Bindjareb-Peel
Aspiring Global Geopark
Site Assessment

Peel Region, Western Australia

Site Selection Report

GOVERNMENT OF WESTERN AUSTRALIA

PEEL Development Commission

Salt and Bush Eco Tours

Acknowledgment of First Nations People:

Indigenous people of Bindjareb country within the Noongar region of the Southwest of Western Australia have a culture and connection to this land that spans up to 50,000 thousand years or more. This represents the longest continuing culture on Earth. We respect the culture and knowledge of the Bindjareb people and aim to learn from their elder's past, present, and emerging as we embark on this project together – walking side by side.

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Table of Contents

Report Purpose	4
Map Overview	5
Geopark Purpose	6
Geopark Narrative	7
Geological Story	8
Biotic Story	8
Cultural Story	9
History	9
International Significance	10

Significant Sites:

Lake Clifton Microbialite Reef	11-14
Lake Clifton Lime Kiln	15-16
White Hills Lookout	17
Wardarn (Indian Ocean)	18-19
Bouvard Reefs	20-21
Tim's Thicket Quarry	22-23
Island Point Reserve	24-25
Warrungup Springs	26-27
Eagles Nest Cave (Morffit's Caves)	28-29
Old Coast Road	30-31
Mandurah Eaton Ridge	32-33
Yalgorup National Park	34-37
Yalgorup Tunnels	38-39
Preston Beach Coquina	40
Djilba (Peel Harvey Estuary System)	41-42
Dawesville Cut	43-44
Coastal Karst Formation	45-46
Mandurah Channel Entrance	47-48
Boundary and Channel Island	49-50
Creery Wetlands	51-53
Waangaamaap Bilya (Serpentine River)	54-57
Lake Goegrup	58-59
Barragrup Bridge and Mungah	60 -61
Cooper's Mill	62-64
Bilya Maadjit (Murray River)	65-66
Yoordinggaap (Harvey River)	67-68
Point Grey	69-70
Lake McLarty	71-72
Pinjarra Plain	73-74
Pinjarra Massacre Site	75-77

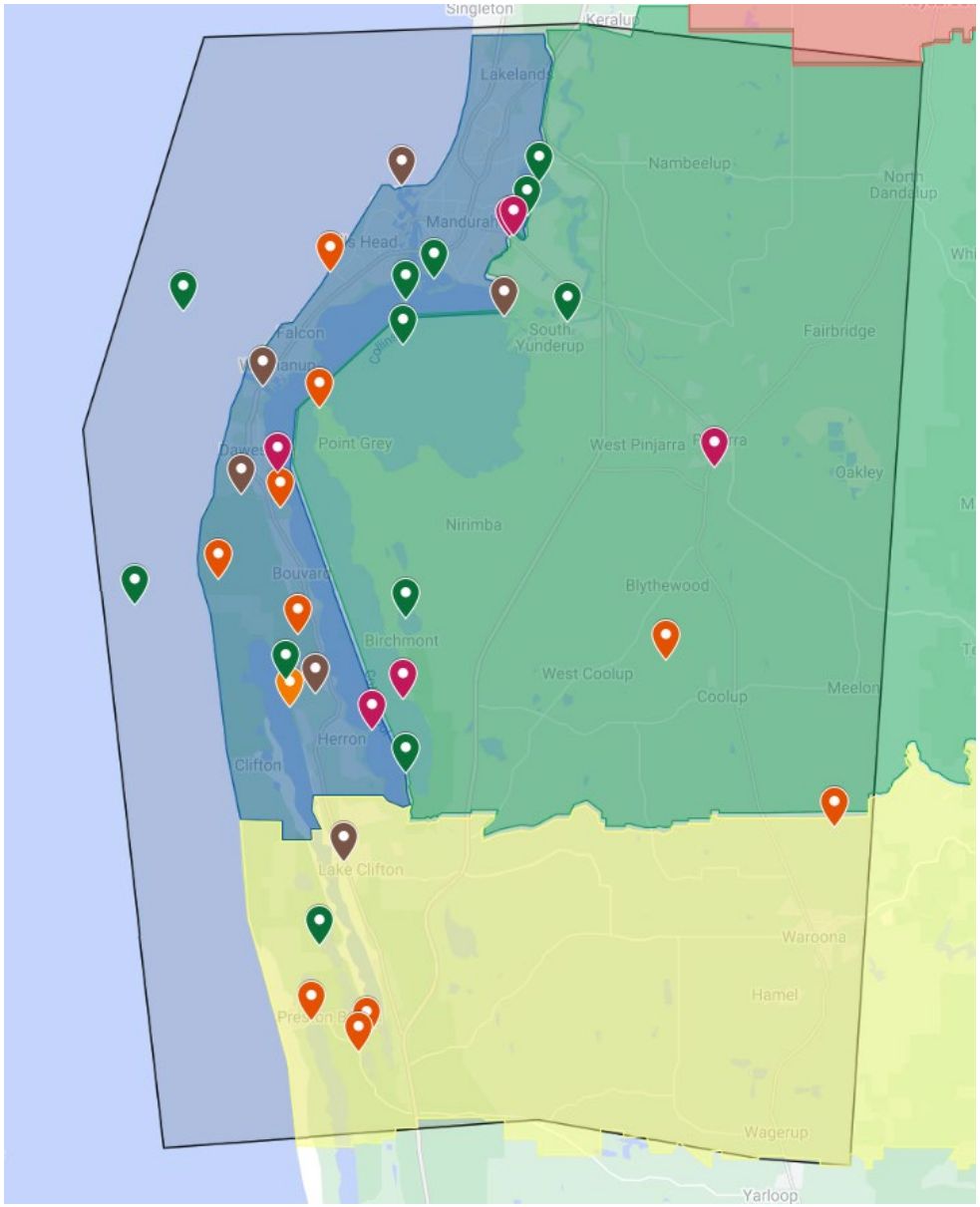
Purpose of this Report

This report aims to provide an overview of the Abiotic, Biotic and Cultural values attached to sites proposed for the aspiring global geopark for the Peel Region. Each site has been selected to align with the UNESCO Global geopark criteria and research has been conducted to support the inclusion of the sites into this Geopark.

This report seeks to gain further support for the selected sites and gain input from the Peel Geopark Working Group before going out to further stakeholders for input and feedback.

Further development of each site and the narrative and connection to the overall Geopark will evolve over the course of establishing this Geopark.

Detailed Site Information:
Site: Name of the site
Location: Google Map GPS coordinates – entering these site coordinated in Google Maps will bring up the pinpointed location.
Land Tenure: overview of land tenures across the site.
Abiotic: geological setting, landscape, landforms
Biotic: biodiversity of Flora, Fauna
Cultural: Indigenous Culture and European History
Other Significance: other recognition i.e. Ramsar
Infrastructure and facilities: what is located in or around the site.
Community Groups: Non-governmental organizations active at the site
Other: Anything that does not fit into the above categories
References: Site references provided



Bindjareb -Peel Aspiring Geopark Map Overview

The Bindjareb -Peel Aspiring Geopark occurs on Bindjareb Country in the Gnaala Karla Boodja Native land title area.

The geological setting is the landscape of the Swan Coastal Plain.

The local government areas where the Geopark occurs are the City of Mandurah (dark blue), the Shire of Murray (green), and the Shire of Waroona (Yellow).

The Boundary:

The northern boundary of the Geopark aligns with the Mandurah and Murray Local government boundaries. The eastern boundary is the geological Darling Fault line. The southern boundary is the Waroona local government boundary. The western boundary is the WA nearshore coastal waters.

Site Markers:

Orange - Abiotic

Green - Biotic

Pink - Indigenous Culture

Brown - Historical

Interactive Online Map - please visit: https://bit.ly/Geopark-peel to access the interactive map.

Geopark Purpose:

Create a Geopark that celebrates the interconnectedness of land, geology, cultural history, and the biodiversity of the flora and fauna of the Swan Coastal Plain within the Bindjareb country also known as the Peel Region. The aim is to foster recognition, respect, and conservation of this region for the local community and visitors to the area.

Geopark Narrative:

The Bindjareb geopark highlights the concept of time and change, geologically, currently, and into the future. Geological deep time and cultural Noongar Dreamtime explain the processes that have shaped the landscape of this geopark. This concept of time and change will allow us to celebrate the deep cultural knowledge and connection to this place, as well as the geological processes that have formed this region. This allows us to look at what may occur in the future with natural geological processes, as well as anthropogenic influences over the biotic world.

This geopark is an exploration of the Quaternary landforms and wetlands of the Swan Coastal Plain across the Peel Region. The Swan Coastal Plain is the surface expression of the Perth Basin and has been shaped by the deposition of sediment from the rising and falling sea levels due to global warming and cooling over the past 2 million years.

The Swan Coastal Plain has four broad geomorphic units representing different geological ages, depositional histories, and sediment types, and as a result, each unit has a unique ecosystem. The main geological units include the Pinjarra Formation, the Bassendean Sands, the Spearwood Sands, and the most recent Holocene Quindalup Dunes. This geopark includes sites that represent each of the main geomorphic units from the base of the Darling Scarp near Pinjarra and Waroona, out to the coastline to Mandurah and Preston.

This dynamic landscape of shallow lakes, estuaries, swamps, rivers, sand dunes, and shoreline represents the current phase of a constantly changing system. The past has created the incredible environment we have today, influenced by the interconnectedness of abiotic and biotic processes, as well as a long history of custodianship by Aboriginal people, to the dramatic changes seen in the last 190 years.

The Geology Story:

Overview:

This Geopark is situated on the West Coast of Australia on the Swan Coastal Plain, between the Indian Ocean and ancient pieces of the Earth's crust, called the Yilgarn Craton to the East. The landscape of the Bindjareb geopark has been shaped by recent dynamic geological processes, but it has also been influenced by geological events that can be traced back billions of years.

Detailed Geology Story:

The exposed rocks of the Yilgarn Craton are mainly granite and metamorphic rocks that range from 3.7 billion years to 2.4 billion years old. The Yilgarn Craton has experienced major change, including being part of the early supercontinents. A continental collision 1 billion years ago with ancient parts of Africa, India, and Antarctica collided with the western edge of the Yilgarn, forming a major mountain belt known as the Pinjarra Orogenic Belt.

The most recent supercontinent was Gondwana which began to break up 180 to 130 million years ago. Africa and India rifted apart and moved away from the West Coast of Australia with the birth of the Indian Ocean. Antarctica split from the south coast of Western Australia while it stayed attached to the southeast of Australia. Major rifting occurred along the Darling Fault with the land moving downward to the west creating a depression known as the Perth Basin.

Over time the mountain range on the western edge of the Yilgarn wore down through the processes of weathering and erosion. Ancient grains were removed from the Yilgarn and transported by river systems into the Perth Basin. The basin would gradually fill with 8 to 15 kms of sedimentary material and the mountain range would be reduced to a low range of hills that is referred to as the Darling Scarp.

The rest of the Australian continent finally split from Antarctica and began its voyage north 40 million years ago. As the continent moved north it began to become warmer and drier with deserts forming in the continent's interior.

These major geological processes created the Indian Ocean, Southern Ocean, and the deserts to the north and east, isolating the South West of Australia from the rest of Australia and the world. This isolation has allowed the evolution of an incredible amount of endemism, making the fauna and flora of the region truly unique.

The Australian continent has been relatively stable geologically for the past 40 million years. The major changes have been due to the rise and fall of the sea levels due to glacial and interglacial periods. The relatively flat laying surface expression of the Perth Basin is the Swan Coastal Plain, which has been sculptured by rivers, waves, and wind. The Swan Coastal Plain consists of old dune systems of quartz sand and calcium carbonate, deposited along shorelines during different sea levels. Depressions between these old dune systems are expressed as lakes, estuaries, wetlands, and shallow coastal waters between the shoreline and offshore reefs. Sea levels in the past 700, 000 years have ranged from 10km inland to 40km seaward from the present-day shoreline.

Landforms such as dune systems, reefs, limestone karst formations, lakes, estuaries, and rivers all preserve the rich geo-heritage values of the region. The landscape tells a story of the processes of the past and reminds us that the landscape is under constant flux.

The Biotic Story:

The South-West of Western Australia has faced such isolation that plants and animals have been able to evolve to their distinctive environments, leading to extremely high rates of endemic species. This region is a part of the Global Biodiversity Hot Spot of the South West botanical province. This region supports an estimated 5,700 taxa of vascular plants, representing two-thirds of the estimated plant taxa in WA (Hopper et al. 1996, Beard et al.2000). About 79 percent of the plant taxa in the South-West Botanical Province are endemic to the province (Beard et al. 2000). Plants in this region have had to adapt to sandy and low nutrient soils and periods of drought. The plants are sclerophyllous (hard leaved), protected on the outside from a glossy or resinous surface. Legumes are able to fix nitrogen into the soil, and this is a hot spot for carnivorous plants that have adapted to gain their nitrogen and phosphorous by digesting insects.

Continued land clearing, plant diseases (particularly Phytophthora spp.), weeds and introduced and other problem animals, road works, utility servicing, and upgrades, urbanisation, grazing by domestic stock, and changes to hydrological regimes continue to impact flora and ecological communities. The Swan Coastal Plain is altered to such an extent that much of the remnant vegetation is regionally significant and needs some level of protection (EPA 2006).

Fauna in this region have particular habitat and spatial requirements and respond poorly to the effects of fragmentation and its associated impacts, such as fire, weeds, competitors, and predators. Therefore a primary aim for fauna management within this region is the protection of existing habitats and rehabilitation of degraded areas to support wildlife. The estuary and waterways provide habitat for a large number of bird species, including migratory bird species coming from as far away as the Arctic circle.

Indigenous Culture

Bindjareb Noongar People

With thousands of generations of occupation in this region, the Bindjareb culture and people are tightly interconnected to this country, from the geology to the flora and fauna. They have experienced geological scale changes of the landscape, with the rise and fall of sea levels and the formation of landscape and rock. The Bindjareb people have witnessed major changes around them and have had the resiliency to adapt to these changes throughout generations.

This project is looking to add stories told by the local Indigenous people to bring culture to the forefront of this Geopark and this is a collaborative process that is being undertaken.

Recent History

Since 1829 with the establishment of the Swan River Colony and the time of European arrival to West Australia's shores there has been a period of major change including rapid population growth and development. Early settlement was initially guided by geology and the ability to grow crops. The soils closer to alluvial river sources were sought out by earlier settlers to support their agricultural needs. During this time there was clearing and draining of wetlands and later the addition of fertilisers at an industrial scale to supplement the nutrient-poor soils. This has led to environmental issues within the river, wetlands, and estuary of the region.

For the first 100 years of European settlement, large stretches of the coastal strip were left relatively untouched due to its lack of viability for farming. Over time the coastal stretch became sought after for lifestyle and aesthetics, which has led to the establishment of major urban sprawl from Perth's capital city both North and South close to the coast. The area of this Geopark represents the current boundary between urban development from Perth City and its boundary in the South. The population of the area within the Bindjareb Geopark is approximately 115,000 (2022).

80% of the original vegetation along the Swan Coastal Plain has been replaced with rural, urban, and industrial developments. With continued growth, there are threats to the remaining geological, biotic and cultural assets. In the last 55 years, there has been a growing awareness and understanding of the major changes to the landscape at the hands of humans. This has increased the level of ecological connection and a passion for conserving what natural areas remain.

International Significance

- **Bindjareb Culture**- a deep interconnection of land and people. Over 50,000 years of custodianship, land use, knowledge, and connection to place.
- **Lake Clifton Thrombolites**- One of the world's largest living microbialites reefs.
- **SW Biodiversity Hotspot**- this region sits within one of only two of Australia's internationally recognised biodiversity hotspots. With incredible endemism with over 8,000 species of native plants and 100 native mammals, birds, frogs, and reptiles. It also has Australia's highest concentration of rare and endangered species.
- **Internationally recognised Ramsar Wetlands**-Rasmar site 482 including the Yalgorup Lakes, Lake Meelup, Lake McLarty, and the Peel-Harvey Estuary.
- **Geo-Heritage Significance** - V. Semeniuk (2009) completed an evaluation of the Geo-heritage significance of Yalgorup and highlighted sites of international significance of quaternary landforms formed through the processes of coastal sedimentation which only occur nationally or have the best examples internationally.

Site Description	Thrombolites of Lake Clifton • A modern microbialite Reef on Lake Clifton eastern shoreline. • The reef structure is up to 150m wide and 10.1km in length. • Thrombolite structures are the most dominant form of microbialite in Lake Clifton. Locally referred to as 'the living rocks' • The Thrombolites are dome-like structures of 1,052,740 individual thrombolite heads (Spectrum Ecology, 2020). • Represents the modern analogy for understanding early forms of microbialites and the earliest forms of life. • Site represents the interactions of the abiotic world and biotic world with microbial communities building calcium carbonate structures. • Understanding the site requires a multidisciplinary scientific approach. • Holds a culturally significant Dreamtime story related to the site and its formation • Scientific and Cultural significant place of deep time origins and Dreamtime creation. • The Scientific narrative with microbialite representing the earliest forms of life as well as playing a major role in changing the Earth's atmosphere into an oxygen-rich one allowing for all the life that thrives today. The Indigenous Cultural narrative of the Thrombolites represents eggs of the female creator and leads to the creation of the waterways bringing life. • Critically endangered ecosystem of both local and international significance.
Location	Lake Clifton Yalgorup National Park, access via the boardwalk from the carpark on Mt John Rd, Lake Clifton. -32.745, 115.65
Land Tenure	Yalgorup National Park (DBCA), City of Mandurah, and Shire of Waroona

Abiotic Geology (landscape, landforms, climate)	Thrombolites are a form of microbialite – structures formed by photosynthetic microbes that precipitate calcium carbonate (limestone). Microbialite structures are evidence of the oldest life on Earth and are of great scientific interest. The cyanobacteria present in ancient stromatolites are a likely source of increased levels of oxygen in the atmosphere 2200 to 2400 million years ago. Western Australia contains a rich microbialite fossil record as well as the greatest number and most varied types of living microbialites in the world. This site provides valuable evidence on the nature of historic environments, aiding in the interpretation of the Earth's earliest biosphere (Moore, 1993). Lake Clifton supports the largest known examples of living nonmarine microbialites in the southern hemisphere. Radiocarbon dating indicates that the Lake Clifton thrombolites began to form up to 1950 years ago (Moore and Burne 1994). Seasonal fluctuations in the Lake Clifton water levels expose the Thrombolites in summer and submerge them during winter. Complex abiotic interactions occur with the surface water and groundwater chemistry, lake sedimentation, wind patterns and climate, all influence the Thrombolite community. Lake Clifton was the first place in the world where modern thrombolites were scientifically compared with modern stromatolites. (Burne & Moore, 1987). The first published report on the organosedimentary features at Lake Clifton was made in 1912. In 1979 L. Moore recognised the occurrence of 'stromatolites' on the foreshore of the Lake.
Biotic Biodiversity (flora and fauna)	The Thrombolites are formed by a complex community of micro-organisms including cyanobacteria precipitating calcium carbonate from fresh groundwater seeping up from underground aquifers. The metabolic activity of the microbes relies on sunlight for photosynthesis and the supply of calcium-rich groundwater for growth. Microbial mats grow on the Lake floor. Diverse metazoan fauna living within the reef structure

Cultural Aboriginal culture and European history	The Thrombolites hold a significant place for the Noongar people in their Dreamtime stories of creation. Woggaal Maadjit's Noorook. The nest of the rainbow serpent and the Thrombolites represent the eggs laid by the serpent. "One day the Aboriginal people of the Mandurah area found there were no waterways, they went to the beach and danced and sung for the great Waugal to come. Then she came and started to make the Peel Inlet and the estuary, she found that she was carrying eggs and she rested in between the estuary and the sea until she laid them. Then the eggs hatched and she sent her babies to do the rest of the work because she was tired. She sent one up the Serpentine, one up the Murray and one up the Harvey and that's how they came to be" – Story told by Gloria Kearing (DWER, 2022).
Other Significance	Internationally Recognised Ramsar wetland site 482 EPBC act Listed as Critically Endangered (Date effective 07-Jan-2010) Tourist Attraction 60,000 to 80,000 visitors per year (DBCA source). Proposed Geoheritage site (Geological Survey WA) Dark Sky Location – Astro Tourism
Infrastructure/ Facilities	All-access boardwalk, carpark, interpretation signage, drop latrines x 2, lakeside loop walking trail
Events, Education	Cultural, Eco, and Nature Tours School groups visits and potential for further educational opportunities. University research projects are ongoing.
Community Group, NGO	Lake Clifton Herron Residents Group (LCHRG) Peel- Harvey Catchment Council commissioned a study on the Thrombolites

References	K McNamara, 2009. Stromatolites Moore, L.S. and Burne, R.V. 1994. The modern thrombolites of Lake Clifton Peel-Harvey Catchment Council 2009. Peel-Yalgorup Ramsar Site Management Plan, Peel Harvey Catchment Council, Moore, L., Knott, B. and Stanley, N. 1983. The stromatolites of Lake Clifton, Western Australia Spectrum Ecology, 2020. Lake Clifton Thrombolite Mapping prepared for: Peel-Harvey Catchment Council DWER, 2022. Peel Harvey Estuary. Aboriginal Significance. https://estuaries.dwer.wa.gov.au/estuary/peel-harvey-estuary/estuary/

Site	Lake Clifton Lime Kiln
Location	Newnham Road Lake Clifton. -32.8106421, 115.6812492
Land Tenure	DBCA – Yalgorup National Park – within the Shire of Waroona
Abiotic Geology (landscape, landforms, climate)	Lake Clifton deposit of marl (carbonate sand, clay & shell) was initially mined to extract lime for making cement. The initial assessment of the lime was from the top of the lakebed and was suitable for cement making however as the dredging got deeper the marl was found to be inferior quality and unstable for cement manufacture due to the high bio-organism contents. The geological resource proved to be unsuitable for its intended purpose.
Biotic Biodiversity (flora and fauna)	The current conservation values of the native vegetation and thrombolites may have suffered irreversible damage if the lime works had proved successful. The area was cleared during the time of the building of the lime kiln. Regrowth includes Peppermint (Agonis flexuosa) dominant woodland, with Tuart and banksia's present. The understory includes many native species of understory including terrestrial orchids. Towards the edge of Lake Clifton is sedge land, samphire marsh that includes open low heath and very open herbland (Keighery & Keighery, 2013.)
Cultural Aboriginal culture and European history	European History: WA Portland Cement Co. 1922 Extraction of Marl from Lake Clifton occurred from 1919 to 1921 lime marl (sand, clay and shells) was pumped from the bottom of Lake Clifton through a pipeline into settling ponds, where it was then loaded onto trucks and sent to

	the cement works at Burswood. Later a railway line was built and officially opened in 1921 to transport the raw material from Lake Clifton to Waroona and then on to the cement works at Burswood. A rotary kiln was constructed in 1922 for the convenience of processing the lime marl at the site prior to transport. It operated for only 2 days and was then closed due to the inferior quality and unsuitable for cement manufacture. Aboriginal Significance: to be completed.
Other Significance	Adjacent to the Lake Clifton Thrombolites which are Ramsar-listed wetlands and a TEC (threatened ecological community).
Infrastructure/ Facilities	Car/bus park, picnic tables, and interpretive signage with an upgraded walking trail to the Lake edge, talking circle with 6 seasons Noongar posts. Future lookout to Lake Clifton planned.
Events, Education	NA
Community Group, NGO	LCHRA – Lake Clifton Herron Residents Association
References	Keighery, G.J. and Keighery, B.J. 2013. Wetland Vegetation and Flora, Part 5. Southern Swan Coastal Plain in A Guide to Managing and Restoring Wetlands in Western Australia. LCHRA, 2022. https://lakeclifton.com.au/

Site	Whitehills Lookout A viewpoint providing 360 views of Ocean, Yalgorup National Park and Lake Clifton
Location	At the end of White Hills Rd (prior to the 4WD track). -32.689874, 115.617177
Land Tenure	City of Mandurah and DBCA
Abiotic Geology (landscape, landforms, climate)	Uninterrupted views of the Yalgorup Landscape, providing the ability to see the regional scale of the geological setting. Valuable site for geological interpretation. Geological features that can be seen include: Bouvard Reefs, Quindalup dune system, Tim's Thicket limestone, Yalgorup plain, Mandurah-Eaton ridge, Lake Clifton, and the Darling Scarp.
Biotic Biodiversity (flora and fauna)	Coastal Heath, Tuart and Banksia Woodlands (Both TEC's). 3 Species of Black Cockatoo use this are for foraging and roosting. See Yalgorup National Park Site Description for further Biotic information.
Cultural	NA Further Consultation needed.
Infrastructure/ Facilities	Stairs to a lookout
Community Group, NGO	Bouvard Coast Care
References	NA

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Site	Indian Ocean / Wardan
Location	The Western Boarder of the Peel Aspiring Geopark
Land Tenure	State Waters of Western Australia
Abiotic Geology (landscape, landforms, climate)	State waters of the Indian Ocean within the Geopark boundary include the continental shelf and ancient shoreline that is now underwater. Formed 130 million years ago from the breakup of Gondwana and since has experienced higher and lower sea levels. Over the last 2 million years the ocean has increased and decreased due to the global interglacial and glacial periods. The ocean plays a significant role in the story of time and changes to our landscape within the geopark. Prevailing Southwest winds coming from the ocean have shaped the coastline and sand dunes that make up the Swan Coastal Plain.
Biotic Biodiversity (flora and fauna)	The Leeuwin current runs from North to South, creating a diversity of life in our ocean. Abundant marine life includes: inshore reefs, shells, sea grass beds, kelp forest, a variety of fish species, marine mammals including dolphins, seals and whales. (local marine surveys not available).
Cultural Aboriginal culture and European history	Indigenous beliefs around Oceans and waterways is that they are living beings. Wardan, or sea, is of great spiritual significance to the coastal Nyungar. The Aborigines along the coastline believe that when the body dies, the spirit goes away westward through the sea, and that there the spirit lives in much the same manner as it has lived when in the flesh … In the

	Swan district, Joobaitch, the last Perth man, stated that when his people died, their kaanya or spirit went away over the sea to another country, called Koorannup or Woordanung (Bates, 1985). Family groups used their coastal resources for subsistence, culture and trade. Cultural stories describe features of sea country.
Other Significance	Locals live near and flock towards the ocean for pleasure and recreation. It is a place where people hunt for food and spend time recreationally.
Infrastructure/ Facilities	Beach access points along the length of the Geopark boundary:
Events, Education	Open Ocean Swims, Paddle Event, Boardriders and Surf life saving events and activities
Community Group, NGO	Bouvard Coast Care, Coastal Waste Warriors, Dawesville Surf Life Saving Club
References	Department of Conservation and Land Management,(1994). A Representative marine reserve system for Western Australia. Report of the Marine Parks and Reserves Selection Working Group. Bates, Daisy, (1985). The Native Tribes of Western Australia. Isobel White (Ed.). Canberra: National Library of Australia, p. 222, In Western Australian Planning Commission. Indigenous Heritage. 2008. http://www.planning.wa.gov.au/dop_pub_pdf/Indigenous_Heritage.pdf. https://www.derbalnara.org.au/wardan-boodjar

Site	Bouvard Reefs
Location	-32.830181121, 115.593200683 - closest land reference
Land Tenure	State Waters of Western Australia
Abiotic Geology (landscape, landforms, climate)	The Bouvard reefs are an offshore submerged Tamala limestone ridge. The Bouvard Reefs are the southern extension of the ridge of the Five Fathom Bank (Searle et al 1987). The offshore reef ridge intersects the coast south of the Bouvard Reef system. This represents a barrier dune with aeolian dunes formed when the sea levels where lower than present levels. The bathymetrically complex near-shore environment had implications in the Holocene history in this part of the coast (EPA, 2009).
Biotic Biodiversity (flora and fauna)	Factors contributing to high biodiversity include a persistent high energy environment, an overlap between tropical and temperate fauna, and the Leeuwin current (which brings warm water intrusion). The shallow continental shelf, and clear waters allow for high levels of light penetration, which promote a high diversity of seagrass and other benthic communities. These in turn provide habitat and nursery areas for a large range of marine fauna. The area is also recognised as an area of global significance for rare and endangered marine mammals and seabirds. (BMT, 2021) Fish Species: Pink Snapper, Tailor, Mulloway, Herring, Skippy, Dhufish, Baldchin Grouper (key species sought for fishing). (Recfishwest,2021) A Biologically Important Area (BIA) for the following marine species: Whales: pygmy blue whale, southern right whale, humpback whale Seabirds: wedge-tailed shearwater, fairy tern, bridled tern, little shearwater, flesh-footed shearwater Birds: little penguin.

Cultural Aboriginal culture and European history	The Noongar People are the native title claimants for south-west Western Australia. They have also agreed an Indigenous Cultural Heritage Land Use Agreement (ILUA) between the state of Western Australia and the Gnaala Karla Booja people within the larger Noongar native title area. This agreement covers the sea within a 3 nautical mile limit. Use of sea was considered important to Noongar people. Marine resources including spearing of seals, camping along the coast to fish, which was important to the family economy. There are a number of fish traps known along the coastline. The claimants tell stories of dolphins and whales being family 'totems'. Further consultation needed
Other Significance	A Scuba Diving Site and Local Fishing Site.
Infrastructure/ Facilities	Closest Boat ramps – Dawesville and Australind and Bunbury. No other infrastructure or facilities present.
Events, Education	University research projected possible. Gaps in knowledge.
Community Group, NGO	Bouvard Coast Care, Coastal Waste Warriors, RecfishWest
References	BMT, 2021. Western Australia Offshore Windfarm Pty Ltd: Preliminary Marine Environment Assessment. http://epbcnotices.environment.gov.au/_entity/annotation/7e439014-7fc2-eb11-80c8-00505684c563/a71d58ad-4cba-48b6-8dab-f3091fc31cd5?t=1624924800339

Site	Tim Thickett Quarry Site
Location	Tim's Thickett Road -32.65S, 115.62E
Land Tenure	DBCA Yalgorup National Park
Abiotic Geology (landscape, landforms, climate)	This site offers views of the internal structure of the Pleistocene Tamala Limestone ridge. Tims Thickett Limestone unit, coastal marine to barrier dune system. Aeolian faces, beach facies, sub marine sand wave facies and sea grass bank facies have been interpreted on the quarry walls (V. &C. Semeniuk, 2009).
Biotic Biodiversity (flora and fauna)	Coastal heathland vegetation and important black cockatoo foraging area.
Cultural Aboriginal culture and European history	Quarry active date unknown. Indigenous Culture: unknown Consultation needed.
Other Significance	State Geo-heritage nomination site 2020

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Infrastructure/ Facilities	None
Events, Education	Previously used as a site visit for the Geological Society of Australia and Geoscience field excursions
Community Group, NGO	Bouvard Coast Care Group
Other	Potential site for visitors -requires safe access and signage
References	V. &C. Semeniuk, 2009. Quaternary Geology, landforms and wetlands between Dawesville and Binningup – description, key features and geo-heritage significance

Site	Island Point Reserve
Location	-32.75496389865182, 115.69544669259456 - Island Point Road off of Southern Estuary Rd.
Land Tenure	City of Mandurah Reserve
Abiotic Geology (landscape, landforms, climate)	Island Point Reserve is on the western side of the Southern Harvey estuary with lagoonal deposits. It sits on the boundary between the Spearwood sands and Bassendean sands. A freshwater soak at the Southern end of the Reserve. Prescence of rhizolith root structures in Tamala limestone.
Biotic Biodiversity (flora and fauna)	70 Ha bushland reserve bordering the Harvey Estuary. It is a biodiverse reserve with 4 varied ecosystems, peppermint dominant woodland, banksia mixed woodland, temperate saltmarsh and sedgeland environments. Tree species: Marri, Jarrah, Tuart, Peppermint and Banksia Woodland. Diverse understory. 62 species of native orchids recorded in this reserve. Fauna – Critically Endangered Western Ringtail Possum population with a survey of 29 individuals sited. Other fauna - Brushtail possums, Brush-tailed Phascogale, Western Grey Kangaroo, Bush birds, waterbird, birds of prey. Active osprey nesting platform adjacent to the estuary. Diverse wildflowers, birdwatching and nocturnal bushwalking environment.

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Cultural Aboriginal culture and European history	Island Point Crossing was a major link between west and east of the Peel-Harvey Estuary. It was a significant crossing point for Aboriginal people who camped in the area. Camping areas are identified in the Southern End of Island Point Reserve. The crossing was also an old stock route from Pinjarra to Bunbury over the Harvey Estuary. Many settlers in the southern section of Mandurah relied on the crossing. Every 6 months the cattle had to be shifted from inadequate coastal grazing areas to grazing areas further inland to avoid “coastie disease” (State Heritage No. 09069). Southern end of Island Point reserve has a freshwater source and this area was relied upon for camping and also a diverse source of bush tucker available throughout the reserve (Yates, 2005).
Other Significance	TEC environment of temperate saltmarsh, boarders RAMSAR site 482. TEC Banksia Woodland
Infrastructure/ Facilities	Dirt road into recreation node, toilet, and parking. Walk trails into the reserve, small boardwalk lookout in the middle of the reserve.
Events, Education	Regular community cleanups, weeding and planting events, future planned bio-blitz
Community Group, NGO	Friends of Island Point, Salt and Bush Eco Tours, Swanlandia Inc. , Coastal Waste Warriors, Peel Region Western Ringtail Possum Action Group
References	http://www.inherit.stateheritage.wa.gov.au/Public/Inventory/Details/f81822ff-34da-455c-aec1-08ec8183bcb6 2005, Amanda Yates and Joseph Walley. A report on Aboriginal Site Survey of Warrungup reserve to Island Point Reserves. (Acquired from Department of Planning, Lands and Heritage.)

Site	Yoka Maya/ Warrungup Spring Reserve
Location	-32.64219169280757, 115.64559752328184 (Estuary Road, Bouvard)
Land Tenure	City of Mandurah Reserve
Abiotic Geology (landscape, landforms, climate)	Located on the Eastern slope of the Mandurah Eaton ridge and the western shoreline of the Harvey Estuary. Geological features include exposed Tamala limestone with karst features, a freshwater spring as well as shoreline lagoonal deposits. An aquifer exists within the Eaton sand unit which underlies the Mandurah-Eaton ridge and is recharged by rain and through the karst features of the elevated ridge. Discharge sites (springs) are present along the base of the ridge and the shoreline of the Harvey Estuary. This site explores the hydrogeology of the area and the contact between geological units.
Biotic Biodiversity (flora and fauna)	Natural spring leading into the Harvey Estuary, samphire wetlands, and sedge lands. Waterbirds, regularly black swans are present drinking freshwater at the edge of the spring, splendid wrens, osprey's and whistling kites, Pelicans, Cormorants. There is an active Osprey Nest. Other Fauna: Quenda and Brushtail possums, Critically Endangered Western Ringtail Possum. Flora Summary: Eucalypt Tuart and Rudis, Saltwater paperbarks, samphire (TEC)

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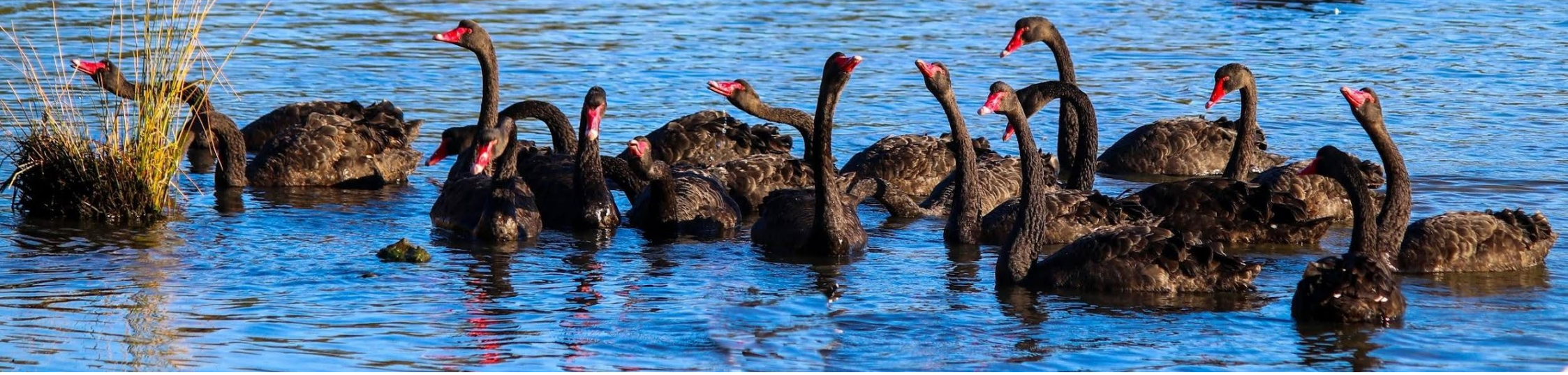
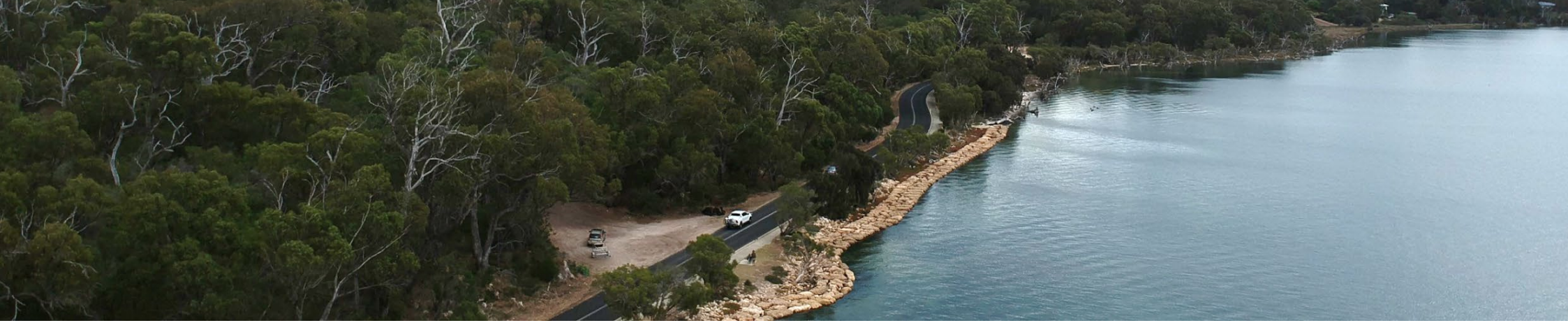
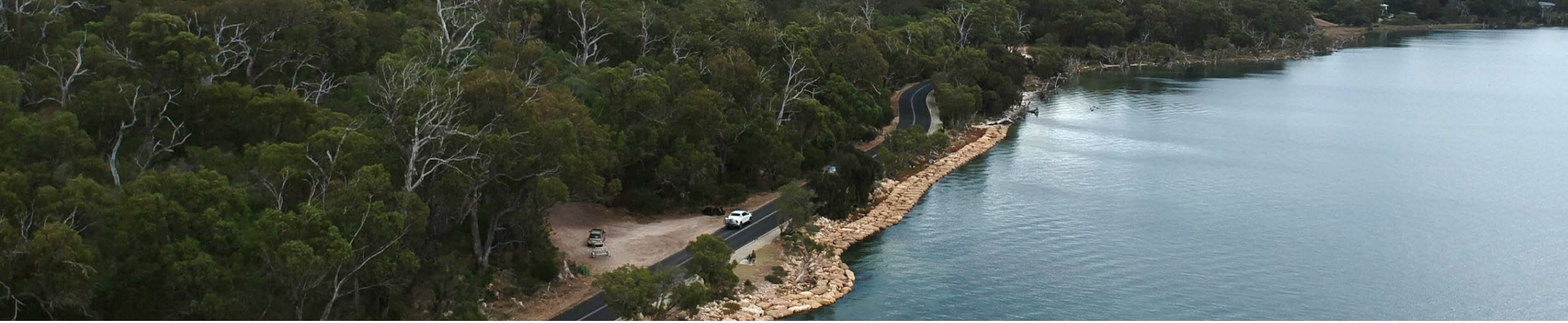


Cultural Aboriginal culture and European history	Indigenous Women's site, including birthing rock, camping grounds, scare tree and access to fresh water. - Reference Gloria Kearing (2005 Yates, Walley) Further consultation needed.
Other Significance	Active recreational site, driving and walkers
Infrastructure/ Facilities	Toilet facilities, boardwalk over the water, limited car parking.
Events, Education	NA
Community Group, NGO	Friends of Warrungup Springs, Residents conducting Osprey monitoring
Other	Significant Prescribed burn occurred in 2017. Roadway built overtop of discharging springs.
References	2005, Amanda Yates and Joseph Walley. A report on Aboriginal Site Survey of Warrungup reserve to Island Point Reserves. (acquired from Department of Planning, Lands and Heritage.) 2022, OUR KNOWLEDGE, OUR LAND. - NGALANG KAADADJAN, NGALANG BOODJA. https://www.ourknowledgeourland.com.au/experience/walking-in-history/bilya-country-story-trail-map/



Site	Morfitts Cave/Eagles Nest Cave
Location	-32.6614158323327, 115.65058560185135 . 1461 Old Coast Rd Bouvard. Lot 2 on Plan 38503
Land Tenure	Private land
Abiotic Geology (landscape, landforms, climate)	Large single chamber cave located within a narrow band of Tamala limestone approximately 8km long by 0.5km wide on the western side of the Peel Harvey Estuary. It is one of at least fourteen caves in the area. Located on the Mandurah Eaton Ridge and the western shoreline of the Harvey Estuary. Geological features include exposed Tamala limestone with karst features of caves.
Biotic Biodiversity (flora and fauna)	Tuart Woodland over limestone, native understory with weed intrusion. Bushland bird species present (survey needed) Further fauna surveys needed for this area. Presence of Western Ringtail Possum (CE) locally.
Cultural Aboriginal culture and European history	Known by local Aboriginal people J.W. Charnley the secretary of the Mandurah Progress Association reported the discovery of limestone caves to the Chief Inspector of Fisheries in 1921. It was named because it was located on Henry Morfitt's property. Morfitt was a convict granted a ticket of leave in 1863 and was a free man by 1870. He worked around Mandurah for many years before taking up land around the cave farming and fishing in the area with his family for the rest of his life. "Up in the other cave at Morfitt's Cave it's called … that's part of a law cave or initiation" J.Walley Non-figurative engravings in the cave are thought to be 21000 years old. (Further references needed).



Other Significance	Aboriginal Site ID 3277, State Heritage Place No 9066.
Infrastructure/ Facilities	NA
Events, Education	NA
Community Group, NGO	WASG Western Australian Speleological Group
Other	Illegal dumping, caving, and offroad biking occurs at this location. Speleological group (WASG) indicate that this site is unmanaged and public education and liaison with land managers is needed.
References	2005, Amanda Yates and Joseph Walley. A report on Aboriginal Site Survey of Warrungup reserve to Island Point Reserves. (acquired from Department of Planning, Lands and Heritage.) Inherit: http://www.inherit.stateheritage.wa.gov.au/Public/Inventory/Details/5884238d-d3eb-4fac-9695-8946c3835556 Gozzard, JR (Bob) 2010, Sea to scarp — geology, landscape, and land use planning in the southern Swan Coastal Plain: Geological Survey of Western Australia, 72p. J.Walley (2005) Mandurah Museum https://www.ourknowledgeourland.com.au/experience/walking-in-history/bilya-country-story-trail-map/

Site	Old Coast Road Indigenous walking route, turned into coastal tourist route.
Location	Old Coast Road – Dawesville to Lake Clifton
Land Tenure	Main Roads
Abiotic Geology (landscape, landforms, climate)	Old Coast Road runs along the Mandurah Eaton Ridge (Pleistocene sand dune and tamala limestone). The road avoids the low depressions of the Yalgorup lakes to the west and the estuary system to the east. Geological features include rising and falling over the ridges of the dunes, views of ocean and estuary visible between rises in the ancient dune landscape.
Biotic Biodiversity (flora and fauna)	Tuart, Marri, Jarrah, Peppermint, Banksia woodland, diverse understory including native orchids. Black Cockatoo Foraging and Roosting sites along the roadside. Regular signs of western grey kangaroo, brushtail and ringtail possums, quenda and brush tailed phascogale (high amounts of roadkill on the road).
Cultural Aboriginal culture and European history	According to the Aboriginal Elders of the Peel Region an important track ran from the Swan to the Vasse Rivers passed along the plain between the Peel-Harvey Estuary and the Indian Ocean. This track was later used by the early settlers as a main roadway between Mandurah and Bunbury which now forms Old Coast Road. A large number of Aboriginal Sites have been Identified in the vicinity of this roadway. (Yates, 2005).

	Old Coast Road was the original Mandurah–Bunbury route, dating back to the 1840s. Part of this road, and the Australind Bypass around Australind and Eaton, were subsumed by Forrest Highway. The settlement of Australind by the Western Australian Land Company in 1840–41 prompted the first real need for a good quality road to Perth. A coastal Australind–Mandurah route was completed by 2 November 1842. In the late 1930s there was a proposal to re-establish the road as a tourist route, which could also reduce traffic on the main road along the foothills, but it was put on hold due to World War II. Improvements to Old Coast Road started in the early 1950s, but with little progress made until 1954 when the Main Roads Department approved £1000 worth of works. The name "Old Coast Road" was formally adopted on 27 January 1959, and a sealed road was completed in September 1969.
Infrastructure/ Facilities	Paved road, signage to places of significance,
Community Group, NGO	PRWRPAG (Peel Region Possum Action Group) requesting a possum bridge at key crossing points for arboreal species
Other	Key area for Dark Sky Preservation.
References	2005, Amanda Yates and Joseph Walley. A report on Aboriginal Site Survey of Warrungup reserve to Island Point Reserves. (Acquired from Department of Planning, Lands and Heritage.) http://www.harveyhistoryonline.com/?p=3481#:~:text=The%20Coast%20Road%20was%20declared,the%20east%20towards%20the%20hills.

Description	Mandurah Eaton Ridge
Location	Representing coastal barrier building during Pleistocene interglacial higher sea levels Elevated sand dune and limestone ridge between depressions of the Harvey Estuary and the Bassendean Sands to the east and the Yalgorup Plain and Lake Clifton to the west. The ridge is approximately 70km long between Dawesville and Eaton. Viewing sites- - Old Coast Road runs along the elevated ridge between Dawesville and Forest Hwy - Treasure Block- DBCA reserve- Lake Clifton Road - Mount John Road and Lakeside Parkway, Lake Clifton
Land Tenure	DBCA- Yalgorup National Park, Main Roads, Private and City of Mandurah Reserves.
A. Abiotic Geology (landscape, landforms, climate)	Mandurah Eaton Ridge- is a ridge dominated by quartz sand with limestone lenses with elevations to 70m. overlying Tamala limestone. This Spearwood dune system represents inter-glacial Pleistocene sedimentary episodes. Formed by the accumulation during inter-glacial periods of near-shore and coastal marine deposits and related coastal dunes that lithified the form the shore-parallel coastal limestones, followed in turn by the development, during the intervening inter-glacial period, of karst, weathering profiles and calcrete on the coastal limestone; shoreline sand barrier, dominated by quartz sand, with local calcareous sand lenses (Semeniuk & Glassford 1987) Exposures of Pleistocene dune sands, Tamala limestone with karst formations
B. Biotic Biodiversity (flora and fauna)	Threaten Ecological Communities of Tuart woodlands thrive on the limestone ridges, Banksia woodlands (TEC) grow in the sand dune sections of the ridge and heath scrubs grow where the sands are thinly overlying limestone outcrop.
C. Cultural Aboriginal culture and European history	Outcrops of the Limestone and Karst cave formation of Aboriginal importance (Further consultation needed). The Old Coast Road runs along the ridge between the wetlands. Numerous sand and limestone quarries
Other Significance	Views of the Indian Ocean, The Swan Coastal Plain and the Darling Scarp

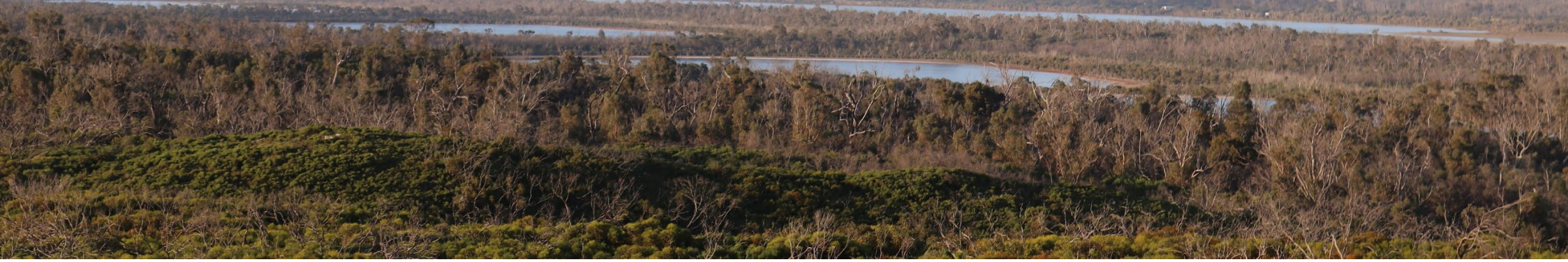
Infra structure/ Facilities	Old Coast Road
References	V.Semeniuk & D.K.Glassford, 1987. Origin of limestone lenses in Perth Basin yellow sand. V. & C. Semeniuk, 2009. Quaternary geology, landforms and wetlands between Dawesville and Binningup –description, key features, and geoheritage significance

Site	Yalgorup National Park
Location	32°51′26″S 115°40′19″E Yalgorup NP is situated between Bunbury and Mandurah on the Swan Coastal Plain, approximately 100 km south of Perth, Western Australia (CALM, 1995). Area: 131.41 km^2
Land Tenure	DBCA
Abiotic Geology (landscape, landforms, climate)	The Geology of Yalgorup National Park represents a snapshot in geological time that demonstrates active and past coastal and marine processes that are globally unique. Features include a South to North Holocene barrier dune that is of international significance. This section of coastline represents an uninhabited example of the past sea level rise and falls over 200,000 years including Pleistocene stratigraphy, landforms, and history (V &C Semeniuk 2009). Yalgorup runs in three parallel lines of interdunal depressions, underlain with calcareous material from marine shell deposits and Tamala limestone (which outcrops at the lake margins). The interdunal depressions runs parallel to the Indian Ocean (1 km west). Spearwood and Quindalup Dune Systems (See Quindalup dune system site details). The Yalgorup lakes all have a different limnology and salinity, which in some lakes is the result of different biogeochemical processes (Burke & Knott, 1989). The lakes vary from about 1 – 4 m in depth, are principally supplied by groundwater and precipitation.
Biotic Biodiversity (flora and fauna)	The chain of 16 brackish and saline lakes within the park, run parallel to the coastline and are situated approximately 1 km inland (TSSC, 2009a). The lakes are separated from the coastline by vegetated and bare sand dunes (DoE, 2014a). The lakes are a part of a larger wetland system in the Peel-Yalgorup lakes system, which is recognised

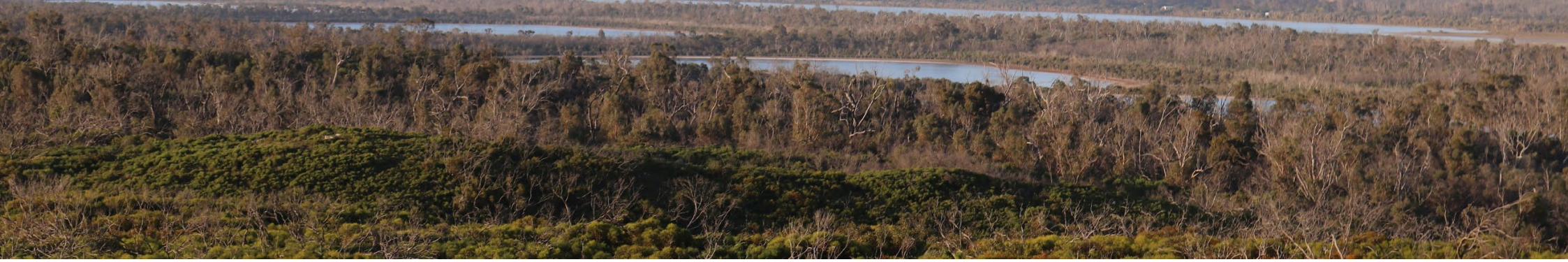
	under the International Ramsar convention as a wetland of international significance (Hale & Butcher,2007). Yalgorup NP contains vegetation complexes, ecological communities and associated fauna habitats, which are not well represented outside the park (CALM, 1995). Vegetation Complexes: The vegetation of Yalgorup NP consists primarily of peppermint/tuart forests and open marri/jarrah/banksia woodland (Clarke, 2011). The understory shrub assemblage is often dense and consists of various species. Vegetation along the lake edges include wetland vegetation including paperbarks, sedges, and samphire species. On the western side of the park on the Quindalup dunes the vegetation consists of Spinifex hirsutus and Scaevola crassifolia, extensive heaths and low shrubland, dominated by coastal daisybush (Olearia axillaris). The vegetation types represented on these dunes are some of the best examples remaining on the west coast (Cast Consulting, 2014). Fauna: The Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) Protected Matters Report (DoE, 2014b) indicates there are 11 species of birds and 3 species of mammals that are listed threatened species that may be present within the park. There are also 34 species of migratory birds (terrestrial, marine and wetland species) listed that may occur within the park; with 19 of these species listed as known to roost within the area (DoE, 2014b).
Cultural Aboriginal culture and European history	The name Yalgorup is derived from the indigenous words “yalgor” (swamp or lake) and “up” (place). There are reports of indigenous artifacts being found within the park (Dortch et al., 2006), two regionally significant sites located in the Peel-Yalgorup area; a religious ceremonial site north of the park and a cave east of the Park. In the Yalgorup NP Management Plan (1995) it states that Calyure, a local identity and leader amongst his people, is believed to have camped in Yalgorup and immediately north of the Park during the summer months.

	Protected bushland provides sites where indigenous bushtucker is prevalent. Bushfood examples: amphibians, typha roots, edible rhizomes, crustaceans, reptiles, waterfowl and their eggs. Traditional knowledge of the area includes that water was available from Melaleuca spp. at any time of year and bush food and medicine included yams, berries, edible roots and reeds, seeds, insects and marsupials. Yalgorup National Park was established in 1966.
Other Significance	Ramsar Listed Wetlands, TEC Banksia woodland, TEC Tuart woodland, TEC Samphire wetlands, TEC sedgelands in holocene dune swales of the southern Swan Coastal Plain,
Infrastructure/ Facilities	DBCA Campsite, 3 x walking trails, public toilets at the Thrombolites,
Events, Education	PHCC study of Yalgorup Lakes, university collaboration and research potential.
Community Group, NGO	Peel Harvey Catchment Council, FRAGYLE, Bouvard Coastcare
Other	Further subsites within Yalgorup can be described for their Abiotic, Biotic and Cultural significance: Yalgorup Lakes – 16 different Goolamwiin Indigenous Property – Cultural Reconnection TEC environments
References	V &C Semeniuk , 2009. Quaternary geology, landforms and wetlands between Dawesville and Binningup description key features and geo-heritage. Cast Consulting Pty Ltd. 2014. Yalgorup National Park National Heritage Listing Background Report

	Department of Conservation and Land Management (CALM), 1995. Yalgorup National Park Management Plan 1995-2005. Western Australian Department of Conservation and Land Management, Perth. Management Plan No. 29 Commonwealth Department of Environment (DoE), 2014. Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) Protected Matters Report. http://www.environment.gov.au/epbc/pmst/. 1 May 2014. Dortch, J., Cuthbert, B., Cuthbert, D. and Wally, J. (2006). Indigenous heritage of the Peel-Harvey Region: a review of previous research and archival data for Phase 1 of the Peel Cultural Landscape Assessment Project. Report submitted to the Restoring Connections Project, Peel Development Commission, Peel-Harvey Catchment Council, Department of Environment and Conservation and South-West Aboriginal Land and Sea Council, Mandurah. p. 45.



Description	Yalgorup Tunnels (Lake Preston Tunnels)
Location	Located off Preston Beach Road off the Heathlands Walk Trail. (Yalgorup National Park)
Land Tenure	Yalgorup National Park DBCA
Abiotic Geology (landscape, landforms, climate)	The tunnels have been dug into the Kooallup Limestone unit. The Kooallup is the youngest limestone unit of the area. Formed during an inter glacial period when the seal level was 3 meters higher than the modern present sea level. The Kooallup limestone is a fine grained calcarenite, aeolianite, laminated calcarenite and shelly calcarenite, bioturbated shelly calcarenite representing coastal marine deposits and related coastal dunes. Geological features exposed by the tunneling include root structures, karst solution pipes, cross lamentations, and shelly layers. The Heathland Walk Trail traverses over the Kooallup limestone ridge.
Biotic Biodiversity (flora and fauna)	Located off the Heathland Walk Trail. The tunnels are located along the Kooallup Limestone with heathland communities of wattles, hakeas, grevilleas. At the top of the Kooallup ridge are communities rare limestone mallee (Eucalyptus petrensis) and Fremantle mallee (E. foecunda). Fossilised roots (rizoliths) are preserved in the tunnel walls as well as modern day roots growing through the limestone.
Cultural Aboriginal culture and European history	A series of 50-meter tunnels measuring 1.8 meters high and wide dug with hand picks into the side of limestone hills. Tunnels have historic significance and demonstrate early methods of tunnelling and use of natural resources. The year and reason for construction is unknown, though it is speculated that it may have been for the building of cottages in the area or possible for the Bunbury breakwater. Local folklore talks of the tunnels being used by smugglers in the 1800's. Dates carved in the walls of the tunnels go back to at least 1927. Some of the entrances were intentionally blocked during World War Two but others remain open even if they are not that easy to find. Currently eight of the tunnels have been located.



Other Significance	Heritage Site PLACE NUMBER 08636
Infra structure/ Facilities	Limited site access with no managed track. The tunnels are located off the main Heathland Walk Trail
Events, Education	NA
Community Group, NGO	NA
Other	Site currently not an accessible site due to wall and roof stability safety concerns.
References	Cast Consulting, 2014 Yalgorup National Park National Heritage Listing Background Report V & C Semeniuk, 2009, Quaternary geology, landforms and wetlands between Dawesville and Binningup -description, key features, and geoheritage significance WA Now and Then- website- Lake Clifton- http://www.wanowandthen.com/Lake-Clifton.

Description	Preston Beach Coquina
Location	Lake Preston shoreline, Causeway Preston Beach Road -32.87730239271528S, 115.66876302789525E
Land Tenure	DBCA- National Park
Abiotic Geology (landscape, landforms, climate)	The Holocene coastal coquina (shell gravel). Defined by Semeniuk (1995). White, cream, yellowish and tan shell beds, shell grit, shelly sand, and coarse to medium sand. Marine mollusk living in the environment when the sea levels where higher than present and the environment would have been estuarine.
Biotic Biodiversity (flora and fauna)	Further survey needed
Cultural Aboriginal culture and European history	N/A – Consultation needed
Other Significance	NA
Infrastructure/ Facilities	NA
Events, Education	NA
Community Group, NGO	FRAGYLE, Preston Beach Residents
References	Semeniuk V 1995 New Pleistocene and Holocene stratigraphic units in the Yalgorup Plain area, southern Swan Coastal Plain. Journal of the Royal Society Western Australia

Description	Peel Harvey Estuary - The Peel-Harvey estuary is the largest and most diverse estuarine complex in south-western Australia with an area of 133 km2 .
Location	-32.613653947274955, 115.64839381534362
Land Tenure	DWER, DBCA, DOT
D. Abiotic Geology (landscape, landforms, climate)	The largest Estuary system in the Southwest of WA. The Peel-Harvey Estuary comprises two large, shallow basins (mostly less than two metres deep); the circular Peel Inlet and the elongated Harvey Estuary. The Peel Inlet is roughly 10 kilometres in diameter, the Serpentine and Murray Rivers flow into the basin from the east and there is a narrow, natural (but artificially augmented) connection to the sea to the north (Mandurah Channel). The Peel Inlet is situated between the Spearwood Dune systems and the Bassendean Sands. The Harvey Estuary is 20km in length and receives inflows from the Harvey River to the south and is connected to the Peel Inlet by a narrow navigation channel at its northern end. The Harvey Estuary is located in a depression between dune systems within the Spearwood Dune Formation. The Dawesville Channel also connects Peel-Harvey Estuary to the Indian Ocean. (pg. 50 ECD Addendum 2019). The Peel-Harvey Estuary has undergone many different phases from marine to estuarine to river systems due to changing sea levels. The Peel Inlet is covered with about 3 meters of sediment overlying the Pleistocene valley (Brearley 2005)
E. Biotic Biodiversity (flora and fauna)	Birds – 104 Wetland dependent birds have been recorded, 1% of the population of 8 different species are supported by the Peel-Harvey Estuary. Dolphins – 80-90 resident bottlenose dolphins call the Peel-Harvey Waterways home. Fish: 70 marine and estuarine species of fish currently reside in the Peel-Harvey estuary. They include marine species such as whiting, mullet (kalkada), tailor (kila) and whitebait, and estuarine species such as black bream (djilba)and estuary cobbler (nyola) (DWER, 2020.) The estuary also supports important commercial and recreational fisheries including blue manna crab, western king prawns and western school prawns. (ECD Addendum, 2019)

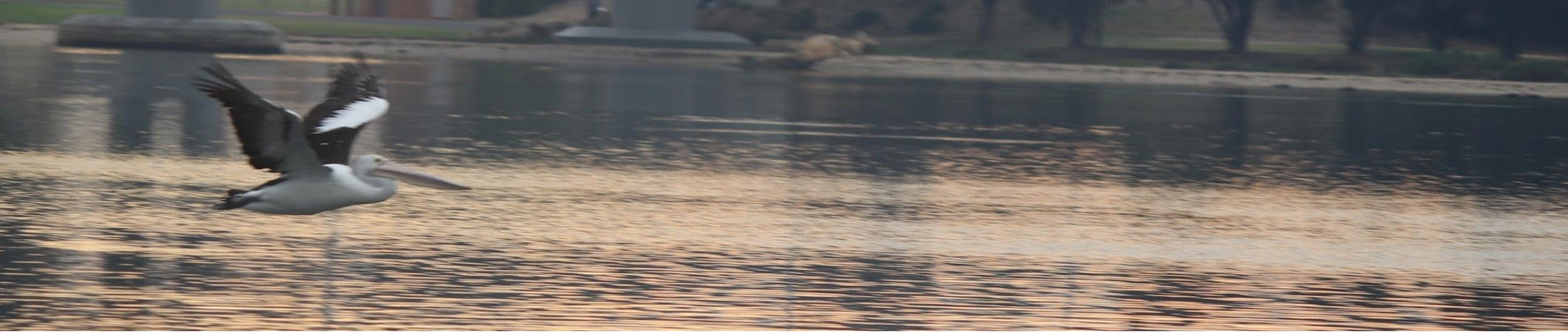
F. Cultural Aboriginal culture and European history	The Bindjareb Noongar people have looked after the Djilba for more than 50,000 years based on governance and lore. Bindjareb Noongar people have a continuing life commitment and cultural responsibility to the preservation of the Djilba and Bilya. There are over 356 sites of Aboriginal significance in the Peel-Harvey which include sites of artefact scatter, camp sites, ceremonial sites, fish traps, skeletal remains and sites of mythological significance. (DWER, 2020)
Other Significance	
Infra structure/ Facilities	Boardwalks, Picnic area, jetties, boat ramps & kayak trails. Tourism operators including Dolphin Cruises, Ways to Nature, Salt and Bush Eco Tours, Goolamwiin, Mandjoogoordap Dreaming
Events, Education	Wetland Weekend Festival, Crab Fest
Community Group, NGO	Winjan Aboriginal Corporation, Winjan Rangers, Peel Harvey Catchment Council, Peel Preservation Group, Coastal Waste Warriors, 55 Kayak Group, Estuary Guardians, DBCA, DWER, Mandurah Sea Rescue
Other	No significant Marine Parks
References	https://peel-harvey.org.au/wp-content/uploads/2021/07/ECD-Addendum-Draft.pdf DWER, 2020. Department of Water and Environmental Regulation, Bindjareb Djilba. A Plan for the protection of the Peel- Harvey estuary. Peel_Harvey_Estuary_Protection_Plan_Bindjareb-Djilba.pdf Brearley, Anne. (2005). Ernest Hodgkin's Swanland Estuaries and Coastal Lagoons of South-western Australia. UWA Press.

Description	Dawesville Cut
Location	-32.60634489534594, 115.6409600640118 - Old Coast Road – Port Bouvard Bridge Dawesville.
Land Tenure	Department of Transport
Abiotic Geology	An artificial channel between the Peel-Harvey Estuary and the Indian Ocean at Dawesville.
Biotic Biodiversity (flora and fauna)	The discharge of nutrients into the Peel-Harvey estuary resulted in it becoming eutrophic. Growths of macroalgae in the form of toxic cyanobacteria nodularia spumigena began to occur on a seasonal basis. The combination of sunlight and stagnant, nutrient-rich, heated water, caused massive blooms of blue-green algae. Professor Arthur McComb and Ernest Hodgkin, identified that the cause of the blooms was the phosphorus load in the water, resulting from run-off associated with agricultural and industrial practices in the catchment area. The creation of the Dawesville cut was a move from estuarine environment to marine environment resulting in the decline of freshwater dependent species and an increase in samphire wetlands. Problematic blooms have not been eliminated. Instead, a range of nuisance and harmful species frequently bloom in the lower reaches of the Murray and Serpentine rivers

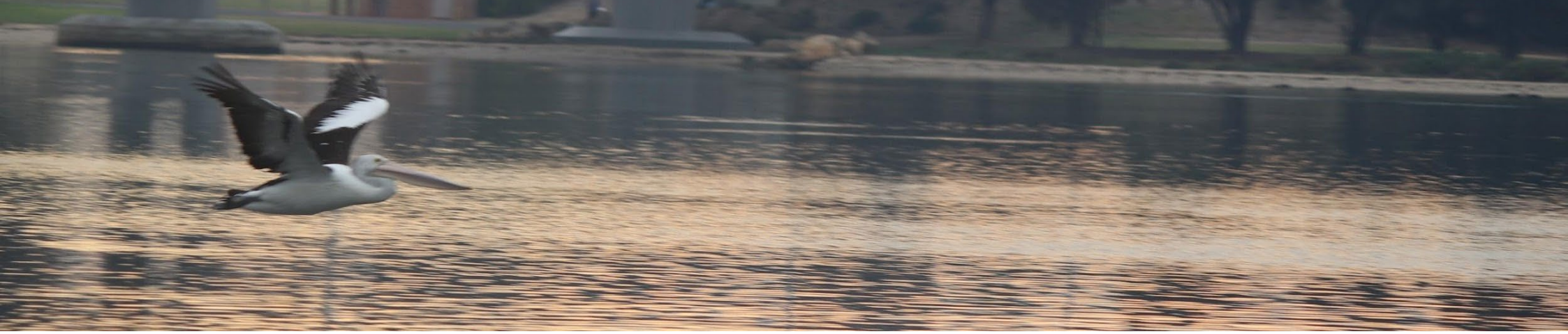
Cultural Aboriginal culture and European history	The deteriorating environment of the Peel-Harvey Estuary became a major political and environmental issue for the Government of Western Australia during the mid-1980s. The channel's construction commenced in 1990 and was completed in April 1994 at a cost of $76 million. It is 2.5 km long, 200 meters wide and between 6 and 6.5 meters deep. As part of the construction, a sand trap immediately to the south of the sea opening was incorporated into the design, to capture sand build-up from the natural south to north movement along the coast caused by the prevailing south-westerly winds. If the sand was not captured and mechanically moved, the channel would quickly silt up, because there is insufficient water flow through the channel to compensate for the build-up. Approximately 85 thousand cubic metres of sand per year is mechanically moved from the south to the northern side of the channel.
Other Significance	Tidal influx into the Harvey Estuary – permeance of local dolphin population. See Peel-Harvey Estuary site description.
Infrastructure/ Facilities	4 lane Port Bouvard Bridge, rockwall and fishing platforms
Events, Education	King of the Cut - Australia's premier downwind stand-up paddle board (SUP) race is held from the Dawesville Cut
Community Group, NGO	Estuary Guardians, Coastal Waste Warriors
References	Hodgkin, E.P., Birch, P.B., Black, R.E. & Humphries, R.B. 1981, The Peel-Harvey Estuarine System Study (1976-80), Report no. 9, Department of Conservation and Environment, Perth. Water & Rivers Commission, 1998, Dawesville Channel Technical Review. Bradby, Keith (1997). Peel-Harvey : The Decline and Rescue of an Ecosystem. Greening the Catchment Taskforce, Mandurah.

Site	Coastal Karst Formation – Ancient calcified tree roots (rhizoliths)
Location	Seascapes Halls Head - -32.521750, 115.782056
Land Tenure	Coastal reserve City of Mandurah
Abiotic Geology (landscape, landforms, climate)	Current shoreline of Halls Head and Seascapes. This site is interpreted as the southern extension of the Garden Island Ridge which intersects the coastline at Halls Head (Semeniuk, 1995), and continues further south inland as the Mandurah Eaton Ridge. The coastal cliffs and outcrops represent the Pleistocene aeolian calcarenite Tamala limestone which is overlain by the Quaternary Quindalup sand dunes. Features present include shoreline platforms, wave cut notches and splash zones, cross-cutting bedding, paleosol horizons, rhizolith fossil root structures, solution pipes, karst formations, and calcrete layers. The processes of erosion including physical, chemical and bioerosion can be witnessed along the shoreline.
Biotic Biodiversity (flora and fauna)	Vegetation includes coastal dune communities as well as marine algae on the shoreline platforms. The bioerosion of the limestone by organisms such as gastropods, chiton, and urchins can be seen along the coastline.
Cultural Aboriginal culture and European history	Indigenous Culture: Further consultation needed. The locality was named after Henry Edward Hall (1790–1859), who received a land grant of 6,715 hectares (16,594 acres) to establish a farm in the 1830s. Halls Head was officially gazetted as a suburb in 1970. It is the location of *Hall's*

	Cottage, the single-storey stone house built by the Hall family in 1833 and the only extant early settler's cottage in the district.
Infrastructure/ Facilities	Halls Head Coastal Trail is a twelve-kilometer moderate walk or bike ride along the beautiful coastline of Mandurah, the heart of the Peel Region. Enjoy spectacular views over the Indian Ocean.
Community Group, NGO	Seascapes Community Association, Halls Head College
References	V. Semeniuk, 1995. New Pleistocene and Holocene stratigraphic units in the Yalgorup Plain area, southern Swan Coastal Plain. Journal of the Royal Society of Western Australia. City of Mandurah Museum, 2022. Halls Family Fact Sheet: https://www.mandurah.wa.gov.au/-/media/files/com/downloads/explore/museum/fact-sheets/hall-family.pdf



Site	Mandurah Channel Entrance 5km channel leading from Comet Bay into the Peel Estuary.
Location	-32.52007934814958, 115.71099855537103
Land Tenure	DOT and City of Mandurah
Abiotic Geology (landscape, landforms, climate)	Under its original natural behavior, this ocean entrance was partially blocked each year, and in the 1940's was totally blocked to flow for several years. Prior to human intervention this was a natural estuarine flood-tide delta with a long and narrow winding channel entrance (A. Brearley, 2005).
Biotic Biodiversity (flora and fauna)	The amount of water passing through the channels is based on changes in water level, driven largely by tides, and also by the amount of freshwater entering the estuary through adjoining rivers. A variety of Fish, Bottlenose dolphins and various water birds use this part of the waterways for habitat and hunting. (See Peel-Harvey Estuary site description).
Cultural Aboriginal culture and European history	Historical: Dr. A. Collie and Lt. Preston explored the Mandurah channel entrance into the estuary in November 1829. In the 1940's after regular blockage of the channel, training walls were built to ensure an hydraulic connection each year. Their spacing was designed to ensure that riverine floods could be carried without back flooding the agricultural drainage area adjoining Peel and Harvey Inlets. Permanent navigation was not anticipated when they were built. Sand bypassing was found to be needed to avoid a sea erosion threat to down-drift urban development. Bypassing was also intermittently carried out to allow the commercial fishing fleet to access the ocean during the rock lobster season. With development of canal estates and



	the Mandurah Ocean marina (which is built on accreted littoral drift sand in previous sand bar areas) bypassing volumes have been increased to allow for recreational navigation. Monitoring of depths, and occasional navigational diversions, have been a part of the ongoing bar management. 2021 saw $1.58 million joint investment through the City of Mandurah and the Department of Transport, and it was largest amount of material moved in one campaign being recorded. Approximately 220,000 cubic metres of sand had been excavated from Halls Head Beach and pumped eastward on to nearby Town Beach during the five-month project which is essential to maintain the entrance channel. Indigenous Dreamtime story: Further Consultation Needed. 'The creator came out of the wardarn (ocean) in the form of a snake: the Waugal. She pushed through the sand dunes, along her path creating the inlet of Mandja (Mandurah).'
Infrastructure	Navigational Channel, Rock groins either side, fishing platforms along the channel.
Events, Education	Australia Day Celebrations
Community Group,	Sea Rescue, Coastal Waste Warriors,
References	2014, Fangjun Li Formation of Mandurah sand bars outside the Mandurah entrance channel. DOT WA https://www.transport.wa.gov.au/aboutus/news-item_47724.asp

Description	Boundary and Channel Island
Location	Channel Island -32.563969773256446, 115.71972588258086 Boundary Island -32.56869806416651, 115.71309311395352 Bordered by Sticks Channel to the South and Mandurah Channel to the West, two islands of the Peel Inlet.
Land Tenure	DPLH, DOT, and DBCA Boundary Island is currently managed by the State Government and is known as Unallocated Crown Land (UCL).
Abiotic Geology (landscape, landforms, climate)	Boundary Island was created from dredge spoil from when Sticks channel was enlarged in 1987. 25 Hectares and 5m elevation.
Biotic Biodiversity (flora and fauna)	Vegetation is a mix of natives and weeds and has established itself since 1987 with plantings of native wetland vegetation since 1987. Boundary Island and surrounding sand bars are a focus of occurrence by a suite of migratory shorebirds (eg. plovers, knots, godwits) that were not regularly recorded elsewhere in the estuary. Waterbirds also use the island with nesting pied oystercatchers, Osprey, and other waterbirds regularly using the island. Historic: The increased tidal range resulted in more frequent inundation of Nirima Cay, which was formerly a nesting site for Australian Pelicans. As a result, Boundary Island is the major nesting site for these birds. This site is subject to frequent disturbance by people (boating, camping, dogs) and this has the potential to disrupt breeding birds.

	A float plane landing near Boundary Island disturbed the nesting Pelican and this breeding site was disturbed to the point the birds abandoned it. DBCA officers confirm the site holds conservation value with the shallow water being a haven for migratory bird feeding. Boundary and surrounding islands connect the corridor from Len Howard Reserve, and Creery wetlands. DBCA have prepared a report for the Department of Lands regarding the island's conservation value, and their possible interest in the management of the island. (COM 2019, Report from Director Sustainable Communities to Committee of Council Meeting of 14 May 2019)
Cultural (Aboriginal culture and European history)	Further Consultation Required.
Infrastructure/ Facilities	A jetty was constructed by the Department of Transport (DoT), and with no party taking on the management of the island, the jetty remains the responsibility of the DoT.
Events, Education	Clean up the Peel
Community Group, NGO	PHCC, Salt and Bush Eco Tours, CCWA citizen science, Birdlife WA
References	Waterways Commission, 1994. Achievements of the Peel Inlet and Harvey Estuary Management Strategy 1989-1994. https://www.water.wa.gov.au/__data/assets/pdf_file/0013/5242/6958.pdf

Site	**Creery Wetlands Nature Reserve**
Location	Creery Wetlands -32.55496516683724, 115.73414121474349 Creery Island -32.565346015434855, 115.72796140525989
Land Tenure	DBCA
Abiotic Geology (landscape, landforms, climate)	Alluvial and lagoonal deposits along the southeastern shore of the Mandurah Channel and the Northern Peel Inlet form the foundations of the Creery Wetlands with its delta islands including Creery Island and Channel Island. About 18,000 years ago the sea level was 150m lower than present levels, at this time the Harvey River and Murray River would have flowed through the area that is known as the Mandurah Channel out past Hall's Head, 40km across a coastal plain, to the sea. The estuary formed when it was flooded by rising sea levels about 8,000 years ago and it continued to rise until about 4,000 years ago when it was between 0.3 and 3 meters higher than the present. The sediment of the Creery Wetlands has been transported by rivers, sea, and wind and covered by a fine layer of black mud with a high carbon layer (Brearley, 2005). Beaches in the Creery Wetlands show evidence of a more marine environment with marine shells forming coquina deposits.
Biotic Biodiversity (flora and fauna)	Flora: The wetlands contain 13 per cent of the tidal samphire wetland in the Peel Harvey Estuary. (1997 inHeritage) Riparian vegetation includes Saltwater Paperbark (Melaleuca cuticularis) whose roots help to stabilize the shores of the estuary. Decline in Freshwater paperbark (Melaleuca rhaphiophylla) has declined over time with salt inundation. Sedges and samphire dominate the edges of the wetlands.

	Fauna: waterbirds and bush bird species including migratory shorebirds, Quenda, Western Grey Kangaroo. Invasive species include rabbits, rats, house mice and cats.
Cultural Aboriginal culture and European history	The Creery Wetlands are remnants of a once extensive system which supported the Aboriginal way of life. The area contains many Aboriginal sites of both ethnographic and archaeological significance, and is inextricably linked with the preservation of the cultural and spiritual values and beliefs of Aboriginal people. The wetlands also contain a mass grave of local Aboriginals who died from disease (probably measles) in the 1860s. (inHeritage, 1997)
Other Significance	"The General Assembly of IUCN - The World Conservation Union in 1994: CALLS ON the Government of Western Australia: (a) to protect the Creery Wetlands and not to allow canals and other development of the area to proceed; (b) to purchase the area known as Creery Wetlands for addition to the Peel Harvey Regional Park.'' Before the reserve was fenced, recreational vehicles used the area extensively, damaging the fragile samphire plants and compacting the soil. Creery was used as a dumping ground for cars and other rubbish. ' In 1999, the reserve was fenced, funded by the Canal Developer. Since the fence was installed, vehicle use has been restricted to service vehicles that stay on well-defined tracks.
Infrastructure/ Facilities	Boardwalks, walking trails, signage, bird hide.
Events, Education	Ways to Nature (eco tourism).

Community Group, NGO	PHCC, Mandurah Bird Observers (Birdlife WA), Peel Preservation Group Inc.
Other	Included as part of Ramsar Site 482
References	1997, inHeritage, Place no. 09087. http://inherit.stateheritage.wa.gov.au/Public/Inventory/PrintSingleRecord/f922c1a6-5997-4e3f-a129-43a321792be4 1994, IUCN General Assembly. https://portals.iucn.org/library/sites/library/files/resrecfiles/GA_19_REC_085_Creery_Wetlands_Western_Australia.pdf http://www.creerywetlands.info/rehab_samphire.html

Description	Waangaamaap Bilya (Serpentine River)
Location	The Serpentine River starts under Bowerling Hill on the Darling Scarp. As it comes off the Scarp it moves onto the Swan Coastal Plain where the river continues West and crosses the Southwestern Highway. It then flows past the town of Serpentine. The river then veers South and continues until it discharges into the Peel Inlet near Mandurah, Western Australia.
Land Tenure	Mixed across different local governments and DBCA reserves.
Abiotic Geology (landscape, landforms, climate)	The Serpentine river flows from the aquifers of the Yilgarn Craton down off the Darling Scarp to the Pinjarra Plains. The Serpentine River takes a right-angled bend and then flows parallel to the coastline for 24km to its entry into the Peel Inlet. This represents the boundary between the Bassendean dunes and the younger Spearwood dunes. The Spearwood dunes would have shaped the Serpentine during the late Pleistocene as the dunes created the North-South lake of Goegrup.

Biotic Biodiversity (flora and fauna)	Serpentine River is tidal for up to 20km to Lake Goegrup. Estuarine and marine fish species will travel up the river for breeding and feeding. Dolphins regularly transverse the lower reaches of the river as far as Paganoni Road. (Estuary Guardians, 2022). During the drier months the Peel -Harvey Estuary, as well as the lower reaches of the river systems, become increasingly saline and are used by marine fish as a nursery (GIBBS, 2011). The first floods of fresh waters from the winter rains then flushes these species, in particular, the sea mullet (Mugil cephalus) and Australian salmon (Arripis truttaceus) make their way back down into the lower reaches of the river and into the Peel Estuary. There is a variety of Riparian vegetation along the edges of the river. Flooded Gum trees (Eucalyptus Rudis) line many parts of the river, she-oaks (Casuarina obesa), and saltwater paperbark (Melaleuca cuticularis) also occur in the riparian vegetation. Standing dead vegetation includes (Melaleuca rhaphiophylla) which has been inundated by saltwater with storm surges and the opening of the two marine channels. Sedges and Saltmarshes line many low-lying edges of the river. Bird species include a wide range of water and bush birds as well as migratory birds over summering here.

Cultural Aboriginal culture and European history	Downstream (west) of the scarp the land has been mostly cleared for agriculture; mostly grazing but with some intensive and irrigated agriculture (including sheep feedlots, poultry farms, and piggeries). There is also considerable (and expanding) urban land use to the north, which is drained by the Peel Main Drain and enters the Serpentine River around 30 km upstream of its confluence with the Peel-Estuary. Serpentine Pipehead Dam was built in 1957, and the Serpentine Main Dam in 1961. These dams were developed to supply the Perth metropolitan area with additional scheme water. Indigenous connection to Serpentine river documented by Daisy Bates and J.E.Hammond. Joseph and Dulcie Nannup's trail commemorate this indigenous families connection to the Serpentine River. Noongar people have always honored the river through a reference in cultural knowledge as the umbilical cord bilya, hence Waangaamaap Bilya (Serpentine River). Sea mullet (Mugil cephalus) and Australian salmon (Arripis truttaceus), known to Nyungar people as kalda and ngarri, were important food sources for indigenous people from the Serpentine. Other fish relied upon for food includes: bream, yellow tail, mulloway, crabs, prawns and cobbler. See Site Fish Mungah for more details on the indigenous connection to this river.
Other Significance	Connected to Ramsar Site 482

Infrastructure/ Facilities	Private jetties, public boat ramps, kayak access, 4km walking trail with indigenous interpretation signage..
Events, Education	NA
Community Group, NGO	Canoe Trail Friends of Mandurah and Pinjarra, Over 55's Kayak Group Mandurah, Salt and Bush Eco Tours
References	DWER, 2022. Department of Water, Lower Serpentine hydrological studies – conceptual model report. https://rivers.dwer.wa.gov.au/catchment/murray-serpentine-rivers/ https://www.water.wa.gov.au/__data/assets/pdf_file/0020/3656/101835.pdf Gibbs, M. (2011). An Aboriginal fish trap on the Swan Coastal Plain: the Barragup mungah. Records of the Western Australian Museum, (79), 4–15

Site	Lake Goegrup
Location	Barragup WA 6209 - -32.521750, 115.782056
Land Tenure	Foreshore reserves City of Mandurah and Shire of Murray LGAs, DBCA manages Lake Goegrup nature reserves
Abiotic Geology (landscape, landforms)	The Serpentine River flows southward between Bassendean and Spearwood Dunes into a large open shallow basin called Lake Goegrup. It is a permanent wetland formed approximately 10,000 years ago.
Biotic Biodiversity (flora and fauna)	Large shallow lake on the Serpentine River. Abundant water bird life, fish breeding area, and regular bottle nose dolphin hunting area. The lake has extensive riparian temperate saltmarshes (TEC) and estuarine fringing forest. Large numbers of waterbirds and international migratory shorebirds use the wetland for feeding and roosting.
Cultural Aboriginal culture and European history	This area has a substantial number of significant Aboriginal sites. It is highly significant to local Aboriginals as a place with significant resources in and around the lake. The richness of the lake as a resource led to conflict between the local indigenous people and white European settlers. The narrow creek which joins Goegrup Lake to Black Lake was a site of a wooden fish trap (or mungur) and indigenous camps spread approximately 200 metres to the south-west and north-east of this Fish trap. It was known as Nambeelup. (O'Conner et al, 1989).
Other Significance	Rasmar Site 482 – Biotic and Cultural.
Infrastructure/ Facilities	DBCA board walk, City of Mandurah kayak launch, picnic area, BBQ, public toilets, walk trail.
Events, Education	Ramsar 482 yearly bird count, Heron and Spoonbill Kayak Trail

Community Group, NGO	Canoe Trail Friends of Mandurah and Pinjarra, Estuary Guardians,
References	https://www.ourknowledgeourland.com.au/mapitem/14-lake-goegerup/ InHerit, 1997. Site number: 09019 - http://inherit.stateheritage.wa.gov.au/Public/Inventory/Details/29b12582-cc82-42f1-8d4a-8b912f89d9b5

Site	Barragrup Mungah and Bridge
Location	On Serpentine River, between Barragup Bridge on Mandurah - Pinjarra Road and Webster Way, Furnissdale
Land Tenure	DOT Marine . Shoreline City of Mandurah, Shire of Murray
Abiotic Geology (landscape, landforms, climate)	The Serpentine river flows from the aquifers of the Yilgarn Craton down off the Darling Scarp to the Pinjarra Plains. The Serpentine river takes a right-angled bend and then flows parallel to the coastline for 24km to its entry into the Peel Inlet. This represents the boundary between the Bassendean dunes and the younger Spearwood dunes. The Spearwood dunes would have shaped the Serpentine during the late Pleistocene as the dunes created the North-South lake of Goegrup.
Biotic Biodiversity (flora and fauna)	Fish Species that have been documented in this portion of the Serpentine river include: Yellowtail grunter, Cobbler, sea mullet, western hardyhead, Australian Salmon. Other Biotic features include Samphire wetlands, Casuarina, Eucalyptus Rudis, and some Melaleuca line the sides of the river at this location.
Cultural Aboriginal culture and European history	Natural Barragup Bridge: Shallow area where there is an underwater bridge that allows for crossing the river (further references needed). Fish Mungah: The Barragup mungah (or fish trap/weir) 100 metres downstream from the bridge on the Mandurah-Pinjarra Road. The Serpentine River itself was an important food source for Aborigines both in the hills and down towards the coast. The Barragup mungah was in regular use during the 19th century, and probably for centuries prior to European colonisation, although archaeological evidence suggests that the Serpentine and Murray rivers were being fished a few centuries after the present estuarine system formed some five thousand years ago. The Fish trap or Barragup Mungah was a reed weir that crossed the Serpentine River. The weir comprised brush and sticks laced together into a 'barrier' stretching from bank to bank, leaving only a small gap in the centre, into which

	fish were forced by the current. People stood on either side of the gap, tossing out hundreds of the fish that passed through. The weir was used mainly during autumn when run-off from the first rains forced the sea-fish downstream. The Barragup mungah in particular would have provided enough fish during the season to enable hundreds of people to congregate in the district for weeks or months on end. It was during these gatherings that the different Nyungar sub-groups carried out many of their legal, social and ceremonial activities. The mungah was the source of some dissension between Aborigines and white fisherman during the 1890s, with local fishermen and the Fisheries Inspectors claiming that it was leading to a decline in fish numbers. The mungah was destroyed at least three times and rebuilt. In 1897 a deputation of local Aborigines including Billy Dower lodged a complaint with the Governor, who was visiting Mandurah. It appears that European fishermen also used the mungah at times, and Charles Tuckey reported to a Joint Select Committee appointed to look into the fishing industry that he had secured 10,000 tins from that source in six weeks in 1896. The mungah was finally destroyed by a Marine and Harbours snagging operation in 1937.
Other Significance	RAMSAR Listed Wetland
Infrastructure/ Facilities	Joseph and Dulcie Nannup 4km Walking Trail starts near this location.
Events, Education	NA
Community Group, NGO	Winjan Corporation
References	Inherit State Heritage Record – Site: 09123 accessed from: http://inherit.stateheritage.wa.gov.au/Public/Inventory/Details/bc31af24-7fef-476f-9196-4b148d848d40 J.E.Hammond,1933. Winjan's People, the story of southwest Australian Aborigines. (pg.36-37) Daisy Bates, 1992. Aboriginal Perth, Bibbulmun biographies and legends. Edited by PJ Bridge Gibbs, M. (2011). An Aboriginal fish trap on the Swan Coastal Plain: the Barragup mungah. Records of the Western Australian Museum, (79), 4–15

Description	Cooper's Mill - Cooleenup Island
Location	Murray River Delta -32.57627281604008, 115.76553733020734
Land Tenure	Shire of Murray and Private land titles
Abiotic Geology (landscape, landforms, climate)	Coopers Mills walls were made of limestone blocks and the floor was limestone rubble , Limestone quarried from Point Grey Quarry and brought across the Peel Inlet Cooleenup Island. Cooleenup is an island formed from the Murray River delta.
Biotic Biodiversity (flora and fauna)	Samphire marshes, with Casurainas overhanging the river. WA Naturalists Club recorded 36 species of native plants and 38 bird species, 9 moss, lichen or fungi in August 2017.

Cultural Aboriginal culture and European history	Joseph Cooper began building the mill in the 1840s but died before he could see its completion. Joseph was a wheelwright and had the skills to make the machinery and had completed the mechanical parts before he died. His sons Thomas and James inherited the mill and with the help of Dan Myerick, a carpenter, and Josiah Stinton it was completed. The mill was in use by 1850 and operated until 1865. Originally it was powered by the wind and then it was converted to steam. The mill was very important to wheat farmers who would otherwise have to mill by hand. The Mill then changed hands and was converted into a smoke house used by local fishermen. The Mill was restored in 1930, 1984 and 2001. Access to the mill is open and vistors can walk into the mill. Indigenous Culture: further consultation needed.
Other Significance	Ramsar listed wetlands.
Infrastructure/ Facilities	Jetty, Picnic tables, playground, toilets, historical information within the mill.
Community Group, NGO	WA Naturalist's observatory house on the island

References	City of Mandurah Museum, 2020. Factsheet Coopers Mill. https://www.mandurah.wa.gov.au/-/media/files/com/downloads/explore/museum/fact-sheets/coopers-mill.pdf WA Naturalists, 2017 - August plant survey. https://www.wanaturalists.org.au/reports/yunderup-field-station-august-visit-to-culeenup-island/

Site	Bilya Maadjit (Murray River)
Location	Running 150km from the East into the Peel Inlet. Tributaries start in Hotham and Williams Rivers.
Land Tenure	DOT marine, Shire of Murray, Private Land
Abiotic Geology (landscape, landforms, climate)	The Murray River has two major tributaries, the Hotham River, which starts near Narrogin and the Williams River, that starts between Williams and Narrogin. These are also the two main rivers which drain the eastern wheat-belt. The Murray River flows through vegetated parts of the Darling Range to Pinjarra. The deposition of sediment from the Yilgarn and Darling Scarp has been deposited over a period of time and on the banks of the Murray River, you can see 4 different time periods of deposition from youngest Coolup, Wellesley, Boyanup and Blythewood. (Seddon, 2004). The right-angle bend in the Murray River occurs South of Coolup and then again north of Pinjarra. In the past the Dandalup River was the mainstream and the Murray River was a tributary. The river then flows across the coastal plain between the Darling Scarp to empty into the Peel-Harvey Estuary near Mandurah through a delta system of islands. This site can be a case study of delta systems, and river morphology with point bars, oxbow lakes, floodplains, perennial floodplain channels.

Biotic Biodiversity (flora and fauna)	Riparian vegetation: Flooded Gum trees (Eucalyptus Rudis) line many parts of the river, she-oaks (Casuarina obesa), and saltwater paperbark (Melaleuca cuticularis) also occur in the riparian vegetation. Standing dead vegetation includes (Melaleuca rhaphiophylla) which has been inundated by saltwater. Sedges and Saltmarshes line many low-lying edges of the river. Fauna: Bottlenose dolphins, Rakali (native water rat) (Hydromys chrysogaster) Fish species: Fish Species: Yellowtail grunter, Cobbler, sea mullet, western hardyhead, pouched lamprey, black bream, Birds: waterbird, migratory and resident, bush birds and birds of prey. Species varies across the river ecosystems, up to 70 species observed.
Cultural Aboriginal culture and European history	Murray River system is a regional significant waterway devoid of dams for public water supply. Further consultation is needed for this site for cultural significance.
Infrastructure/ Facilities	Boat ramps, bridge, navigation markers, weir at Pinjarra.
Events, Education	NA
Community Group, NGO	PHCC
References	Brearley, Anne. (2005). Ernest Hodgkin's Swanland Estuaries and Coastal Lagoons of South-western Australia. UWA Press. Seddon, George. & Duany, Andrés. & Tredennick, Mark. (2004). Sense of place: a response to an environment, the Swan coastal plain Western Australia.

Site	Yoordinggaap (Harvey River)
Location	Lower reaches of the Harvey River -32.782312136293214, 115.7149122222166
Land Tenure	Shire of Waroona, DWER, Private land
A. Abiotic Geology (landscape, landforms)	The Harvey River is approximately 80 km in length from the headwaters to the confluence with the estuary. It flows in a Northwards direction and enters the estuary through a large shallow crow's foot delta. The Harvey River is the main river that flows into the Harvey Estuary.
B. Biotic Biodiversity (flora and fauna)	The three dominant tree species, Casuarina obesa, Eucalyptus rudis and Melaleuca rhaphiophylla, make up the riverine vegetation of the Harvey River delta. They have showed a general decline in canopy condition over the four years following the opening of the Dawesville Channel. The most likely explanation of the tree decline on the Harvey delta is in changes to the salinity regime of the lower Harvey estuary following the opening of the Dawesville channel. Standing dead vegetation remain. Increase in Samphire wetlands and sedgelands since 1994. 34 Species and 2574 birds counted in Summer 2021 - Annual Shorebird count. Bottlenose Dolphins make their way through the Harvey Delta and into the Harvey River Evidence of Rakali, Wester Grey Kangaroos use the samphire marshes and are regularly seen.

C. Cultural Aboriginal culture and European history	Aboriginal Culture: consultation needed European History: The river's first recorded encounter was by Dr Alexander Collie and Lieutenant William Preston in an expedition in November 1829. It is presumed to have been named by Governor James Stirling after Rear Admiral Sir John Harvey, who in 1818 was Commander in Chief of the West Indies Station while Stirling had served in that region. There are seven large dams that are managed for different purposes across the Harvey River. Around 3 km downstream from Harvey Dam, flows are directed into the Harvey Diversion Drain (at a structure known as Larsen's Cut) which was built in the 1930s to manage flooding. Water from an irrigation pipeline is released into the river at Larsen's Cut. The Harvey catchment has been extensively cleared for agriculture (Brearley, 2005).
Other Significance	Ramsar wetlands
Infrastructure/ Facilities	None
Events, Education	Tours through Salt and Bush Eco Tours
Community Group, NGO	Harvey River Task Force, PHCC, Swanlandia Inc, Estuary Guardians
References	DWER, 2022. Healthy Rivers - Harvey River Overview. https://rivers.dwer.wa.gov.au/catchment/harvey-river/ Gibson, N. (2002). Decline of the riverine trees of the Harvey River delta following the opening of the Dawesville Channel. 84. 116-117. Brearley, Anne. (2005). Ernest Hodgkin's Swanland Estuaries and Coastal Lagoons of South-western Australia. UWA Press.

Site	Point Grey - Eastern side of the Peel Harvey Estuary
Location	-32.618744214054026, 115.66602749972874
Land Tenure	Private Land, Shire of Murray
Abiotic Geology (landscape, landforms, climate)	Point Grey peninsular occurs in the Spearwood sands unit which is characterised by gentle to moderately inclined hills and gently undulating plains associated with Tamala limestone and limestone derived sand. Karst systems and caves occur throughout the area.
Biotic Biodiversity (flora and fauna)	Open Tuart woodland with cleared understory. Estuary fringe vegetation - samphire mashes, sheoak, paperbarks, kunzea. Black Cockatoo foraging area. A total of eighty-six species of waterbirds have been recorded in the Peel Inlet—Harvey Estuary System, including five darters and cormorants, twelve herons and allies, twelve ducks and allies, five rails, thirty-five shorebirds and nine gulls and terns (Bamford, 2001)
Cultural Aboriginal culture and European history	Bordering the Harvey and Peel Estuary Systems, would have been a source for food for indigenous people, camping and hunting would have also occurred in this location. Further Consultation is needed.

Other Significance	Ramsar wetlands
Infrastructure/ Facilities	none
Events, Education	none
Community Group, NGO	PHCC, PPG
Other	Marina proposal to dredge the estuary to the Dawesville cut was decline via the Minister for Planning
References	EPA Environmental report https://www.epa.wa.gov.au/sites/default/files/EPA_Report/Point%20Grey%20Marina%20-%20EPA%20Report.pdf EPA - Environmental Scoping Document https://www.epa.wa.gov.au/sites/default/files/Environmental_scoping_document/A1751_R1420_ESD.pdf Bamford, M.J. 2001. Waterbird Monitoring at Point Grey: Progress Report; September 1999 to August 2001. Bamford Consulting Ecologists. Kingsley, Western Australia.

Site	Lake McLarty Nature Reserve - Eastern side of the Harvey Estuary by 600m.
Location	-32.70928166541002, 115.71332020875414
Land Tenure	DBCA
Abiotic Geology (landscape, landforms, climate)	Lake McLarty is a shallow, oval, medium-sized, freshwater lake with a gently sloping bottom. Open water covers a maximum area of approximately 2.1 km (north to south) by 1.25 km (east to west). The lake lies in a natural drainage depression within the coastal plains and is isolated from the eastern shoreline of the Harvey Estuary (distance of 600 m) by a vegetated fossil dune ridge. (DEC , 2008). Lake McLarty is located in a depression between the Spearwood dune system and the Bassendean dune system.
Biotic Biodiversity (flora and fauna)	The 163 hectare wetland provides habitat for an abundance and diversity of waterbirds and regularly attracts over 30,000 waterbirds each summer. Lake McLarty regularly supports more than one percent of the total Australian/world population of two Australian resident wader species, the red-necked avocet (Recurvirostra novaehollandiae) (5.1% of the Australian population) and red-capped plover (Charadrius ruficapillus) (1.6%), which qualifies it as being of international significance under Ramsar guidelines. The emergent vegetation at Lake McLarty consists predominantly of sedge land margins which are important for breeding swans and other waterbirds. The lake also supports a range of invertebrate species that provide an abundant food source to the numerous water and shorebirds that inhabit it. The current water regime at the lake creates suitable feeding habitats for migratory waders and is one of the few local lakes to support this pre-migration feeding. (DEC, 2008.)

Cultural Aboriginal culture and European history	Indigenous Culture: further consultation needed. European History: Several drains were constructed in the Lake McLarty area in the early 20th century, which have altered natural overland drainage into the lake. Drainage continued into the 1960s, when the drain on the southern side of the lake was constructed to enable the southern areas to be more viable for farming. The natural water system that ran into the lake from the east was blocked and diverted at the time of drain construction. Prior to that time, much of the land surrounding the lake was inundated. It is presumed that drains were formed to reduce water levels in the lake and provide better conditions for pasture growth in adjacent area. (DEC, 2008.)
Other Significance	Ramsar Listed Wetland
Infrastructure/ Facilities	none
Events, Education	PHCC open day at Lake McLarty
Community Group, NGO	Friends of Lake McLarty, PHCC
References	DEC, Department of Environment and Conservation, 2008. Lake McLarty Management Plan. https://www.dpaw.wa.gov.au/images/documents/parks/management-plans/decarchive/2008081_lakemclartympl_web.pdf

Site	Pinjarra Plain
Location	Coolup, Pinjarra and Murray Riverbanks Two to Three sites required to represent the Pinjarra Plain and its associated sediments
Land Tenure	Shire of Murray, Private Land, DBCA Reserves
Abiotic Geology (landscape, landforms, climate)	The Pinjarra Plain is the low lying and flat area found to the east of the Swan Coastal Plain stretch to the west of the Darling Scarp and overlying the Bassendean dunes. The sediments are fluvial in origin and are the floodplain deposits of the major rivers that flow across the Swan Coastal Plain. The soils are primarily clay and the landscape is of low relief and naturally poorly drained. During winter surface water appears as seasonal wetland and swamps. The Pinjarra plain soil is relatively fertile in comparison to the nutrient-deficient soils of the Bassendean and Spearwood dunes. The soil stratigraphy of the Pinjarra Plain consists of various deposits including the Coollup, Boyanup and Wellesley units. These stratigraphic units are exposed at river beds on sections of the Murray River near Pinjarra.
Biotic Biodiversity (flora and fauna)	The seasonal swaps host abundant insect and birdlife. The Pinjarra Plain has been heavily cleared with few Jarrah trees remaining. There are Marri trees on the plain, with Wandoo on the clay flats, paperbarks in the swamp areas and flooded gum along the watercourses. Much of the Pinjarra Plain is pastureland with drains constructed to reduce the amount of waterlogged land.

Cultural Aboriginal culture and European history	It is thought that the name (Pinjarra) is a corruption of the Aboriginal word (beenjarrup) meaning (place of the swamp). Another interpretation for Pinjarra comes from Bin-jaril / Binjarlly which means to dig in and amongst the swamps and jarrah trees (Boodjar Place Names). The Pinjarra Plain was one of the first areas to be cleared for pastures by the settlers.
Other Significance	The clearing and the draining of the Pinjarra Plain had major environmental effects including loss of vegetation communities as well as contributing to the nutrient problems of the Peel-Harvey Estuary
Infrastructure/ Facilities	Varied across the Pinjarra Plain
Events, Education	NA
Community Group, NGO	NA
References	Boodjar, UWA (2002). Nyungar Placenames in the South-West of Western Australia. https://www.boodjar.sis.uwa.edu.au/boodjar-placenames/pinjarra Brearley, Anne. (2005). Ernest Hodgkin's Swanland Estuaries and Coastal Lagoons of South-western Australia. Seddon,George. (1972), Sense of Place. A response to an environment The Swan Coastal Plain, Weastern Australia

Site	Pinjarra Massacre Site
Location	McLarty Road, Battle of Pinjarra Memorial Park , Pinjarra. -32.641667, 115.869444
Land Tenure	Shire of Murray
Abiotic Geology (landscape, landforms,)	See Pinjarra Plain site See Murray River site.
Biotic Biodiversity (flora and fauna)	Large Jarrah Trees (Eucalptys Marginata, Flooded Gum (Eucalyptus Rudis), with riparian vegetation leading down to the edge of river. (see Murray River Biotic Site).
Cultural Aboriginal culture and European history	28 October 1834, Governor James Stirling led 25 European colonialists including military and mounted police towards the Pindjarup Noongar encampment on what is now McLarty Road. The armed party led by Stirling approached a group of Pindjarup /Bindjareb camping and began shooting at the unarmed indigenous. Between 15 and 80 Pindjarup were shot and killed. The colonialists had one death, the police superintendent was speared and later died. This event in history was recorded

	as the Battle of Pinjarra, but has later been renamed the Massacre of Pinjarra. (Contos, 1998). It is an Aboriginal Heritage Site, and listed
Other Significance	Pinjarra Massacre Memorial inscription: “In memory of the men, women and children of the Binjareb Noongar people and a Colonial Officer who died here on the 28th October 1834 as part of confrontations in the early days of the Swan River Colony. Remembering the spirit of the traditional owners of this land, we go forward together in peace, building a united nation for future generations.”
Infrastructure/ Facilities	Memorial Monument.
Events, Education	Commiseration Events starting in 1991,- Back to Pinjarra Day, the first remembrance ceremony for the Pinjarra Massacre was held at the Memorial Area, initiated by Theo Kearing and his wife, Gloria.
Community Group, NGO, Business.	Binjareb Park Cultural Tours, Mandurah Dreaming Cultural Tours, Winjan Corporation

References	N.Contos, T.A.Kearing, L. Collard, D. Palmer. (1998) 'Pinjarra Massacre Site Research and Development Project: Report for Stage 1', in conjunction with Murray Districts Aboriginal Association. http://inherit.stateheritage.wa.gov.au/Admin/api/file/a32f1bff-4af9-564a-68ce-8409d0c9f3cc Heritage site: 03957 http://inherit.stateheritage.wa.gov.au/Public/Inventory/Details/f616e25f-cf6f-467b-9c60-d07bdd4aaa33

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