from the Island, materials will be sourced from the mainland and transported to the site via the Sealink ferry.

The buildings and site works have been designed so that the built form is set into the landscape rather than perched on top of it. In order to achieve this there will be a requirement for excavations in and around the buildings. This material, if not lost in the immediate landscape surrounds can be easily utilised in the golf course environs without any need for disposing the material off site.

Construction waste will be predominately in the form of lightweight materials and will be disposed of off-site at approved waste collection facilities.

An environmental management plan (EMP) has been prepared (refer. Annex O) and details the strategies and actions to be implemented to protect the existing environment during construction and operation including issues surrounding the transport and storage of chemicals.

11.4 Noise control measures

Construction activities;

10 Possible noise impact arising from the project site will be at its most significant during golf course building construction. The main mitigating factors to any such impact will be the size of the subject site, the attenuating effect of distances and wind. Strictly controlled hours of operation will also limit the impact of construction noise to neighbouring properties.

Noise sources during this phase include earth moving machinery, irrigation pumps, power tools, vehicle noise including trucks and other large vehicles, and general vehicular traffic. The range of noise includes the sharp intermittent use of power tools to the somewhat ambient noise levels introduced by the continually operating machinery such earthmoving equipment.

10 On account of site size and prevailing winds the offsite noise impacts from construction equipment will be minimal.

Operation activities;

Possible sources of noise impact arising from the project site during its operation include irrigation, mowers and maintenance machinery, service vehicles, general vehicular traffic and domestic activities.

Overall the operation of the facility will provide a low level of noise impact on the environment in the context of main activity areas, site topography, vegetation and prevailing winds. Further the project will operate under the State EPA guidelines and adopt strictly controlled hours of operation to also limit the impact of noise to neighbouring properties.

11.5 Erosion control measures

As part of the EMP (refer Appendix O)), one of the first tasks will be to identify areas around the site which are subject to erosion and areas which may be prone to erosion during the construction phase of works. These areas, some of which have already been identified by the environmental consultant, through a variety of measures will be isolated and treated accordingly in order to protect them from further degradation.

As part of the EMP (refer Appendix O), work practices are to be examined and assessed in accordance with the likely environmental effects that such practices may have throughout the construction and operation phases of the project. In combination with the EMP, strict Safe Operating Procedures (SOP's) will be employed on all equipment and operations carried out on the site. This is to not only mitigate against environmental impacts but also to ensure worker safety is maintained.

While provision for staff accommodation is provided on site for construction workers in the first instance, it is anticipated that some of the workers may choose to rent properties in and around the townships of Kingscote and Penneshaw. Following the construction phase of the project, the onsite accommodation can be utilised by operations staff on either the golf course or the resort as and when required. The purpose of these accommodation units is to provide a backup accommodation option for those workers who like to be on the site throughout the job or for those who are staying for only a short time as the case may be.

In the event that the accommodation units are not required post construction, they can be easily dismantled and taken off site.

11.6 Management Plans

As part of the EMP (refer Appendix O), ongoing monitoring of the golf course and the resort environs will be carried out on a regular basis with the aim of minimising environmental impacts. Areas under consideration are listed in the EMP and include;

- 2e Apart from areal control and culling measures in regard to the existing kangaroo and wallaby mob there are no encumbrances or similar mechanisms proposed to be initiated to control and manage activities on adjoining land. The site is currently unfenced and open to free kangaroo access from abutting properties. Despite any plans to install peripheral fencing it is expected that effective kangaroo control and management will be achieved by culling to control numbers and the use of specific planting to reduce the attraction of the site. Such control measures would require to be carried out in co-operation with owners of adjoining properties including crown land.

12.0 RISK AND HAZARD MANAGEMENT

12.1 Public safety mechanisms

3d A combination of passive and active bushfire management strategies are proposed within this report to comply and where possible exceed statutory requirements and minimise the risk to life and property without the need for large scale vegetation clearance.

Passive Measures:

Due to the careful siting of the clubhouse and accommodation lodges away from the existing remnant vegetation the provision of a 20 meter band of modified vegetation can be easily maintained. This is further enhanced by the provision of a suitably sized car park and access road in the clubhouse and accommodation lodge precinct thereby acting as a fire reduced zone and further reduces the fire intensity risks in and around the clubhouse precinct.

Most of the vegetation between the clubhouse and accommodation precinct and the coast is existing low dense vegetation up to 1.5m in height and is effectively wind pruned by the southerly high winds.

The villa units which are located in the open areas to the east of the clubhouse, nonetheless are in close proximity of the larger story remnant vegetation bordering the eastern boundary. In the event of a fire, there is access provision to the east and west of these units via a single lane asphalt road which leads directly to the clubhouse precinct.

Vegetation around these villa units will be carefully selected and maintained to ensure they do not provide a potential fire hazard.

All buildings will be constructed to follow the principles of Australian Standards AS3959-1999, Level 3 Construction, as recommended for Extreme Fire Risk. This will include:

- Non-flammable materials for all external surfaces;
- All glazing toughened, with openings protected by stainless steel mesh;
- Any underfloor spaces sealed with vents covered with stainless steel mesh;
- Foil under all roofing and roof spaces sealed;
- Provision for a designated room within the clubhouse to be designed to a higher standard of fire resistance to provide a designated safe refuge;

In the event of a fire, it is proposed staff and guests would remain in the main clubhouse area as the fire approached and then proceed to the specific refuge area when directed by trained staff.

Active Measures:

Butterfly sprinklers, raised above the height of the vegetation, spaced to ensure complete coverage and located within 10 m of all buildings will provide water resources capable of suppressing fire. These sprinklers will saturate the vegetation immediately adjacent to the buildings thereby increasing the low level humidity which has the effect of raising the radiant heat above buildings with the introduction of winds.

Roof mounted sprinklers will be located above gutters and near roof ridgelines to limit spark and ember attack and reduce radiant heat impact.

A number of suitable located hose reels will be located around the clubhouse and accommodation precinct and the maintenance compound to provide additional firefighting infrastructure to control spot fire and ember attack prior to and after the front passes.

All sprinklers and hose reels will be served by a continuous main line controlled by a pump with back up diesel powered generators. A minimum supply of 150,000 litres will be maintained at all times to supply this system with water being stored in a combination of the main irrigation dam and storage takes in and around the clubhouse precinct.

12.2 Fire and evacuation management systems

3d

Due to the dense vegetation of Davies Road, the biggest risk to life will be in the evacuation of the site via this road. The main clubhouse building will be designed as a safe refuge within which staff and guests can be safely accommodated without the need for additional assistance.

The irrigated golf course complete with back up diesel generators could provide an adequate alternate refuge if trained staff considered it appropriate.

Strategies to minimise vegetation clearance and modification for fire control purposes include;

- No clearance along property boundaries or existing access tracks for fuel break purposes for reasons stated above.
- Vegetation clearance to the extent necessary to accommodate the building footprints and associated works such as driveways and vehicle movement areas.
- Vegetation modification will be undertaken where applicable within a 20m band of major buildings and maintained to a height on no less than 300mm which is considered sufficient to reduce fuel build-up but not eliminate the species.
- Revegetation of scalded areas following fires within the 20m band of the main buildings.

- Key resort personnel to be first aid trained;
- Resort to hold a Royal Flying Doctor Service medial kit, oxygen, and if applicable a small defibrillator, stretcher and supplies for trauma and pain relief.

12.3 Pollution and contamination mitigation measures

1 The project will formulate a comprehensive Environmental Management Plan (EMP) to the satisfaction of EPA and council which will include in it a detailed section on the containment, storage and use of fuels and chemicals in and around the site. A copy of the current EMP is contained in appendix O of this report.

Although it may be necessary to store fuels and chemicals on project sites, this inevitably creates an environmental risk. Spills can severely pollute waterways and land.

Reducing the quantities of chemicals and fuel stored on-site to minimum practicable levels is desirable. Infrequently used chemicals should be ordered just before they are needed. It may be possible to use a mini-tanker to refuel vehicles, instead of relying on a central fuelling point.

There are several approaches that can be taken to reduce the risk of fuel spills. Steps include designing storage units to prevent vehicles or fork-lifts puncturing tanks, fitting automatic cut-offs to fuel dispensers, and making units vandal resistant.

Installing bunds will prevent spilt fuel escaping and causing environmental damage. Bunds should be designed and installed in accordance with EPA guidelines.

Key design issues addressed in the guidelines are height of bund walls, construction material, vehicular access, and stormwater management. Roofed bunds are strongly preferred.

Should a spill occur, then it is necessary to have a contingency plan in place to deal with the clean-up. It should consider issues such as cleaning up spilled material on the site, containing and cleaning up spills which have entered waterways, disposal or reuse of recovered residues, and contacting key company and government agency personnel to advise them of the emergency.

12.4 Weed and pathogen control measures

Phytophthora is a parasitic fungus that lives in the soil and attacks the roots of plants. Although there are many different species, cinnamomi is the most frequently associated with dying vegetation. In South Australia, dieback caused by Phytophthora has been found in a number of sites that are within high rainfall areas, including Kangaroo Island (TSA 2000).

Annotations for Submission by James E. Newcomer

- 7 The South Australian Aboriginal Heritage Act 1988 does not mandate a need for an Aboriginal heritage survey and there is no legislative requirement to conduct a cultural heritage survey at the current project location. However, the AHA 1988 does provide a legal obligation for the construction of the proposed golf course to not 'damage, disturb or interfere' with an 'aboriginal site' whether this site is recorded or not. In light of this and resulting from the desktop survey, site inspection and recommendations by Heritage Consultant EBS-Heritage, it is proposed to adopt an approach that fosters consultation with the relevant Aboriginal groups while implementing a site discovery procedure for all earthmoving works as well as a site induction to ensure all project members are aware of the nature of objects that may be found.

direct contradiction

- 7 At this point no direct consultation has been conducted with the relevant Aboriginal parties, i.e., the Ramindjeri people. These were amongst some of the first Aboriginal people in South Australia to come into regular contact with European settlers with Kangaroo Island based sealers raiding Ramindjeri lands for women in the early 19th century.

The following procedure is to be followed in the event of any potential Aboriginal site identified during construction.

1. Do not remove anything from the area. Continue activities away from the area.
2. Inform Construction Project Manager (CPM) of site discovery.
3. Construction Project Manager informs Department of State Development and Division for Aboriginal Affairs and Reconciliation (DAARE) to confirm whether the site is an Aboriginal site.
4. If the site is confirmed not to be an Aboriginal site works may continue at the location.
5. If the site is confirmed as an Aboriginal site the CPM is to liaise with DAAER to determine the appropriate management approach.
6. If the site cannot be avoided during construction activities the proponent (Programmed Pty Ltd) may need to apply to DAARE for Section 23 authorisation to damage, disturb or interfere with the Aboriginal site.
7. If the site can be avoided during construction activities then works may continue at the location with management measures implemented to avoid damage to site.

Aboriginal Heritage Act 1988 (SA)

The South Australian Aboriginal Heritage Act (AHA) is administered by the Department of State Development, Aboriginal Affairs and Reconciliation Division. Any Aboriginal site, object or remains whether previously recorded or not, is covered under the blanket protection of this Act. The AHA provides the following definition of an Aboriginal site in Section 3:

"Aboriginal site" means an area of lands;

- a) That is of significance to Aboriginal tradition or;
- b) That is of significance according to Aboriginal archaeology, anthropology or history.

It is an offence under section 23 of the AHA to damage, disturb, or interfere with an Aboriginal site, objects or remains unless written authorisation from the Minister for Aboriginal Affairs and Reconciliation has been obtained. Penalties for an offence under this section are up to \$10,000 or six months imprisonment in the case of an individual and \$50,000 in the case of a corporate body.

The project area may contain Aboriginal sites, objects or remains covered by this Act. There is no legal requirement under the AHA to undertake an Aboriginal cultural heritage survey and most surveys are undertaken as a risk management/due diligence strategy to ensure no project delays are encountered during the construction phase.

At this point no direct consultation has been conducted with the Aboriginal people during the preparation of the assessment document.

13.2 Native title

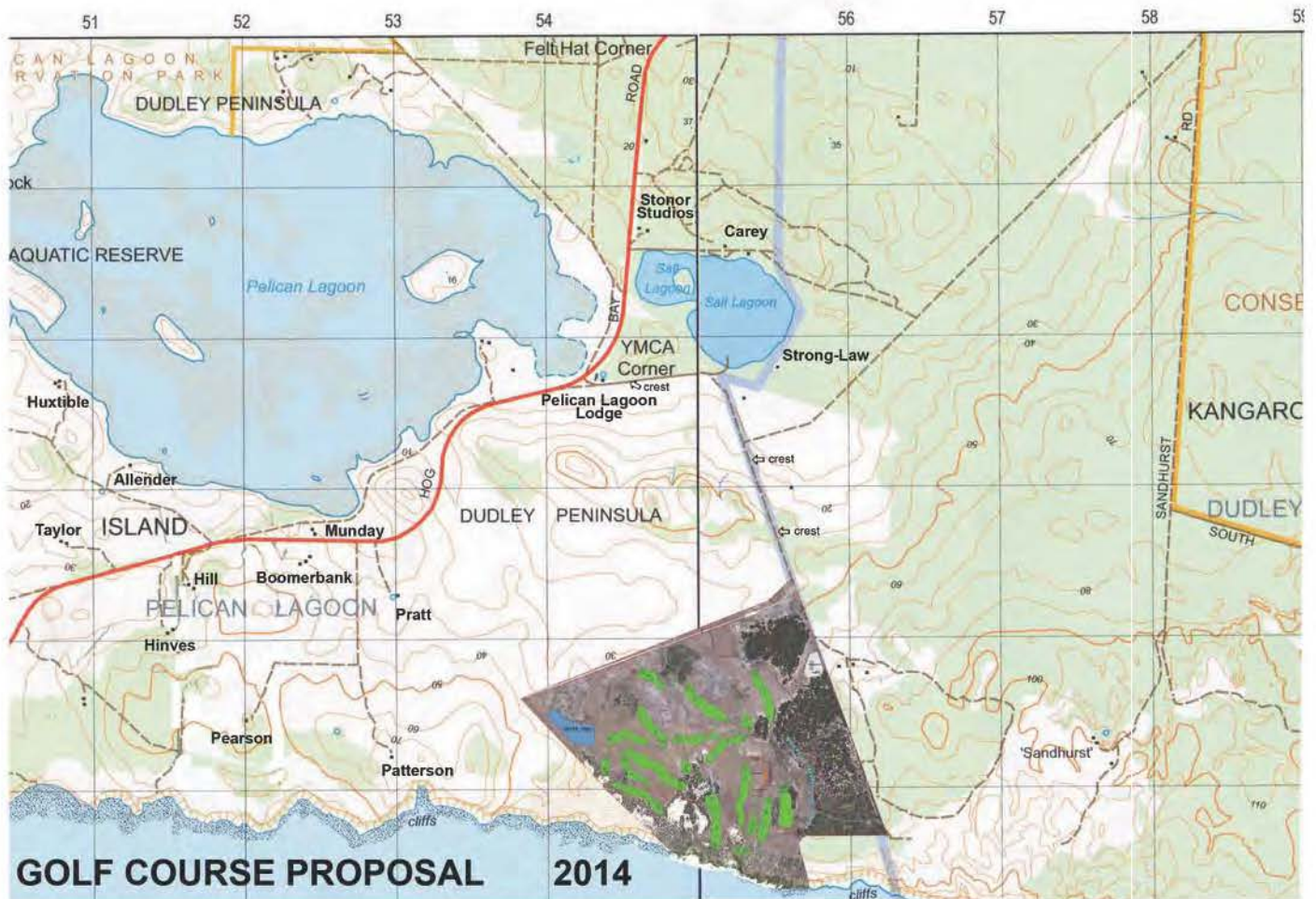
Under the Native Title Act 1993, the National Native Title Tribunal (NNTT) is responsible for maintaining three public registers; the National Native Title Register, the Register of Native Title Claims and the Register of Indigenous Land Use Agreements. These registers hold records of native title determinations, applications and Indigenous land use agreements made under the Native Title Act 1993.

7 The project site comprises, for the most part, private freehold land and as such, Native Title is therefore extinguished over the private freehold land component of the project area. The proposed golf course proposes use of parts of the crown land in the coastal reserve. In this regard the current project area is within the claimed native title lands of the Ramindjeri (SC2010/003) and under the Native Title Act, consultation will occur between the Programmed Pty Ltd and the Ramindjeri representatives if any land subject to Native Title is to be affected.

At this point it is understood that there are no Native Title Claims over Kangaroo Island.

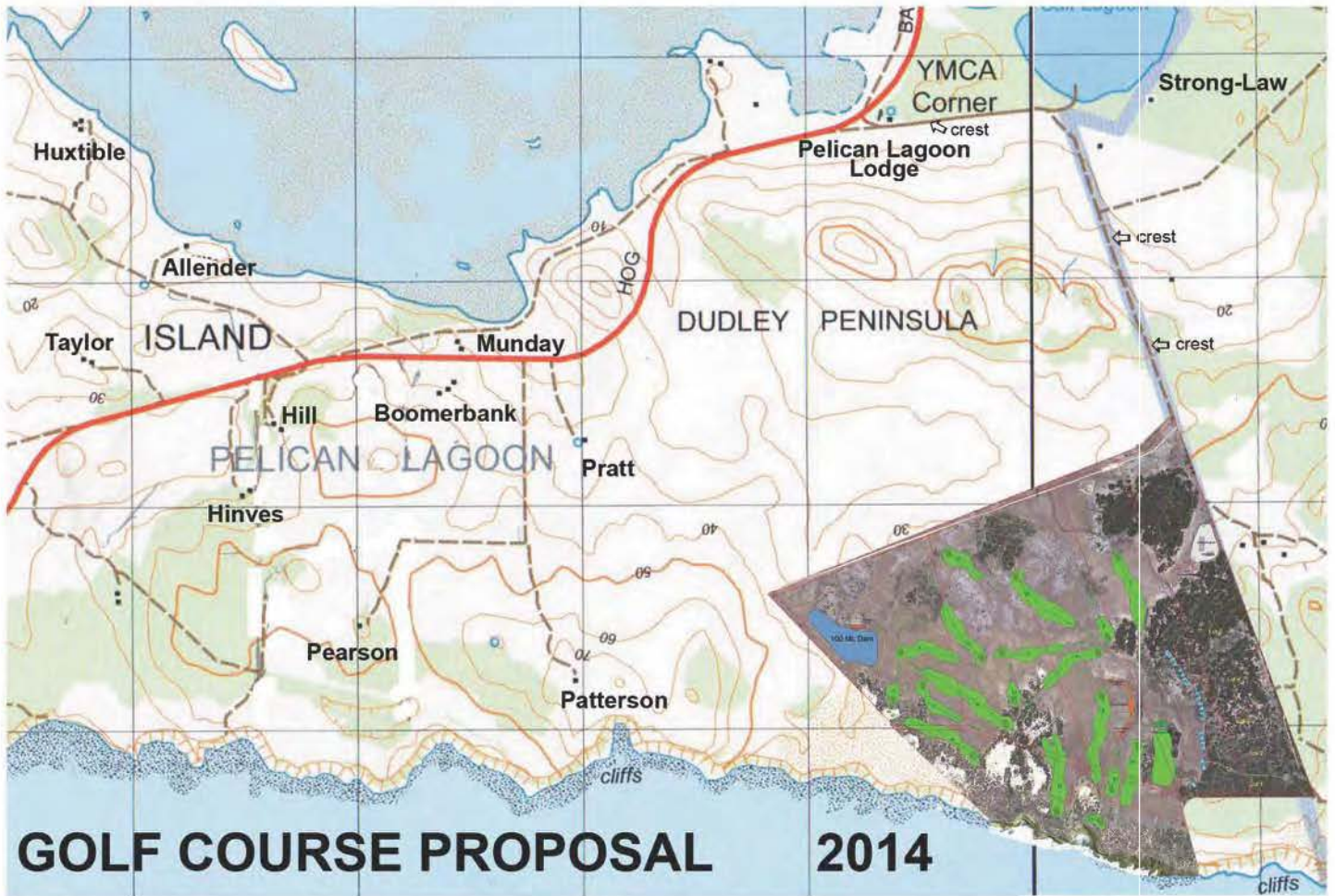
Hello Justin,

Thanks for emailing your map that I requested at your meeting with the Kangaroo Island public on 25 August. I have taken the liberty of superimposing in onto the topographic map for the vicinity. The map is a good fit.



Residents in the area have been discussing your proposal, and there are some uncertain issues coming from those conversations. I write to ask you to clear up any of these for which you have additional or correct information. As you can see, some of them could be controversial and getting things straight at this point should work to avoid potential disagreements.

1. What is your company's past and current relationship to two other golf courses, namely the one at Port Hughes, which has apparently gone into receivership prior to opening (ABC Radio National), and the one on King Island which is rumoured to have been sold by your company prior to opening?
2. Has your company purchased some or all of the blocks concerned with your Kangaroo Island proposal, or does it hold an option or options to purchase?



3. Some greens appear from the map to be outside the block boundaries shown in red, in the Coastal Conservation Zone. Can you explain this?



4. You have already acknowledged that for safety reasons some work may be necessary to Davies Road, the proposed entrance to the course. There are three blind crests on this one-lane gravel road (as shown in photos and on the above topographic map). How do you propose to resolve these obvious hazards, and who would pay for the necessary improvements?

5. Much of the area of the course is infested with invasive weeds (below photos), including onion weed, cape weed, and rocket among others. How do you propose dealing with these? At present, they are the main vegetation responsible for stabilising sand.



Invasive Cape weed is just getting a hold (right), while onion weed is well established (left).



Wild rocket, or Lincoln weed (left) fringing a small quarry that has mobilised sand.

6. As a follow-on to the above, there is a potential problem with destabilising sand, thereby causing wind erosion and mobile dunes. A small quarry at the crest hill on the easter side of the course, approximately where some of the buildings are proposed, has mobilised sand there. The first weed to stabilise this movement is Lincoln Weed (wild rocket).

7. As you are aware, there a very numerous kangaroos in this area. All green vegetation shows signs of severe browsing, even box thorn (photo below right). What plants or grasses will you be introducing, especially for the greens, that will resist this predation?



8. You may be aware that this spring a slaughter of at least 18 kangaroos occurred along Davies Road and on both sides of the new road fringing the north boundary of the proposed course. I am sure you would agree that this practice, while once commonplace in country Australia, has no place in contemporary culture. As part of your master plan, have you considered a planned response to such vandalism?



Gray kangaroos are very numerous in the area (white arrows). Large males are the heaviest kangaroos in Australia. One specimen killed on Hog Bay Road and submitted to the SA Museum weighed 77 kilograms



9. There are concerns that properties fronting the proposed water pipe line will be required to pay water rates even if they do not access the water. (Assuming that SA Water would regulate and maintain this line.) Have you checked legislation and/or SA Water policy as regards this issue? Who would maintain and operate such a pipeline?

10. Recently one resident was informed by ETSA personnel that the electricity feed for Kangaroo Island is at its absolute maximum. Is this your information? Does the master plan for the course include alternative energy generation?

Thanks again, as your confirmations and corrections of this information is much appreciated, especially by those of us living at Pelican Lagoon. I would also hope that this letter might assist in your planning.

Regards,

James Newcomer
3196 Hog Bay Rd
Pelican Lagoon

Mackenzie, Alex (DPTI)

From: Indiana James [garfishki@hotmail.com]
Sent: Monday, 29 June 2015 11:55 AM
To: DPTI:KI Golf Course
Subject: KI Golf Course Submission - James Newcomer

Dear Mr. Kleeman,

Please append the following correspondence to my submission, which was sent to you by post in hard copy and in which the attached are referenced.

Justin Trott [Add to contacts](#) 3/04/2015
To: Indiana James

Dear James,
Again I apologise for the delay in getting back to you on your concerns.

As mentioned the other day, we are proceeding with the Public Environmental Report through the State's Major Projects group. This is proving to be a highly inquisitorial process and I assure you it focuses on a range of your concerns. In response to many of the issues raised during the process we have engaged highly capable specialist consultants who make specific recommendations that will inevitably be adopted in any ultimate planning approval that may issue.

From my role as the project manager I can offer the following responses to your queries:

1. No, There is no connection with Port Hughes whatsoever from an ownership perspective. Apart from using the same Designer with a very different brief, we were contracted to undertake the construction and maintenance of the course. Unfortunately the Port Hughes project, primarily based on low residential sales was cancelled. I understand the course has been handed over to the local council and is functioning as a 9 hole municipal golf course.

Cape Wickham on King Is. was a course that we developed ourselves. Having built the course over the past three years, the course was sold to an investor who is heavily involved in the golf industry and who owns a number of courses. While I cannot advise on the machinations that lead to this asset disposal, what I can say is that we maintain and manage all Golf Courses that we build, irrespective of ownership. This I am sure should allay any of your concerns.

2. I am not privy to the technical terms of the land tenure at the present time, but I can confirm our company has control of the real estate in some form.

3. At this point in time the final design has not been finalised. However, it has been identified by the designers that some areas of the coastal reserve

land may be utilised to not only enhance the golf experience but also address some of the erosion issues that are clearly evident on site. This is far from being unprecedented and is commonplace around the globe with many famous courses occupying coastal land and in so doing protect it from such erosion issues. It is certainly not the intention to undertake wholesale clearing of such areas, but rather 'tip-toe' into certain parts of this land taking advantage of the natural contours the overall site has to offer.

4. This is a matter for our road and traffic experts that have been employed to determine if a hazard exists and if it does then designs and specifications will be prepared for its treatment. Obviously any improvements associated with the development would be part of the development cost.

5; 6; & 7. As part of the development a comprehensive vegetation management plan will be prepared in consultation with our environmental consultants and the NRV to determine a best policy approach to dealing with not only the erosion issues but also the weed burden which is clearly evident across the site. In this regard we will be relying heavily on local plant suppliers and revegetation groups to supply the necessary plant material and expertise to implement this strategic plan.

8. Again in consultation with our environmental consultants and indeed with local council, we will be formulating a comprehensive kangaroo management plan which may include many different measures and strategies. Again we will be relying on local expertise in managing this issue. It is important to note that we don't see kangaroo's and golf being mutually exclusive - in fact we welcome them onto the course as is the case at Cape Wickham and other numerous courses around Australia such as Anglesea, Queenscliff in Victoria, and Noosa Springs in Queensland among others..

9. The water infrastructure is being paid for and supplied by us as a cost to the development. Much effort has been spent on assessing the optimal source of water for the site. Sources examined and assessed included bore water, desalination, and water trucks. In the long term, providing this water facility to the course will not only secure water to the project on an annual basis, but will also provide a necessary piece of infrastructure for future growth of the Island particularly on the Dudley Peninsula. We have no intention nor would we be authorised to charge or impose water rates for this infrastructure on local residents.

10. It is our information from SA Power that there is no shortage of power supply to K.I. In fact the demand is reducing as many Islanders are installing supplementary renewable energy option including solar, wind, etc. The problem of power on K.I. is not the supply ; it is the distribution of it across the Island. We were hopeful of SA Power upgrading their system so we could access the useable power, however based on their assessed demand they could not justify or make a case for its upgrading. We therefore have had to make provision for this expense in the overall development cost. Like the provision of water it should be noted that in the upgrading of the distribution of this power, the necessary infrastructure will be provided for by the development to aid further growth into the future.

Again, thank you for your input. I trust I have responded satisfactorily to your queries with the above answers and comments, and look forward to working together during the construction phase and eventual opening and on-going management of what we believe will be a great Golf Course and indeed a magnet for new visitors to the Island.

Kindest Regards
Justin Trott

Sent from my iPad

On 31 Mar 2015, at 12:20 pm, "Indiana James"
<garfishki@hotmail.com<mailto:garfishki@hotmail.com>> wrote:

Thanks Justin for getting back - look forward to your reply. James

> From: Justin.Trott@programmed.com.au<mailto:Justin.Trott@programmed.com.au>
> To: garfishki@hotmail.com<mailto:garfishki@hotmail.com>
> Subject: Re: Golf Course proposal for Kangaroo Island
> Date: Mon, 30 Mar 2015 08:40:02 +0000
>
> Dear James,
> Apologies for not getting back to you sooner. We are up to our eyeballs at
the moment with writing this PER and are meeting with Major Projects again
tomorrow to go through what i hope will be the final submission before it goes
to public exhibition.
>
> Hard to believe it has taken over 18 months to get to this point on what
would otherwise remain a heavily degraded site.
>
> Following tomorrows meeting i will give you an update and answer your
questions as best i can.
>
> Thank you for your continued support and interest in the project.
>
> Kindest Regards
> Justin Trott.
>
> Sent from my iPhone

Hello Justin,

Thanks for meeting with the Kangaroo Island public last Monday evening, 25 August, to provide information about your proposed golf course.

After the meeting I approached you to ask for a copy of the map displayed during your presentation. You agreed and presented me with your business card. Please email the map to me at garfishki@hotmail.com.

I also write to ask you to confirm information given during your presentation and also in response to questions from the gallery during the question time as well as to individuals who approached you after the meeting, as follows:

- You, Justin Trott, are the General Manager of the Golf Division of Programmed Turnpoint, your training and background are in landscape architecture, and you are currently based at Mornington, Victoria.
- Your company owns a golf course on King Island.
- Davies Road will be the entrance to the facility and will not be altered or improved.
- Guests will be brought to the facility via mini-vans, rather than coach or by air.
- A patronage is anticipated of approximately 12,000 persons per year.
- Green fees will be \$50-\$100.
- Running costs are estimated at \$800,000 per annum.
- A permanent staff of about 15.
- Year round operation
- There will be no helicopter transport to or tours around the facility.
- An electrical substation is planned to supply power from the existing grid.
- Water will be provided through a 200mm pipeline from Middle River Dam at a projected cost of \$2 million.
- Desalination has been eliminated from options to provide water.
- All buildings will be below horizon line, most below tree line as viewed from Prospect Hill.
- The facility will not be fenced off from kangaroos.
- No soil will be brought on to the grounds.
- Anticipated start date of June 2015 for ground breaking.

Thanks again, as your confirmation of this information will do much to relieve some anxieties about the proposal as well as to disburse incorrect rumours.

Regards,

James Newcomer
3196 Hog Bay Rd
Pelican Lagoon

From: **Justin Trott** Justin.Trott@programmed.com.au
Subject: RE: Golf Course on Kangaroo Island
Date: 11 September 2014 2:53 pm
To: **Indiana James** garfishki@hotmail.com



Dear James,
Apologies for the delay in getting back to as I have just returned from a week's annual leave and the email back log is ridiculous.

Please find attached concept master plan as it currently sits, but note that minor revisions will occur as we work through the PER.

In general your synopsis of the evening and what was said is accurate bar for the following minor points;

Although not said on the night, my background was in Golf Architecture and Landscape Architecture for 20 years, while the past two years have been in Golf/Landscape Construction and Maintenance and more recently project development.

Intersection with Davies Rd and Hog Bay will only be improved to the point that safety concerns are alleviated.

Anticipated running costs of approx. \$800K are for the golf course operations only.

We are in the hands of the PER and the support from the local interest groups to get this over the line, so here's hoping.

Kindest Regards

Justin Trott GENERAL MANAGER - GOLF DIVISION



1A Fuji Crescent Mornington VIC 3931
D 03 5977 1200 F 03 5977 0200 M 0417 036 959
justin.trott@programmed.com.au
programmed.com.au





RAMINDJERI HERITATGE ASSOCIATION INC.

14th June, 2015



To whom it may concern,

We the Ramindjeri sovereign tribal people of the area which includes all the upgrade and proposed areas for the development on Kangaroo Island, without the consent of our people, do submit this document (rebuttal) for the clarification of our expressed sovereign rights over the lands which you are currently proceeding to develop, for your consideration.

We have not been included in any of your previous meetings in which you have discussed the destruction of our home lands to this date. Ramindjeri Heritage requested a Heritage agreement to be entered into prior to commencement of any works.

We believe that such an agreement should identify a commitment to cooperate and support the maintenance of all of the cultural expectations of the Ramindjeri Nation.

Furthermore it has been proven beyond a shadow of doubt, in the Native Title Court that we are not a sub-group of Ngarrindjeri or Kaurna or for that matter anyone, we are a nation of our own. We further inform you if the you or the State continues down this path without consultation with the Ramindjeri sovereign spoke person and representatives of the tribal people of this lands, there will be worldwide ramifications to shame you all. This is our sovereign rights to our land and rights to have a say in our future together as Wirritjin. (Black fellow / white fellow working together)

See Attached documents and our boundary map of our lands.

We look forward to further discussions in relation to this matter,

Regards,

Karno Walker RHA – Chairperson / Spokesperson, Sovereign, Southern - Law man

Karno G. Walker (Karno)

Vivienne Greenshields – “Princess Unbulaba” RHA – Secretary, Sovereign, Southern - Law woman

V. Greenshields

SUBMISSION RE: KANGAROO ISLAND GOLF RESORT

A group of business leaders called The Shearing Shed Group supports the proposal of the Kangaroo Island Golf Resort at Pennington Bay.

This group aims to promote positivity.

Our support is based on the following:

Parts 1 & 2

- It is made very clear in the proposal (contents 2) that local tradespeople will be used in the construction phase. Also local materials will be used where possible. We support these proposals.
- Up to 60 people will be employed in the construction phase with 25 jobs available afterwards. On an island these numbers are significant.

Part 3 the Project part B

- The site chosen is significant, the views are stunning
- The site is neglected and over run with invasive weeds (onion, lincoln weeds and African Boxthorn). The proposed management plan will reverse this degradation
- Design of the building using local stone will blend with the surrounds and will have very little visual impact
- Management control proposed we believe will minimize the threat of dust and noise escaping the site especially in the construction phase

Part 4 – part C - Planning and environmental legislation and policies

- As noted it is zoned primary production. The claim that this was last burnt in 1954 is incorrect as the locals can tell you that it was burned frequently since then up to the late 70's. The reason was to manage and sweeten pasture for grazing of livestock.
- It is noted that fairways that intrude into the coastal conservation areas have been planned to minimize impact
- Under KI Natural Resource plan there is a strong desire to restore degraded areas. The proposed management of feral weeds will sit well within these ideals
- As noted in plan a 10% increase in tourism numbers has a huge impact on local economies not only in employment but also in monetary flow-on.

Part 5 – Need for the proposal

- As stated above employment is of a premium concern
- Money that flows in to the Island economy will multiply through the community
- Degraded areas will be restored

- A different type of tourist will be targeted. They will stay more than one day and will visit and taste what Kangaroo Island has to offer
- Water pipeline will benefit those living along the route as well as possibly serving American River. While water is being taken out only in the wet season very little impact will occur at Middle River.
- Rest of state will benefit because of different type of tourist
- It would be a great loss not only to KI but to whole state if this proposal fails to go ahead.
- The degraded site has the potential to be restored to not only a pristine area again but also to become very attractive.

Part 6 – Environmental Issues

- Flora – when the site is overrun with weeds the native flora has little hope of returning. Control the weeds and re-veg is proposed. We note fire is to be used. We encourage this. Our local flora in most cases needs fire to be restored.
- Fauna – There certainly will need to be a control program for kangaroos. We suspect that this will have to be extended to wallabies and the brushtail possum. As noted, wallabies and possums are more nocturnal than kangaroos therefore very hard to determine numbers. This site as noted will certainly have to be fenced.
- We suspect that the proposal will bring an increase in numbers of heath goannas. We certainly would not hold this project back on the assumption made that it could be a site for bandicoots and possible fly over of Osprey and white bellied sea eagle

*** In summary we support the proposed Golf course:-

Being a degraded area, restoration will have a very long-term outcome for this site. Also has the real possibility of restoring balance to native flora and fauna.

Employment for KI not only in the construction but on-going.

We suspect the multiplying effect of each dollar could be 6. This would have a very positive outcome to many businesses on KI.

Will give local builders, from earthworkers to plumbers and electricians a major boost having worked on such a major project.

Will give our young people the opportunity to gain good hospitality skills and to work with people from all over the world.

Signatories

Megan and Michael Barrett

Proprietors

Century 21 Kangaroo Island

Rodney and Judie Bell	Proprietors	Bellevista
Philip Bell	Proprietor	Linden Lea Mitre 10
Andy Boardman	CEO	Kangaroo Island Council
Peter Clements	Councillor	Kangaroo Island Council
Graeme Connell	Councillor	Kangaroo Island Council
Peter Davis	Proprietor	Island Beehive
Tom and Fiona Fryar	Proprietor	Fryar's free-range eggs
Cate and Andy Gilfillan	Proprietors	Southrock Lamb
Pierre and Branka Gregor	Proprietors	Adagio Bed and Breakfast
Mark Hardy	Proprietor	Hardy Earthmoving
Andrew and Tracie Heinrich	Proprietors	Ellamatta
Colin Hopkins		Elders Real Estate
Jeff and Val Howard	Proprietors	Dudley Wines
Peter and Julie Ingram	Proprietors	Ingrams Home Hardware
Geoff Rischbieth		Chemplus Pty Ltd
Richard Trethewey	Principal	Circle T Holdings
David Turner	Proprietor	Turner Fuel
Craig and Janet Wickham	Proprietors	Exceptional Kangaroo Island
Kate and Roger Williams	Proprietors	Roger's Café
Darry Fraser	Proprietor	KI Paper Works
Peter & Julie Wyatt	Proprietors	KI Transfers

Major Development Application Kangaroo Island Golf Course Resort Submissions



Tell us what you think about the following aspects of the Public Environment Report.

Submissions may be made available for public inspection and would be included in the proponent's Response Document (that will be released for public information at a later date). Please indicate below if you object to your submission being made available in this way.

Name *Elizabeth Sheatman* Address *PO Box 347 Penneshaw 5222*
Telephone *8553 1224* Email

Overall, what do you think about the proposed Kangaroo Island Golf Course development?

It looks like another Southern Ocean Lodge style exclusion zone with little value for the locals

Do you have any specific comments on the following?

Tourism and economy (Tourist visitation, job creation, value adding to local business etc)

Environmental (native vegetation and animals, landscape, cultural heritage etc)

The proposed culling and total waste of carcasses ~~of~~ of kangaroos in the designated area for the golf course is unacceptable. Chemicals used on golf courses are also unacceptable. The huge use of water & power may well be negative for the environment & locals



Government of South Australia

Department of Planning,
Transport and Infrastructure

Infrastructure and services (Power and water use, delivery of services to the site etc)

See previous

Buildings and design (Building location, design and architecture, landscaping etc)

Competent design

Traffic and access (safety and access, car parking etc)

Are there any other matters you would like to raise?

Please indicate your preference below:

Please make my submission public

Please *do not* make my submission public

Written submissions commenting on the PER are invited until 5pm, Tuesday 30 June 2015 addressed to:

Minister for Planning c/-
Robert Kleeman, Manager
Development Assessment (Investment Management)
Department of Planning, Transport and Infrastructure
GPO Box 1815
ADELAIDE SA 5000

or via email to: dpti.kigolfcourse@sa.gov.au

Further information

Call – 1800 PLANNING – press option 1

Visit – sa.gov.au/planning/majordevelopments

Email – dpti.kigolfcourse@sa.gov.au



Government of South Australia

Department of Planning,
Transport and Infrastructure

Public submission by Kathie Stove

PO Box 648

Penneshaw 5222

kathie@inwriting.com.au; 0417 086 870

Public Environmental Report for Kangaroo Island Golf Resort Located at Pennington Bay, KI

Application further to Sec. 46 (6a) of the *Development Act 1993* for:

- a golf course and associated practice facilities, clubhouse and dining facilities
- tourism accommodation and staff accommodation facilities
- a maintenance compound and associated facilities including water storage
- residential development
- stormwater and sewerage infrastructure for the capture, treatment and re-use of recycled water
- associated infrastructure in respect of water supply, electricity, telecommunications, stormwater, effluent disposal, roads and parking.

General comments

My general impression of this proposal is that it is patently absurd.

This public environmental report is long winded and repetitive. It does not extend its deliberations beyond the actual site to the other critical environmental factors that are integral pieces of this proposal: Middle River Dam, the water pipeline to the course and Pelican Lagoon Basin, in which it sits. It is so short on detail, consistency and evidence that I consider it to be an insult to the many, busy, people who have to spend the time to work their way through more than 200 pages to find out so little about the proposal.

I have to think that this lack of substance and attention to detail in the PER indicates that the proponents will have a similar attitude to the actual proposal and the people of Kangaroo Island will be left with yet another white elephant (like the plantations) that we have to deal with. I know many people on the island get excited by the prospect of jobs but would change their view if they read through the proposal and had a moment's pause instead of believing the hype. I believe this proposal would do nothing but damage to the island.

Recent community engagement by both Kangaroo Island Natural Resources Management Board and Kangaroo Island Futures Authority emerged with clear community support for a Kangaroo Island 'brand' predicated on a healthy, resilient natural resource base, including the wise and productive use of water. The community said that what they valued about Kangaroo Island was the unique sense of place; peace, quiet, wildness, space, slow pace and safety; nature, wildlife, beauty, unspoilt coastlines and cleanliness; community spirit and caring, friendly, diverse attitude; economic opportunities – agriculture, tourism, small business – based on natural resources and local know how; and creativity, learning, local knowledge, skill and resilience. This gold course concept does not fit into those values.

Executive summary, Need for the proposal

It is expected that the Island, as a region, will continue to develop as a pre-eminently sustainable, nature-based tourism destination. However, there is also a need to provide opportunities in other tourism markets around the themes of outdoor adventure and leisure activities, the coast, niche food and wine products, heritage and culture. These markets should add depth to the Island's appeal as a visitor destination and encourage longer stays.

I dispute this claim as an argument for such a proposal as this golf course. In fact, I think that this proposal is at odds with the brand of the island as a sustainable nature-based tourism destination. It would require animal 'management' to the extent of a substantial fence that would have to extend out along the ground to exclude kangaroos, wallabies, echidnas and goannas which would otherwise chew up or dig up the course, and leave their calling cards everywhere. Tiger snakes are not mentioned in the PER but they will also be there, in numbers. Would the patrons of a 'wild links' course choose to be housed in a detention centre?

The motto 'Zero harm', statement of 'entirely ecofriendly' and claim of 'sustainability' are also preposterously juxtaposed against:

- transportation of water about 80 km from its source
- CSIRO predictions of declining rainfall across Kangaroo Island
- introduction of dangerously weedy couch grass for all fairways and tees
- application of herbicide and fertiliser on extremely poor soil in the catchment of Pelican Lagoon, a Marine Park Sanctuary Zone
- proximity to endangered birds such as the Osprey, Little Penguin and the Western Whipbird
- encroachment on and use of the Coastal Conservation Zone
- deprivation of public access (**10.4**) to Crown leasehold land in the Coastal Conservation Zone.

I suggest two alternatives to this proposal, both of which are more in keeping with the natural experience of Kangaroo Island and would give genuine community benefit.

The first is a drive to increase visitation from birdwatchers, which is a high-return tourism sector that is rapidly increasing as natural areas become more scarce in the developed world. And it fits with the brand of Kangaroo Island. Birdwatchers contributed \$36 billion to the US economy in 2006 and 20% of all Americans are identified as birdwatchers (US Fish and Wildlife 2006).

The second is an extension of the community built golf course at Penneshaw (see below).

Specific comments

My specific comments can be grouped under three headings:

- financial credibility
- water
- sustainability.

I have used quotes from the document (indented, italics and lightly corrected) to which my comments apply.

Financial credibility

2.0 Background to the project

The economic benefits are:

- 1. injection of \$9.5M p.a. into the local economy*
- 2. under a moderate growth scenario of the economic impact of tourism and agricultural growth (KIFA 2013) an increase of \$9.5M represents 40% of projected growth regional product of the Island with an overall direct impact of 4.5% on Kangaroo Island's gross regional product*

3. *the multiplier effect of 2.0 to 2.5 that will permeate the overall Island economy*
4. *the overall development cost of some \$14 million will contribute at least \$6 million directly into Kangaroo Island economy through jobs, materials, transport, planning and consultancy*
5. *the residential /clubhouse component of the resort will afford a significant marketing and selling opportunity for local produce (including wine, lamb, honey) thus capitalising on the 'clean and green' image of the Island.*

5.2 Local and state benefits of the proposal

From an economic and social perspective the following statistics and facets are intrinsic elements of the proposal:

- *The overall course construction and building development is budgeted at \$14,000,000.00 of which there is an identified direct local contribution of some \$6,000,000.00 in labour accommodation, local materials, plant hire, travel, etc.*

I do not see any evidence nor support for these figures. The overall development cost of \$14 million seems to be very low considering that power access costs are stated as \$1.9 million – already more than 13% of the funding gone. Where is the breakdown into components: the cost of the water pipeline, site preparation, transport, golf course construction, clubhouse construction?

With a quick internet search I find that a golf course architect who is willing to state a ballpark price (and therefore probably cheap) quotes up to \$5 million for a high quality course (such as this proposal with aspirations to make it into the top 100 courses of the world in 2 (or was it 3?) years). And would I be right in thinking that a Greg Norman course would be more than just a little more expensive?

The \$5 million is for just the course, in a mainland location near to population centres, and in US\$ where wages are much lower than in Australia and the exchange rate is about 77c to our Australian dollar. So lets be conservative and double the price – that's \$10 million + \$1.9 million for power, so pretty close to \$14 million already. And oops, there's the clubhouse, accommodation and the water pipe ...

Water

6.11.2 Water and 10.2 Water

Water is provided from two sources:

- *Water will be harvested from the Middle River Dam during peak flows when surplus water would otherwise flow straight out to sea. Water will be taken per developer-paid infrastructure near Playford Hwy–Milk Track corner and transferred direct to site, some 35km to the south.*
- *Potable water for use by visitors and staff of the golf resort and clubhouse will be mainly sourced from treated rainwater collected from the roof tops of the various buildings.*

Middle River Dam

The dismissal of water that would 'otherwise flow straight out to sea' as 'surplus' shows an ignorance of and lack of care for environmental processes. That water is the lifeblood of river ecosystems below the dam; the flow out to sea of a river is a critical part of its functioning. The River Murray is a clear example of a river in serious dysfunction because of a lack of flow through its system and out to sea.

'Total potable water supplies currently available on the island amount to 875.6 ML annual and this compares to potable water demand of approximately 673.4 ML. Therefore, on average, there is a surplus of approximately 202 ML of drinking water in the island per year. Due to anticipated growth in demand, the surplus is expected to reduce to around 22 ML by 2050.' (*Kangaroo Island Demand and Supply Statement for Water 2015*)

This proposal would reduce the volume of available water dramatically and in drought years would be dangerous. The CSIRO climate projections (www.climatechangeinaustralia.gov.au/en/climate-projections) for the Southern and South-Western Flatlands East, which includes Kangaroo Island, states:

- Average temperatures will continue to increase in all seasons (*very high confidence*).
- More hot days and warm spells are projected with *very high confidence*. Fewer frosts are projected with *high confidence*.
- A continuation of the trend of **decreasing winter rainfall** is projected with *high confidence*. **Spring rainfall decreases** are also projected with *high confidence*. Changes in other seasons unclear, although downscaling results suggest a continuation of the observed autumn declines.
- Increased intensity of extreme rainfall events is projected, with *high confidence*.

The trend to less winter and spring rainfall is enough to show that this proposal could not succeed because it is relying on 'excess' water which would otherwise go over the spillway. According to the CSIRO projections, that water will continue to decline. Without the Middle River dam water the proposed facility would have to be closed down, leaving Kangaroo Island with the mess to clean up.

4.5 EP Act 1993 and associated policies and guidelines

*The site is located outside on an EPA designated **Water Protection Area**. The closest areas so designated are Middle River and North West River.*

However, the **source** of the water which would be delivered to the site through the pipeline is in an EPA designated Water Protection Area and this must be taken into account.

Pipeline

Information on this pipeline, its cost and the manner of its construction appears to be missing from this PER, yet it is critical to the project.

The statement 'buried within the Hog Bay curtilage' is the closest we get to any description of the construction method.

By definition curtilage is land immediately surrounding a house or dwelling, including any closely associated buildings and structures, so is clearly misapplied here. However, I take the use to mean land immediately next to the Hog Bay Road. Is this the cleared strip right next to the road? Is it the vegetation that lines the road and is an integral part of the signature Kangaroo Island experience? Many of the vegetation blocks along this road are Kangaroo Island Narrow-leaved mallee, a vegetation community declared as critically endangered under the Environment Protection and Biodiversity Conservation Act. This is not mentioned in the PER.

If indeed the pipe is to be buried immediately next to the road, then the costs would have to include traffic control. How much is this pipe dream expected to cost?

The proposal is a slap in the face to American River residents who have been crying out for a reliable water supply for many years but costs have defeated their chances.

Will properties that the pipeline passes be obliged to pay water rates as is the case with all SA Water supplies, whether the owners use the water or not? These landowners may well object to having to pay for something they did not ask for.

Storage on site

Water sourced from the Middle River Dam will be stored directly into the onsite 100ML storage dam. A separate take off tapping point will be installed prior to the water entering the storage dam and directed into a sealed tank/s ...

Water evaporation from the proposed storage dam may be a problem particularly during the warmer months while wind generated evaporation is regarded as a year-round issue. Various measures to control this loss are currently being investigated with the optimal approach currently seen as the provision of a surficial polyethylene membrane (floating cover) resulting in an evaporation mitigation rate of approximately 90%. It is stressed that evaporation is presently a developing technology and that at the time of dam construction and filling with water the most overall beneficial technique will be employed to ensure minimal loss.

Evaporation is fully developed in the area!

4.3 Kangaroo Island NRM Plan Strategic directions

Promote water management that protects aquatic environments

There are no aquatic environments on the site and irrigation management will be controlled in such a way so as to mitigate against any impacts on the groundwater environment. The soil types on site are primarily free draining sands overlaying sandstone and limestone formations which reduce the occurrence of groundwater mounding. Records on site indicate the shallow standing water levels are in excess of 40m below ground level.

There appears to be no comprehension of the need for lining the dam, despite the statement that the soils are free draining. What will be the nature of the lining, how often will it need to be replaced and what costs will it add to the project?

Irrigation

The free draining soils will also have implications for the irrigation. The emphasis in the PER is on not over watering to stop water pooling. However, the nature of the soils indicates that the opposite is the problem. How will the need for constant irrigation, especially in this exposed location with vicious winds and with very porous soil and underlying rocks, affect the groundwater and Pelican Lagoon? The lagoon is the natural destination for all this water, a Marine Park Sanctuary Zone and iconic nursery area for many marine species, such as King George whiting, garfish and salmon – all of which service the fishing and tourism industries of the island.

The PER is almost entirely devoid of any discussion of geology, and its implications for the water to be pumped into the area.

The *Business Plan 2012–2013 Site Investment Guide: Protecting critical aquatic ecosystems, Pelican Lagoon Basin* was prepared by NRM staff on Kangaroo Island. Pelican Lagoon Basin, which includes the area proposed for the golf course, is the catchment area for the High Ecological Value Aquatic Ecosystems of Pelican Lagoon. The following quotes from that report are relevant to this proposal (my bolding) but are not covered in the PER.

‘Pelican Lagoon contains 274 surface water courses (draining from predominantly agricultural or residential land) and a localised regional groundwater flow system with **very high recharge potential due to the high permeability of the largely limestone strata** in the basin.’

‘Pelican Lagoon supports more than 60 bird species, including **more than 30 that are listed as endangered, rare or vulnerable.**’

'Key threats to the site include **land and coastal development and associated runoff**, grazing pressure, weeds and pest animals (marine and terrestrial), and tourism. Catchment runoff is high in nutrients and sediments from cleared pasture and croplands, as is sewage runoff from surrounding townships and subdivisions.'

The existing threats can only be exacerbated by the proposed golf course development.

On-site rainfall

The *Kangaroo Island Demand and Supply Statement for Water* (2015) gives an alarming picture of rainfall in the decade 2001–2010, which included several years of drought. A marked drop in rainfall is seen from the patterns of the previous 100 years across the island from Emu Bay to Flour Cask Bay. The strip has a rainfall of 300–400 mm per year, whereas the southern half had previously registered an average of 500–600 mm per year. This is close enough to, and moving towards, the vicinity of the proposed golf course to indicate that future rainfall would decline there as well.

Sustainability

Built forms

No attention is drawn in the PER to the fact that all accommodation and the clubhouse is facing west which in summer would be unbearable and would have huge implications for cooling.

6.11 'Cross ventilation' barely hints at the howling winds that would batter this development at any time of the year.

6.11.4 Waste

It would be expected that a tourism facility such as this proposal would generate quite large amounts of food waste and green waste. However, it is not mentioned in the waste section. I would think in an 'entirely ecofriendly' proposal that it would be acknowledged as something to be closely considered.

*10.1, Hard waste disposal:
present capacities will be able to absorb the expected waste generated*

As all KI rubbish and recycling is shipped off the island, this would add to the cost for island ratepayers

As a destination

*The principle [sic] basis for establishing a world-class golf facility and residential component at the location is to provide not only golf in a quite isolated, scenic and natural setting but also to afford a high-end level of accommodation from which golfers and other guests can both explore the Island as a whole (by car or escorted bus touring) while having **direct access to spectacular coastal walking tracks for which the Island is renowned.***

Are the proponents encouraging their guests to walk along the coast even though they have stated that the walking track has been taken out of the proposal?

In fact, Kangaroo Island is not renowned for spectacular coastal walking tracks. They are quite limited especially on the south coast where the human impact would be damaging to the local ecology.

5.1 The proposal cites the growing demand for golf developments:

Barnbogle in Tasmania, the championship courses of the Murray River at Yarrawonga, Cobram, Barooga, etc., and the Mornington Peninsula courses in Victoria

and the

growing market for the developing 'experience' golf on a golf destination basis where visitors enjoy both the characteristics of the course itself and the unique offerings of the surrounds, including spectacular scenery (such as Kauri Cliffs at Bay of Islands, NZ), local food and produce, and environmental conditions, e.g., Cape Wickham on King Island, Tasmania.

It seems the market is becoming crowded. Why would Kangaroo Island enter such a market with a cheap proposal? Why not continue to set ourselves apart by not going down the same road?

5.3 Consequences of not proceeding with the proposal

Should the proposal not go ahead it is difficult to envisage any alternative use other than low intensity grazing being pursued. Whilst being intrinsically attractive as a physical tract of land with its spectacular scenery, wildlife and strong sense of being entrenched in a natural, isolated environment the site needs a singular stimulus to warrant its development with tourist accommodation. That stimulus is identified as championship level, links golf and the opportunities arising from golf tourism.

Southern Ocean Lodge doesn't need golf; it does very well out of the natural values and spectacular beauty of the south coast. A revegetation program for the proposal area with local KI plant species would be cheaper (not requiring the water piped in) and more sustainable than an input-intensive project such as a golf course.

4.2 Kangaroo Island is one of Australia's National Landscapes which are tourism icons in their own right, because of their natural assets, not golf courses.

And for the people who want a golf experience, why not use one of the existing golf courses – take the burden off the volunteers who have put in thousands of hours of work to create beautiful courses. The Penneshaw Golf Course has a vista that is truly spectacular. The money earmarked for this proposal could be better spent upgrading that course, extending it to 18 holes with greens rather than scrapes, and putting in a club house and accommodation that would face north). The adjacent blocks of land are for sale.

In the scheme of the modern world Penneshaw is still a remote location, and for Kangaroo Island, it has the best and most reliable power, and a desalination plant for water supply.

4.4 SA Tourism Commission design guidelines for sustainable tourism

- *Achieving authenticity by being genuinely relevant to the history, industry, culture, lifestyle and natural resources of the district*

The proposal responds in a highly considered way to the principle [sic] natural resources of the area being the wild scenery, the vegetation and the wildlife.

These are just empty words. This proposal is not relevant to the local history, industry, culture and lifestyle. The whole empty proposal is quite at odds with the 'discover the things that really matter in life' Kangaroo Island Brand and the beautifully natural Kangaroo Island experience rapidly vanishing from the rest of the world. Please reject this proposal.

Mackenzie, Alex (DPTI)

From: Pam -general [pmjwhi@gmail.com]
Sent: Tuesday, 30 June 2015 5:00 PM
To: DPTI:KI Golf Course
Subject:

I am happy for my submission to be made public.

Overall, what do you think about the proposed Kangaroo Island golf course development?

I think it is a foolish idea that indicates a very poor understanding of the natural environment of kangaroo island.

I believe that the project could best be summed up by the statement:

" The end result will be to destroy what they've come to enjoy."

Do you have any specific comments on tourism and economy?

If most of the visitors to the development are expected to fly in (from interstate and overseas) they will not have independent transport and are therefore less likely to patronise other businesses on the island?

Kangaroo Island already has an established reputation as a significant tourist destination because of its unique landscapes and ready access to wildlife in its natural habitat. This unspoilt nature and relative lack of development is probably its greatest asset. Why should it go the way of vast tracts of Australian coast with continuous housing and "leisure" developments such as those on the south west coast of Western Australia or Queensland?

If we are trying to boost the Kangaroo Island economy and increase employment why not put effort into expanding opportunities for developing tourism around Kangaroo Island's natural assets that already exist rather than destroying them for the needs of a narrow group of potential visitors. For example let's develop more wildlife and sea tours and invest in the thriving artist communities who do so much to enhance our appreciation of this beautiful place.

Do you have specific comments on the environment?

The proposed site has probably remained relatively untouched for so long for good reason: it is harsh limestone country where even endemic plants struggle to survive the combination of poor rocky soil, unreliable low rainfall and a large number of grazing kangaroos.

>> If the aim is to develop a wilderness golf course what is the plan for the "greens" to survive in harmony with the native animals who will find all that green grass eternally irresistible?

Do you have any specific comments on infrastructure and services?

Water supply for developing and maintaining greens let alone the proposed 80+ dwellings is of great concern to me. Where will the water come from and what is the risk of other landowners having to subsidise the water costs for this development?

Finally ,what is the plan for the large amount of waste generated by this development ? Has the untouched coast and fragile nature of the surrounding land been taken into consideration when planning waste disposal?

Yours sincerely
Pam White

Sent from my iPad

Major Development Application Kangaroo Island Golf Course Resort Submissions



Tell us what you think about the following aspects of the Public Environment Report.

Submissions may be made available for public inspection and would be included in the proponent's Response Document (that will be released for public information at a later date). Please indicate below if you object to your submission being made available in this way.

Name CYRITA WILLIAMS Address 185 GLEN BARRETT DVE KINGSCOTE
Telephone 0456 080 882 Email kidave@hotmail.com

Overall, what do you think about the proposed Kangaroo Island Golf Course development?

GREAT for economy, job creation.
Good use for a place that hasn't been used for a long time

Do you have any specific comments on the following?

Tourism and economy (Tourist visitation, job creation, value adding to local business etc)

Can I have a job please?

Environmental (native vegetation and animals, landscape, cultural heritage etc)

I like this part of the island.
Coastal walk would be a great addition for the other walking trails available on the island.



Government of South Australia
Department of Planning,
Transport and Infrastructure

Infrastructure and services (Power and water use, delivery of services to the site etc)

Buildings and design (Building location, design and architecture, landscaping etc)

Traffic and access (safety and access, car parking etc)

— hope the road is 'upgraded' to a better road with all the traffic that will be ~~coming~~ using it (currently not much at mo.)

Are there any other matters you would like to raise?

Please indicate your preference below:

Please make my submission public

Please *do not* make my submission public

Written submissions commenting on the PER are invited until 5pm, Tuesday 30 June 2015 addressed to:

Minister for Planning c/-
Robert Kleeman, Manager
Development Assessment (Investment Management)
Department of Planning, Transport and Infrastructure
GPO Box 1815
ADELAIDE SA 5000

or via email to: dpti.kigolfcourse@sa.gov.au

Further information

Call – 1800 PLANNING – press option 1

Visit – sa.gov.au/planning/majordevelopments

Email –



Government of South Australia

Department of Planning,
Transport and Infrastructure

Major Development Application Kangaroo Island Golf Course Resort Submissions



RECEIVED
- 8 JUL 2016
PLANNING DEPT
KANGAROO ISLAND

Tell us what you think about the following aspects of the Public Environment Report. Submissions may be made available for public inspection and would be included in the proponent's Response Document (that will be released for public information at a later date). Please indicate below if you object to your submission being made available in this way.

Name Robert Williams Address 76 DAUNCEY
Telephone 040 9673640 Email Rwi19634@kic-lond.com.au

Overall, what do you think about the proposed Kangaroo Island Golf Course development?

Very Good Project

Do you have any specific comments on the following?

Tourism and economy (Tourist visitation, job creation, value adding to local business etc)

Will increase all of above

Environmental (native vegetation and animals, landscape, cultural heritage etc)

Very minimal



Government of South Australia
Department of Planning,
Transport and Infrastructure

Infrastructure and services (Power and water use, delivery of services to the site etc)

WILL HELP TO PROVIDE WATER
ALONG THE WAY.

WILL HAVE NO ADVERSE EFFECT.

Buildings and design (Building location, design and architecture, landscaping etc)

VERY WELL DESIGNED.

Traffic and access (safety and access, car parking etc)

NO PROBLEMS

Are there any other matters you would like to raise?

CAN ONLY BE GOOD FOR KID
FANTASTIC DEVELOPMENT.
MUST GO AHEAD.

Please indicate your preference below:

Please make my submission public

Please do not make my submission public

Written submissions commenting on the PER are invited until 5pm, Tuesday 30 June 2015 addressed to:

Minister for Planning c/-
Robert Kleeman, Manager
Development Assessment (Investment Management)
Department of Planning, Transport and Infrastructure
GPO Box 1815
ADELAIDE SA 5000

or via email to: dpti.kigolfcourse@sa.gov.au

Further information

Call – 1800 PLANNING – press option 1

Visit – sa.gov.au/planning/majordevelopments

Email –



Government of South Australia

Department of Planning,
Transport and Infrastructure

D. A. 'Andy' Young:
'Melaleuca Cottage';
Vivonne Bay;
Kangaroo Island; Sth Aust.
Postal; P.O. Box 726,
KINGSCOTE ; S.A; 5223
Email; dayoung@adam.com.au

To the assessors,

may I thank you in advance for what I suspect is going to be quite a considerable job.

Before I start my critique of the contents of the EIS report for the Kangaroo Island golf course, may I note that in my experience the document that was put out to public comment was one of the most poorly written, poorly drafted and amateurish documents I have ever read.

I believe, were this document to be considered in an EIA in the state of Victoria, it would have been found to have been completely unacceptable and that it is quite concerning that such a poorly drafted, poorly referenced and poorly argued document should come up for public comment in South Australia, particularly when concerning such an environmentally sensitive site and such socially sensitive issues.

Some of the English was of a laughably poor standard.

I would further observe that these flaws in what is supposed to be key document, advancing a multi-million dollar proposal and one that was bound to initiate intensive debate and a serious level of controversy at that, is not reassuring as regards the bona fides or professionalism of the proponents of this proposal in my opinion.

I will address the many specific concerns I have later, but my general critique of the document, outside of the skills used to write and produce it, include

- the repetitious nature of the points advanced in the projects favour. I believe this document could easily have been have been produced in a format that would have totalled considerably less than one hundred pages.
- The clumsy and, at times, near unreadable state of the written English used.

The repetition and padding that has been included in the document, along with the extremely poor standard of the written English, might make cynical person wonder if the document was constructed in an attempt to dissuade people from reading it and for the proposal to therefore avoid criticism. If this was the case, they might possibly have succeeded in my case, had this proposal not been so obviously flawed and in need of critical review.

I would ask the assessors of this response to remember that the document you are reading has been produced by an individual who has a completed year ten level of education.

In this context, I would ask whether the document I am attempting to critique, with it's clumsy, repetitious style, full of typos and bad grammar, should have been at least of the standard of written English and to the standard of grammar that is contained within this response?

I would also contrast the main EIS report with the consultants reports and letters that accompany it and from which much of the text has been drawn.

While I have some issues with the points these documents make and some questions regarding their methodology and scope, none the less I found these documents ranged from adequately to well produced and that their presentation and the standard of their writing is in marked contrast to the primary EIS document itself.

I would particularly mention the EBR report and compliment this consultancy for the document, regardless of some of the issues I have identified with it.

The question all of the above suggests to me is: how can we have confidence that the proponent will get the project right, when they have failed to present us with a professional EIS?

Despite the commendations I have just provided for the supporting documentation, none the less these documents also had several flaws I could identify. Some of these were of a seemingly trivial nature: for instance, when referring to the *Eucalyptus rugosa* association, and again in the vegetation listings, *E. rugosa* is repeatedly referred to as 'Coastal White Mallee' throughout the Botanical Enigmerase report and in the primary EIS document. This mistake was repeated in the EBR report , but only at the first listing of *E. rugosa*.

In fact, in the source document for the common names of flora used in this document, 'It's Blue with Five Petals', by Ann Prescott, it is *Eucalyptus diversifolia* that is called the 'Coastal White Mallee'.

In both of the environmental consultants reports, their plant lists make this clear, as they also refer to *E. diversifolia* as 'Coastal White Mallee'. This means there are, in fact, two different trees for which they have use the same common name. I would again point out that this mistake is only found in the initial plant list in the EBR document, and elsewhere *E. rugosa* is, correctly, referred to as the Kingscote Mallee.

The fact that this mistake occurred within two supporting documents is concerning and could lead to questions as to whether there has been a level of data-sharing, or possibly plagiarism, when compiling these documents. As I think a balanced assessment would say that the two consultant reports should be truly independent to be of real worth, this is a concern.

A second concern relating to these documents is one of omission. Two major mistakes concerning fauna, as well as a further series of issues regarding flora that may, potentially be found on the property, have occurred within both of the supporting environmental reports.

There is also a avian phenomenon that went without comment. This may effect the dwellings and in particular the club-house, with expansive use of large glass windows and lighting, during discreet nights of the year.

As these mistakes and the omission are also identical across both commissioned environmental reports, it once again leads to the suspicion that these two reports, that are presented as being 'independent', have a degree of commonality that may in fact give an impression of collaboration or worse.

The specific omissions surrounding avifauna likely to be present on the land in question, concerns the Bush Stone-curlew, *Burhinus grallarius*, a bird listed as vulnerable within South Australia and who's presence upon the tract of land in question, quite possibly as a breeding species, should be regarded as highly likely. I would direct you to the abstract of a paper in which these assertions are confirmed at: <http://www.publish.csiro.au/paper/MU02029.htm> .

Kangaroo Island is this species last South Australian stronghold and it is widespread on the island, though numbers have been declining over the past twenty years. It favours open, stony, country to breed in and from my observations, the tract of land in question would be considered type habitat. The omission of a large bird species and one with a high conservation rating, throws the validity of the report, it's supporting environmental documents and it's finding into question.

A second fauna species is not mentioned in any of these reports and will certainly be present on and around this tract of land. It is a case where conflicts between the proposed development and this species presence is, to a point, inevitable. The species in question is the Island Black Tiger Snake, *Notechus scutatus ater*.

These snakes are quite common in the vicinity of Pelican Lagoon and it's surrounds. They are a large and, at times, quite aggressive snake. They are also rated in the worlds ten most dangerous venomous snakes, based on a toxicity per millilitre basis.

They will inevitably be attracted to the open environs of the course and will be found basking or traversing the course, it's surrounds and it's built infrastructure from time to time.

Such a significant, locally abundant, species should certainly have been referred to in a document such as this EIS and it's supporting documentation. The species is not mentioned as being present, or as one that is likely to be present, within any of the material I viewed.

A major concern also comes from an OH&S perspective. Protocols and further contingencies, such as education regarding dangerous snake interactions for patrons and staff, the provision of antivenom etc., should have been factored into any reasonably comprehensive EIS style document.

While it is true that under the NPW Act (1972) section 54 (2), a snake that is considered dangerous and threatening can be killed, this in itself is a risky activity and protocols should be available to assist in such cases.

It also should be remembered that this species is an important apex predator on the island and that continual and widespread removal of the species from a given environment may have other consequences to this environment. I believe the ecological imbalance caused by the consistent removal of predatory species, including the flow-on consequences of this approach, are relevant to an EIS type process.

The omission of any reference to this species, how interactions with it will be dealt with, contingencies, OH&S implications and education for patrons and staff surrounding the species and it's presence in the area, are a second significant oversight of the material provided in relation to the fauna that may be present.

In terms of the floral assessment, I would acknowledge that both consultative teams involved in producing the supporting documentation have a specific expertise in this area, however I believe there were flaws and oversights involved when producing this section of the report as well.

I would again refer to the mistake regarding the correct commonly-used name for *Eucalyptus rugosa*. It is a minor, but instructive, error. As *E. rugosa* is the dominant component of the only identified rare-flora association in the documents, this mistake is perplexing and indicative of a lack of attention to detail.

Once again I acknowledge that the EBR report only made this mistake a single time and through the rest of their document, this mistake is corrected.

Other issues have arisen from the surveying window that was used by both consultants. This did not allow small, ephemeral, listed plants, such as orchid, which may enjoy a high conservation rating, to be observed during the surveys.

There is a single species, *Caladenia sanguinea*, that is a listed plant and is recorded as being 'likely' to also occur in the remnant Mallee fragments present within the land-parcel in question.

As someone who has been involved in the study of orchids on Kangaroo Island over the past thirteen years, I believe that the open under-storey areas within Mallee growth, recorded in the report and accorded only a moderate rating of conservation significance, may in fact harbour several further orchid species than those recorded.

These may include *Caladenia stricta*, (which I believe is not restricted to the area between Vivonne Bay and Seal Bay, as suggested in the EBR report. Rather these observations seem to refer to recent records. Historical records were from the Dudley Peninsular and may well have involved relatively adjacent areas to the proposed development), as well as *Pterostylis mellograma* and others.

To make an accurate assessment of the orchid flora of this area, spot-surveys in both Mallee habitat and coastal cliff-fringes, should be conducted in late July and again in mid-September.

The omission of these speculative records have the unfortunate effect of casting into doubt the accuracy of the respective reports' ratings of the quality of native vegetation present. Were these orchid species found to be present through a more thorough and targeted surveying regime, this might significantly affect recommendations of assessed environmental worth of the various vegetative communities involved. It may also effect recommended environmental works or payments under the environmental remediation programs proposed.

Dense plantings of secondary under-storey species may crowd out pre-existing, listed, orchid species and the potential for this is not discussed anywhere in these reports.

A final point missed in the EIS documentation, is that migratory flocks of Prions of an undetermined species, occur in large numbers, albeit in a very narrow time window, in coastal and closely proximate sub-coastal environs on the south coast of Kangaroo Island. These flights occur from time to time, may be weather dependant and are hard to predict.

The birds are attracted to lights and are prone to crash into lighted objects in the area of their

migration in vast numbers after dark.

The result of the birds crashing into the lighted windows of the club-house and other buildings could range from stunned individuals falling onto roofing or the ground, through various levels of physical injury, including broken bones that may necessitate the birds to be euthenized, to direct fatality. This could cause the area directly adjacent to the club-house and other lit areas to become littered with dead, dying or injured birds.

The proponents may wish to consider the potential impact on the feelings of guests and staff present should such an event, with these attendant outcomes, occur and may wish to have provisions in place to deal with lighting hazards at these times.

I believe the absence of any mention of the large, dangerous Island Black Tiger Snake, *Notechus scutatus ater*, is of extreme concern. This matter, if no other, deserves urgent attention and may potentially have direct, life threatening consequences if this fails to be done.

I believe that as current OH&S laws state that if a potential injuring or life-threatening process is identified by an individual who is an employee of the state, including volunteers, in regard to an activity, then the failure to notify and act is a culpable action and that fines and other consequences may result. I am alerting the EIS review panel of these concerns and believe that there may be downstream consequences were the panel and the proponent to not directly address this issue, if an incident involving one of these snakes was to then occur.

I would recommend that the specifics of maintaining a dedicated, refrigerated supply of Tiger Snake antivenom be required of the proponent, in the event the proposal is approved. This would also necessitate having an individual who has training in administering such antivenom to be present at all times. Tiger Snake activity is not restricted to the warmer months. They may be active on a fine day throughout the year and in fact I saw one a fortnight ago at Vivonne Bay, crossing a road.

I also believe that along appropriate inductions and training of staff in dealing with these snakes, educational and interpretive material should be prominently and widely available, dealing with this snake, it's presence in the area and what to do if it is encountered, for all patrons and visitors.

I would request that the panel considers specifying that a time-specific survey be undertaken for the identified vulnerable large bird species here identified, the Bush Stone-curlew, *Burhinus grallarius*.

Similarly, a time-specific survey or surveys be undertaken to ascertain whether listed or other ephemeral plants are occurring on the site have been missed because of the late time-window in which initial surveying was undertaken. I believe there is no need to repeat this surveying during an autumn time-window, as no potential ephemeral, listed, flora is likely to be found during an autumn time-window at this site.

A second, major concern resulting from my appraisal of the report and it's supporting documents, is the one of possible contamination, via shed storm-water, of the adjacent Pelican Lagoon.

I believe the 'motherhood' type reassurances contained in the reports and the subjective assessments that accompany these assertions, apparently trying to downplay this possibility, do not afford the issue the degree of seriousness that is commensurate with actual risk.

The EMS report treats particulate contamination of water resources as a major threatening process, however the extensive use of chemicals that are currently commensurate with this proposal and it's upkeep, are given only lip-service in the primary document.

There are several issues that I would like to highlight in relation to the potential for chemical or fertiliser contaminated water to leave the property and end up in the local water-ump, Pelican Lagoon.

The first of these is that of the potential of chemical contamination of storm-water.

The proposed golf-course, the EIS document acknowledges, is likely to be highly dependant on both fertiliser and pesticide usage to maintain the fairways and greens to an acceptable standard. Further to this, it would appear that large amounts of herbicide will be used, both from a course maintenance perspective, as well as a primary measure to suppress the spread of potentially weedy-grass species from the course environs, into adjoining areas of native vegetation.

The amounts to be used, or the nature of these chemicals, are not specified in the EIS, apart from stating that minimal amounts will be used and that they will be transferred, when possible, from off-site to the point of usage to avoid spills. The logistics involved in doing this would appear inconsistent with the scope of the areas these chemicals will be applied to, which are proportionately large, and the regularity of application, which will need to be near continuous, to create the 'dead-zones' around all fairways and (presumably) greens, in an effort to stop the migration of grasses, as mentioned above.

A point worth considering is that this system does not appear to be a tried methodology and there are no examples given where this system has been successfully used elsewhere, that I could find, in the supporting documentation.

While engaged on this search, I have found a discussion of invasion of couch-grasses into bent-grass greens (which may be a relevant factor in assessing which chemicals or practices are likely to be employed in the maintenance of other aspects of this proposed course;) see http://www.agcsa.com.au/files/Tech%20Talk13.1%20pg%2038-39pdf_0.pdf#page=1&zoom=auto,-326,827).

On the whole, golf-courses do not seem to have been routinely placed in such environmentally sensitive areas, so this issue of grass-spread and concerns surrounding it appears to be somewhat novel.

Rather the use of a sprayed buffer around the fairways seems to have been an off the cuff suggestion by one of the consultants, to deal with an otherwise intractable issue, and the full consequences of adopting such an approach do not seem to have been investigated.

The issue of controlling sub-surface stolons, which are a primary method couch-grass uses to spread and are unlikely to be effected by Glyphosate spray, are not dealt with. While spaying surface foliage of couch-grass with Glyphosate, given optimal conditions, is likely to be relatively effective,

with the caveats I have noted below, the potential for sub-surface and deep stolon development to allow the plant to pass under the control zone is not dealt with in the document.

I suspect, in practice, that what this strategy will mean, will be the near-continuous use of Glyphosate-based herbicide. All eighteen fairways and greens will have a broad border/interface areas sprayed with Glyphosate in a near continuous manner, when weather conditions permit.

Couch grasses are fast-growing plants, and as Glyphosate is a contact poison and is not systemic, the application period will have to be frequent to very frequent in any given section of the course, to achieve the desired prophylactic effect.

As this will be the only form of control specified, along with seed-head suppression, to control course-grasses from becoming invasive weeds, then the importance of this process working cannot be over estimated.

Apart from a possible consequence of herbicide resistance by using this type of regime, (which I will address below,) there is a very real possibility of spraying needing be carried out in sub-optimum conditions. The only alternative to this would be to use highly toxic, residual herbicides.

Glyphosate needs to be applied when there will be no significant precipitation for 12-24 hours post application if it is to be effective and if the herbicide is to be contained at the site of application. With the need to mitigate course-grass expansion over such a large area, the issue of long periods of precipitation, where weather conditions do not allow for the applications needed, is not addressed in the EIS or the source documents.

As I have noted, the only other potential solution to this issue would be to use residual herbicides of much greater toxicity, that will persist in the soil and allow grass suppression during periods of prolonged wet weather.

Because the proponents make much of the fact they believe they can achieve their aims and goals with a 'low chemical use, low toxicity' regime, this is the reason I believe the control vector of choice will be a Glyphosate-based suppression system. My remarks are made in that context.

While of relative low toxicity in and of itself, (though it does have World Health Organisation rating of '2A', based on a report by the International Agency for Research on Cancer, meaning that it is considered to be 'likely to be of a cancer-causing nature in humans'), many Glyphosate formulations incorporate surfactants known to be deleterious to water-systems, should they enter them. While it is true these chemicals denature relatively quickly, especially in the presence of clays, the site in question has skeletal, linoid, soils, and this may effect the ability of the chemicals to denature in the soil profile.

Dealing with the issue of the potential of herbicides and other chemicals to migrate off-site, the report throughout is clear that it only deals with the contingency of water migration off-course in the context of low to medium level rain events, of a 'once in two year' nature.

As several rain events that have far surpassed these levels have occurred recently and as the predictions surrounding climate change would indicate that this trend is likely to increase, the fact is that large-scale, storm-water mobility across the terrain should considered as relatively likely on a semi-regular basis, unless mitigated against. The proponent's EIS makes it clear that these types of events are beyond the contingencies that have been considered in drafting the document.

It makes a claim at one point that a long, east-west running limestone ridge, situated to the immediate north of the properties in question, will block any storm-water passage. The basis of that assertion is not clear from the supporting documentation I was able to read in the short time available to me.

From the documentation available from the Department of Environment that I could find, regarding drainage lines and glacial valleys, it would appear that the land in question sits within a recorded glacial valley system as described within the document: <http://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=4&ved=0CDQQFjAD&url=http%3A%2F%2Fwww.environment.sa.gov.au%2Ffiles%2Fsharedassets%2Fpublic%2Fscience%2Fki-biological-survey-climate-geology-landuse-gen.pdf&ei=k9yPVcfCNli0mAXorb7ABg&usg=AFQjCNF-BVVxvqnBP8F7vtwX5jer8jqcVw&bvm=bv.96783405,d.dGY> .

The EIS also makes contradictory claims regarding porosity of the site and the ability of surface water to infiltrate aquifers. In one section it states that there is little to no chance of ground water contamination, as the nature of the soil and geology means that surface water will not penetrate it (thus leading to fears of the effect of run-off), in another section it claims that envisaged works will minimise storm-water shed, as they will allow for the penetration of surface water into aquifer reserves: as I remarked in the notes I made when drafting this document, you can't have it both ways!

By using the satellite view of the property on Google Earth, combined with past field studies I have conducted in this area, (I was present when the potential midden area based on Norman Tindale's photograph from the 1930's was mapped,) I believe there are two potential paths for large-event storm-water escapes to occur from this property.

One is via the road system to the east of the property, along the current roads and their easterly verges. Any flow in this direction will tend to end up in the small salt-lake at YMCA corner about one kilometre north east of the north-eastern corner of the property and from there it could potentially overflow into Pelican Lagoon in a very large scale event.

The second potential escape point lies to the west of the property, below the proposed dam infrastructure, along an apparent drainage line running due north from this point. It starts in the area where the unnamed road reserve gives access to the property for both the gas and water delivery systems and ends at the point where the waters of Pelican Lagoon lie closest to the property.

I note that eco-swailes are proposed to be placed along the edge of the unnamed road, when it is developed as an infrastructure maintenance track, but can see no contingencies or capacity to use similar soft technology along the apparent drainage line.

As the eco-swailes are only geared towards the low and medium level rain events anyway, their usefulness in large scale rain events, similar to the 20-30 centimetre falls over a few hours that have been experienced in the last several years on Kangaroo Island, is doubtful anyway.

As Pelican Lagoon is a jewel in the crown of the island's, indeed the nations, marine reserve complex, I believe the issues of nutrient and chemical contamination of this water body, with it's restricted intertidal influences and therefore it's restricted ability to disperse contaminants, is not adequately addressed in the EIS document. To only deal with rainfall events of a 'one in two year' probability is disingenuous and when situating a project in an area closely adjacent to the noted aquatic habitats of significance at Pelican lagoon and American River, need to be viewed as a major oversight of this EIS.

I believe, when the issue of water-borne contaminants is considered as part of this review process, that the precautionary principle should dictate that greater than usual levels of safeguards should be adopted when tackling these issues. In this context, I believe that only dealing with the consequences of low to medium level rain events in constructing responses within the EIS is a major flaw of this document. Should nutrients or toxic surfactants enter the Pelican Lagoon system, expected effects could be the formation of algal blooms, or the occurrence of fish and other marine creature kills.

As I have also mentioned above, a second issue of concern regarding the proposed control of the fairway grasses, is that it would seem likely that large amounts of a single type of herbicide will be the primary vector of control.

Indeed, if any herbicide other than Glyphosate is used upon the course, then the effects of these highly toxic, residual, chemicals will strengthen the concerns expressed above, regarding potential migration of these chemicals via storm-water run-off.

On the other hand, there is evidence to suggest that a potential side effect of the repeated, heavy usage of one herbicide, (in this case Glyphosate,) may be the development of resistance in the target plant species, the couch-grass, as well as any other weedy species present. This would then necessitate the usage of secondary chemicals, such as those alluded to above, that use a different pathway to control the plants in question. It is known that over reliance on a single herbicide, even one as effective at preventing resistance as Glyphosate, can cause this type of resistance to occur, by continually selecting for resistant individuals in the plant population.

There is no room for reducing application levels, if the strategy of producing dead-zones at the edges of fairways and greens is to be effective in suppressing the spread of course-grasses into the wider environment.

Further to my concerns regarding the use of herbicides to control course-grass spread, I would express some doubts if the efforts needed to maintain this sort of control, along with the suppression of every flowering head of the grasses proposed to be used, will be within the ability of the course manager to maintain. This goal, aside from the up-keep of a major golf-course, represents an investment of a considerable number of worked hours and cost by itself.

Any relaxation of the regime; for instance if one stolon of grass moves into the surrounds, or if one flower-head successfully sets seed; will cause the whole approach to be compromised. Should this occur it will become inevitable that without a vast public investment, the course-grasses will become a widespread problem plant throughout the region.

Regarding the use of adhoc suggestions to try to tackle potentially serious environmental damage, I believe this issue of the control of course-grasses is one of several areas of the proposal where novel, apparently untested, 'solutions' are proposed to address major issues.

It may be this type of continual spraying and seed-head suppression has been effective elsewhere. This is hard to determine without adequate referencing.

In looking at the limited, non-peer reviewed documentation that Botanical Enigmerase sourced and listed in the production of their document and remembering this is the report where the suggestion for the utilisation of this type of regime has apparently originated, there does not appear to be any reference as to where this technique was drawn.

On the one hand, innovation is to be encouraged. On the other, without going through a procedurally correct, scientifically-rigorous, assessment, there is capacity for the suggested control measures to be found to be impractical or ineffective. This may occur for a variety of reasons and there is no redundancy of procedure to rely upon should this be found to be the case.

As the outcomes from a failure of these suppression systems, whether caused by the admittedly unlikely occurrence of herbicide resistance or simply due to logistical impracticality, would be the spread of a highly mobile plant into private bushland, Conservation Parks and other areas, then the imperative for getting these systems right is apparent.

I would add that the discussion surrounding Kangaroo and Wallaby control is of a similar type. There is a continual assertion that these animals are a primary cause of the degraded nature of the land in question, however the objective support for this assertion appears to be missing. How can one know that the land was not in a worse condition when commercial grazing ceased and that it has slowly improved its environmental values under the current usage regime? The evidence supplied is subjective and anecdotal and I would contend this is not a good enough standard of evidence in this type of document or process.

I would be more willing to consider the assertions made throughout the EIS, if good, quantifiable, evidence was given to back up these types of assertions.

The issues surrounding the supply of water to the resort and golf-course are many and may end up being extremely socially divisive, unless rigid protocols are put in place.

The time when the assurances contained in the EIS and the memorandum of understanding between the proponents and SA Water are going to be contested, such as the water-harvesting windows and the assurance that only potential overflow capacity will be diverted to the resort and course, will be during dry years. This is also when the residential population and the local environment of Middle River will also be competing for this limited water resource.

In this light, I believe that the proponents must be made to give a cast-iron guarantee that they will adhere to all such agreements regarding water harvesting, even if this causes the proposal to be eventually deemed non-viable. To not do so, makes these assurances of no worth.

I believe the danger in the assertions that have been made about the Middle River Dam capacity and environmental flows are that they refer to long term averages. They do not specify what may have occurred in the driest of the last twenty-five years, for instance, when this water resource was essentially exhausted some years and where replenishment may have meant little or no overflow occurring in the time-window when the course development will be allowed to harvest this overflow. Should this occur into the future, and with all predictions regarding climate change suggesting this is likely to be the case, then what are the consequences for all of the parties competing for the resource?

I would suggest that environmental flows may well be the first to be sacrificed in this scenario. As many of the nesting trees that the Kangaroo Island subspecies of the Glossy Black Cockatoo, *Calyptorhynchus lathami halmaturinus*, rely upon, occur in areas that are watered by the Middle River overflow, then this may directly affect these birds. By seeking to minimise discussion around this possibility within the EIS presented, I do not think the document fulfils its duty to assess broader environmental consequences that may flow from actions associated with the development.

If there would be a flat, legally-binding commitment from the proponent that they will only utilise overflow from Middle River Dam, between the months of May and October and that they categorically state they will never, under any contingencies seek to vary these terms regarding water rights from this source, even if it effects the viability of their venture, then I am willing to withdraw my questions regarding this area of the report.

I would then also be of a similar disposition regarding the current social usage of this resource. As I have already stated, this is a resource that has failed at the end of prolonged dry spells in the past, leaving the town of Kingscote without a municipal water supply. The piping system referred to for the transportation of the resource to the course area, with the further municipal usage that is envisioned by the properties that this pipeline bypasses, all speak to an increased strain being brought to bear on the primary resource, Middle River Dam, in times of water shortage and during dry years.

This is the basis for my criticism: that the methodology of dealing with averages is not sufficient when addressing these issues: rather, a methodology of looking at historical low points in the water storage cycle of the island need to be understood and contingencies, including that of trucking water from the mainland if needed, need to be put in place and budgeted for in this context.

What is likely to happen otherwise, is that the resort will wish to prioritise its water usage over that of the general population and the environment. Indeed, it would be surprising if the proponents of a major investment, such as this one, did not make such an application for priority in water supply, should it be critical to the survival of their venture.

I believe were this to happen and domestic water resources were to be denied to other users of the Middle River Dam because of this, then considerable ill will and social friction may be generated.

If the proponents are not willing to guarantee they will not apply for water allocations above and beyond those outlined in the EIS document and in the agreement with SA Water, should they not get enough supply from the current water-harvesting contingencies, then I think it reasonable to assume the scenario I have outlined above will occur, from time to time. If this may be the case, I think it is reasonable for the community to be informed of this and for the assessment to proceed in the light of the discussion that may ensue.

Another issue is that of the allocation of an apparently large amount of Kangaroo Islands' electrical capacity to this venture.

The assessing panel may not understand this, but Kangaroo Island has a single major entry point for the power we currently use. While there is some secondary back-up capacity on island, and we hope to be able to supplement this over time by the use of renewable power generation, the current supply comes from the under-sea cable from the mainland. This cable reaches the island near Cuttlefish Bay, somewhat to the east of Penneshaw.

All current domestic allocations as you move to the west of the island are reliant on this resource and when you reach the more westerly settlement areas of the island, for instance at my home settlement of Vivonne Bay, reliability of supply is determined by the power draw-down further to the east. We are, in effect, at the end of the line.

In practice this means we experience regular, small-scale power failure events. When major users to the east turn on fixtures and plant, this causes a draw-down that in turn causes a power failure, often of a few seconds to around a minute, down our end of the supply chain. This results in

electronic devices such as clocks, DVD players, etc. needing to be reset nearly every day and is the cause of much frustration within our communities.

I think users to the west of the island would be very interested to know what guarantees are in place that the usage occasioned by forty, power-intensive, residential units, plus forty accommodation villas, each housing up to four occupants, plus a clubhouse, restaurant and course-maintenance facilities, (augmented as they are by a certain investment in solar capacity,) will not cause frequent and large scale blackouts, similar to those we experienced in 2003-4, where over thirty blackout events, some for as long as two days, occurred in the fortnight just after Christmas.

I would note that while the resort will not be inconvenienced during blackouts, as they will have additional diesel generator capacity, the same may not be true for the thousands of other domestic and visitor users who may be severely impacted during such an event.

I would also note that such supply failures have caused much bad press for the island as a tourism destination when they occurred in the past. Should they occur again, especially as a regular feature during our summer tourism season, then this may influence expected visitor numbers to all tourism-based ventures, including the proposed resort and golf-course.

I would note that there appears to be no additional allocation of generating resources, outside of some roof-top solar ones, in the formulation of the plans surrounding the proposed course development.

Rather, if my reading of the documentation is right, and this is an area where I admittedly have little expertise, there will be a sub-station to buffer and to prioritise the high levels of current draw the development will demand, at the expense of the demands of other users, especially those to the west of the development. If I am wrong in these conclusions I would apologise in advance and would be happy to be shown that these concerns are groundless.

My final question regarding this subject is would the golf-course and resort be prepared to guarantee, should it be shown that a major black-out event was the direct consequence of their load and draw crashing the island's, (or part of the island's,) grid, that they would pay restitution, plus compensation for any devices or goods that might be damaged by such an event, in a prompt and full manner?

If not, are we to assume that such black-outs may well be expected to happen due to their power draw on already stretched supplies, and that the attitude of the resort will be 'I'm all right Jack and stuff the rest of you,' should this occur?

When addressing the social dividend of the proposal, I am mindful of the need to encourage top-end jobs for islanders, on Kangaroo Island.

I am also aware of the down-stream consequences of the stated policy of the proponent to feature island-sourced produce as a primary feature of their restaurant facilities and the spin-offs for local contractors during the construction phase of the project. This is commendable and will provide considerable benefit to the broader island community.

I would note, however, that the top-end Southern Ocean Lodge development, situated in the south-west of the island, has had enormous problems attracting local staff to work in their resort. This is partly due to issues of remoteness and travel time to the facilities, combined with a reluctance

from many island-based people to move away from their current accommodation, to an on-site accommodation option.

It is also a consequence of the reality that many of our brightest and best young people either wish to pursue a future in agriculture and continue the family farming tradition, or see that their future is best served by moving to the mainland and pursuing their chosen careers there, in light of the multiplicity of opportunities that are open to them in this market place.

This tends to mean that many of the potential work force likely to be attracted to the facility are also those who may have been unable to find work elsewhere for a variety of reasons.

As the talented work-pool that does exist on the island is fairly well known to local employers, most of these talented and socially gifted individuals are actively competed for and are already in relatively well-paid, fulfilling employment. Unless the wage dividend paid by this resort is significantly superior to that found elsewhere, it may mean that the proposal finds there is a talent shortage when it comes to its stated employment aims.

All of these factors have resulted in the Southern Ocean Lodge sourcing nearly all of its work-pool from areas other than Kangaroo Island.

While it is true that some of these individuals, who first moved to the island to seek work with the Southern Ocean Lodge, have since made Kangaroo Island their home and are contributing their skills and resources to the community, the claims that the resort will be a long-term job bonanza for the island, and that nearly all positions on the staff will be filled by islanders, need to be tested in the light of these facts. Rather, it may be the proponents will end up seeking most of their staff from the mainland and the perceived benefit to the Kangaroo Island Community may need to be reassessed in this context.

The issue of economic viability is one that is well worth considering.

In the advent of failure that a serious economic downturn or other miscalculation of potential patronage may occasion, there are contingencies for removal of built infrastructure, however the removal of the actual course and its potentially invasive alien course-grasses do not seem to have been specified in these plans.

I would briefly note that the construction of the 40 houses to act as a financial buffer to the project is putting even more capacity into an already over serviced market and that this may have an impact on other house prices, but for me this is a minor concern.

The built infrastructure is unlikely to spread and grow, though it may produce a visual scar on the landscape.

This not the case with the course-grasses: these have the potential to be invasive throughout the region.

In this context I believe the question of the removal of the courses and their grasses is of greater importance than that of the removal of built infrastructure in the event of a project failure and is one worth addressing.

I believe it would be appropriate to gain an independent valuation of the timely and total removal of all the grassed surfaces for all the fairways and greens infrastructure and for this assessed

sum of monies, sufficient to do this job in its entirety, to be held in surety for a ten year period, against the failure of the development. This would be a similar style of surety required when undertaking a mining venture, where sufficient funds to allow for remediation are set aside until the site has actually been remediated at project end.

This money could be held in a long-term, high-interest, account and only accessed in the event of project failure and the remediation work needed to be undertaken, or if the course-grasses were not contained by the outlined control measures and needed to be removed from the surrounding bush areas.

After the ten years was up and if the course had remained solvent during this entire period, (and if the course grasses had not escaped from fairways and greens), then the whole sum would be returned to proponent, upon a written guarantee that grass removal and course rehabilitation would be undertaken, should the venture fail.

If, however, the provisions to stop the grasses escaping fail, then these funds, or a portion of them, should be employed to mitigate this occurrence.

If the venture was on-sold to another party, then a similar covenant would need to be provided by the buying party before the sale could progress.

Should, at any time, the project go into receivership, then the funds held in trust for the contingency of the projects failure should be held for a period of a further five years after the initial ten year period expired.

The consequences of the course-grasses escaping are extremely serious and would be costly for the community to address, should this occur. It is far better that the proponents are put at some small financial disadvantage, so that they take their responsibilities in this area seriously, rather than it being the broader community, specifically volunteers, who shoulder the burden of dealing with these consequences, should this aspect of the project go wrong.

I am not an economist, but if I am right in interpreting the figures given, the baselines provided for the projects viability are: 20,000 visitor nights p.a. at roughly \$350 per head; 22,000 rounds of golf p.a. at approximately \$125 per player day. This will mean (if averaged, which is unlikely to happen) that there will be around 55 player per day, present on the course, assuming every day is playable, a very risky assumption when considering the extremes of weather experienced on the island!

I would suspect a more realistic set of assumptions would specify that at least 30 days a year will not be suitable for golf because of extremely wet weather, that a further 20 days a year or more, (outside those that are too wet,) will be too windy, with winds over 35 knots, and that a further 5-10 days a year or more will experience temperatures over 37 degrees and will be too hot for most golfers. My mother is a keen golfer, so I know the ends they will go to get a round of golf in, however I would suggest these are reasonably realistic figures, when working out what will be the amount of days the course is playable through the year.

If my calculations are correct or close to being correct, a liberal estimate of the number of playing days at the course per year is around 300. If this is held to be a reasonable estimate, then this means roughly 67 people per day on average will be playing the course.

I would hold that it is likely this number will be significantly skewed in favour of the summer months, when, should the stated figures be accurate, several hundred people may occupy the course

on any given day.

Winter, especially during rainy, wintry, periods may attract a lot less patronage.

If this is the case, then it will be hard to engender the proposed values of: 'isolated, rugged, coastal'; during times of peak usage!

In fact all Kangaroo Island businesses suffer from a bottle-neck of patronage to capacity at certain times of the year and I see no reason why the golf-course should enjoy constancy of patronage, when no other island-based tourism business does. Our tourism providers have lived with a boom/bust cycle for as long as they have been operating and a successful business plan on the island needs to encompass this reality. I believe that the baseline figures from the proponent as regards this development need to make it clear how they will cope with the peaks and troughs they are likely to experience while operating on Kangaroo Island, while also realising that ferry and plane cancellations are not uncommon in rough weather and that the product they are selling is weather dependant.

While I do have legitimate concerns if the projects goes ahead, should it go ahead I am very clear that it must succeed. Should it go ahead and fail, then this will be the worst possible outcome for all involved. In this light I would ask the proponents to consider the issues I have raised above.

I have noted that their own projections of occupancy and facility usage will deliver them a 7% increase above investment p.a., so the diminution of these projections by as little as 2,000 visitor nights p.a., or if the figures of course patronage vary downwards by as little as 10%, will have severe implications for the financial viability of the project.

It should be noted when the proponent mentions Barnbougale as a model for their project, that this is an extremely attractive golf and resort complex, which charges less for the green-fees than the Kangaroo island proposal and is an extremely highly rated course (number eleven in the world, with the adjoining Lost Farm number twenty-three in the world). These two courses are part of the Tasmanian golf-courses that the Tasmanian Visitor Survey states attract 27,000 visitors who play golf while visiting this state each year; (see <http://www.examiner.com.au/story/2428520/barnbougale-tops-resort-leaderboard/>). I would question if it is credible that a single course on Kangaroo island, with facilities that are rather costly to patrons for what they offer and a course that the proponents while aspiring for it to be within the top 100 golf-courses in the world, have not achieved this yet, could have this sort of drawing power?

Based on this assessment, I would question who has done the financial modelling for the project, or whether these are just figures plucked from the air, designed to rush the state government into approving the development for benefits that may or may not exist.

Let us examine some case histories of other developments of a similar nature or attempting to draw upon a similar price-demographic of tourist to the one we are considering here, that exist near by.

On the South Australian mainland, the Wirrina Cove development, sited in a relatively isolated, 'rugged, coastal' area of the Fleurieu Peninsular, has struggled financially from day one.

While not offering a product that sits quite as highly up in the cost-profile as the proposed development, Wirrina is none the less a country-club style project, reliant on the sale of adjoining property associated with the venture and with an activities emphasis on its golf-course. It also boasts a marina type development.

It has been a white elephant from day one, with multiple owner, and multiple receivers left to clean up the mess.

I would also mention the K.I. Wilderness Retreat, situated near Flinders Chase National Park. While not a golf-based enterprise, it was initially aimed at a similar demographic and cost profile as the golf-resort project being proposed, with the aim of servicing the 'ecotourism' market.

The costings and location of the project were the subject of considerable public concern on the island at the time it was proposed.

It was pushed through by government despite these concerns.

It has also been a spectacular financial failure, with multiple owners who are constantly downgrading the product in an attempt to find a viable market demographic they can service.

This has resulted in the 'Retreat' becoming, essentially, a back-packer style development.

It would be unfortunate if, in the medium term, the proposed resort met a similar fate to either Wirrina or the K.I Wilderness Retreat.

I would also note that, when this developer compares their project with Barnbougle in Tasmania it is being not proposing nearly the degree of financial input the Tasmanian project enjoyed. From what I can see, course and surrounds developments in Tasmanian top-end golf courses are vastly more costly to produce than the sixteen million dollars, in total, to produce a club-house, facilities, accommodation. that the Kangaroo Island development budgets for.

In the light of this and given the second-rate EIS with which they aim to gain endorsement for the project, might it not be understandable if it was suggested that the developer may be cutting corners when it comes to the quality of the fixtures and facilities and hoping that no one notices? If this is the case, is this not the recipe for having yet another 'white-elephant' development littering our coastal areas?

The final main point I would like to address in response to the EIS and it's supporting documentation, deals with the issue of the indigenous cultural sites that are identified as being potentially present in the EBR report.

I would agree, based on the Tindale photograph and the exciting finding of the worked waterhole, (which is possibly unique in a Kangaroo Island context), that further work needs to be done on assessing cultural sites and artefacts that may be present within the development footprint.

I would note that as well as mandating inductions for workers and contractors, there may need to be regular site inspections to ensure that protocols surround the non-disturbance of any cultural sites or artefacts found during this work are adhered to. There is anecdotal evidence that several individuals from both on the island and elsewhere, who could potentially be used as contractors, may pay lip-service to such instructions surrounding cultural finds, then simply dispose of any such artefacts found, whether they are those of indigenous cultures, or those of early European settlers. This would typically be done to ensure the site development, and therefore their work schedule, is not impeded to any degree.

A further issue is the opinion given in the EBR report that the Ramindjeri Nation is the correct group to approach when speaking for this country.

The Ramindjeri Nation, to my knowledge, consists of local identity Karno Walker, along with his two brothers.

Karno has identified himself in the past as 'the King of the Ramindjeri'. The Ramindjeri claim to speak for this country is in the context of an attempted native title claim by Mr Walker, representing the Ramindjeri Nation, over the whole of the Fleurieu Peninsular, the Greater Adelaide area and the southern Murraylands and Murray-mouth, as far as Kingston in the south-east. I would refer you to the article at the time by the Murray Valley Standard: <http://www.murrayvalleystandard.com.au/story/1195966/native-title-claim-causes-offence/> ; as well as the Department of Environment report: <http://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=4&ved=0CDQQFjAD&url=http%3A%2F%2Fwww.environment.sa.gov.au%2Ffiles%2Fsharedassets%2Fpublic%2Fscience%2Fki-biological-survey-climate-geology-landuse-gen.pdf&ei=k9yPVcfCNli0mAXorb7ABg&usg=AFQjCNF-BVVxvqnBP8F7vtwX5jer8jcgVw&bvm=bv.96783405,d.dGY>

In the article, it is made clear that there was considerable anger at this land claim from other aboriginal nations. The claim over Kangaroo Island was made on the novel assertion of 'black-fella, white-fella dreaming', meaning Mr Walker asserted an ancestral claim to the lands of Kangaroo island on the basis of a pattern on the back of a Ramindjeri Kadaitcha photographed in 1913, that Mr Walker asserts represents the Adelaide area, the Fleurieu and Kangaroo Island.

His claim was also advanced on the premise that for three generations (including the present) Mr Walker's family had been engaged in contract shearing of sheep on Kangaroo Island.

In the Department of Environment report referenced above, it details the evidence that shows the ambiguities in determining which Nation speaks for country on Kangaroo Island.

All Mr Walker's claims have been dismissed without trial whenever they have been presented to any body of legal standing.

Archaeological evidence, although far from conclusive, suggests that, in fact, it may have been the Ngarrindjeri Nation who visited or dwelt on Kangaroo Island, pre-European settlement.

They have a strong tradition of dream-time stories surrounding the island, named Karta by the Ngarridjeri, Ramindjeri and Kurna.

The Ngarrindjeri ancestral spirit being, Narungderi, travelled along Kangaroo Island on his way to a place in the Milky-way.

I would suggest that it would be a very divisive move to mandate that the Ramindjeri Nation, in the person of Mr Walker, has the right to speak for this country and for the cultural sites that might exist there. This may be interpreted as acknowledging his right to speak for this country more broadly and therefore to legitimise his claim to be regarded as the native title holder.

I believe a degree of consultation with Mr Walker may be appropriate, but only if a similar level of consultation is sought from Ngarridjeri elders as well. Failure to do so may have profound cultural consequences, and may result in what might be perceived as vexatious land-claims in the future.

In summing up, may I state categorically that I am not, in principle, opposed to top end tourism development and the infrastructure that surrounds it, being an important part of the tourism market on Kangaroo Island.

Rather, my concerns surround the bona fides of this proposal, reflected in the sloppy and poorly produced EIS they have provided us with.

The concerns I have raised in this response are not comprehensive. There are further issues I could have presented dealing with raptors, including Peregrine Falcons, nesting under the limestone cliff-top overhang east of Pennington Bay in the last 30 years, issues with the assessment of the amount of native vegetation existing on Kangaroo Island within the various reports. The stated figures vary between the reports and, in some cases, within the reports themselves. Is the figure 55% remaining native vegetation as claimed in some of the documentation, or around 40% as claimed elsewhere?

I believe, in the end, that these issues are minor ones and even though they do reflect on the quality of the documentation, they are not nearly as serious as the issues I have chosen to highlight.

Rather the issues I have dealt with above are those I consider the most important issues that are raised by this document. They touch upon the very poor level of evidence it produces for many of the assertions that are contained within it and the omissions also to be found within it. As I have previously remarked, it is generally short on detail and proven process, while rich in subjective assertion, obfuscation and motherhood statements of goodwill when addressing extremely serious issues.

I question the financial competency of the proponents, reflected in what I believe is the ridiculous assertion that more visitors will play golf each year on their yet to be constructed golf-course, than is currently the case in the whole of the state of Tasmania, a suite of courses that includes one of their models, the world's eleventh-best golf-course, Barnbougle!

I question the investment size in comparison to the outcomes they envision and wonder what capacity they have to absorb the well known cost blow-outs involved with construction and maintenance of facilities on Kangaroo Island, as well what visitation bottlenecks in our boom/bust tourism economy are going to mean for the figures their economic projections are based on.

I am particularly worried when this proposal with all of its flaws and poor evidentiary process, reflected in the EIS documentation provided, lies a scant few kilometres from one of the most important marine reserves in South Australia. In fact, I wonder if there is any reason, other than the bargain price of the land they have purchased, that they did not explore the possibility of a course development at Point Reynolds, between Pennington and D'estrees Bays, which would have had all of the advantages of the proposed site and would have not had the same issues concerning the proximity to Pelican Lagoon?

It would be one thing if I had examined a tight, well-referenced, realistically-costed document when I read their EIS and its supporting document. This was not the case however.

So I would ask, in closing, whether you have attempted to read the the proponent's EIS in its entirety, and if so, with your hand on your heart, whether you believe that this document and therefore the project it proposes, clears the bar that it so clearly should when making this sort of proposal. This is particularly so when the issues surrounding the site are taken into consideration.

I would finally state that I believe a top-end golf-course for Kangaroo Island may well be a feasible, beneficial project. I believe that this current proposal, however, is not credible and would request that you consider the failings outlined here and in other submissions and require the proponent to produce a credible document before you will consider approving the proposal.

Thank you.

David Andrew Young,

Lot 187 Flinders Road Harriet subdivision (Vivonne Bay).

Postal; P.O. Box 726 Kingscote, South Australia; 5223.

(08) 8555 1504.

email: dayoung@adam.com.au.

28th of June, 2015.