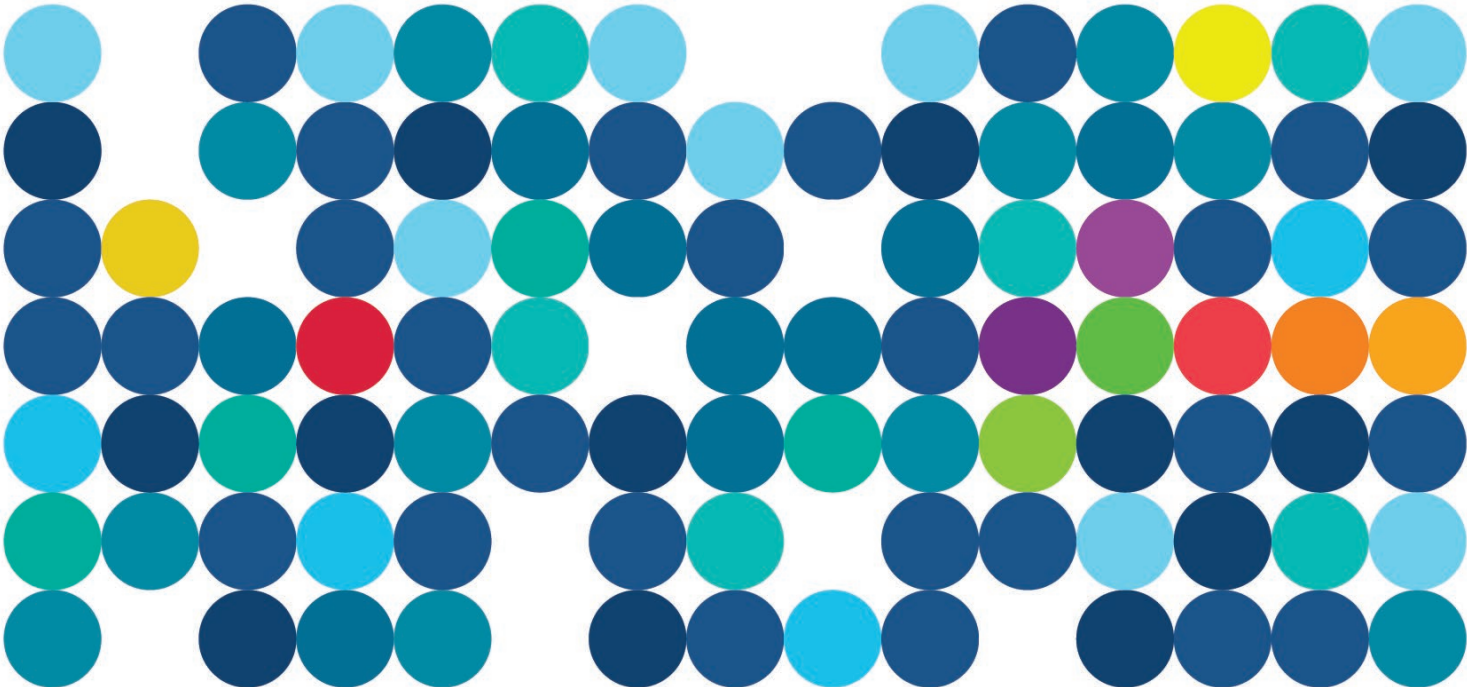


Alkimos Water Precinct

Environmental Management Plan

Revision 1 – April 2023





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1. Summary

This document provides the plan to manage terrestrial environmental risks within the Alkimos Water Precinct.

An environmental risk assessment conducted on the likely risks to the Alkimos Water Precinct has identified the following key environmental factors for the project:

- Flora and vegetation,
- Weeds, pests and disease hygiene
- Terrestrial fauna
- Fire
- Waste and hazardous substance management, and
- Reinstatement and revegetation.

The following objectives for the Alkimos Water Precinct have been established:

- No further change to baseline cover of vegetation in areas identified for conservation (Area 9a, 10a and 10b)
- No change to significant landforms in the Alkimos Dune Complex within the Alkimos Water Precinct
- No impacts to terrestrial fauna in the Alkimos Water Precinct



2. Project Overview

2.1. Background

Figure 1 details the location of the Alkimos Water Precinct.

In 2006 the Western Australian Planning Commission (WAPC) put forward a proposal to amend reservations and zonings in the Metropolitan Regional Scheme (MRS) consistent with the Alkimos-Eglinton Structure Plan.

This proposal was assessed by the Environmental Protection Authority (EPA) under the provisions of the Environmental Protection Act 1986. MRS Amendment 1029/33 was endorsed by the Minister for Environment and issued Ministerial Statement 722.

As part of Ministerial Statement 722, certain areas were set out surrounding the proposed Alkimos Wastewater Treatment Plant as Conservation Areas 9a, 10a and 10b, detailed in Figure 5.

The environmental impacts of the Alkimos Wastewater Treatment Plant (WWTP), operated by Water Corporation, were also assessed by the EPA and approved by the Minister in 2007 (Statement 755).

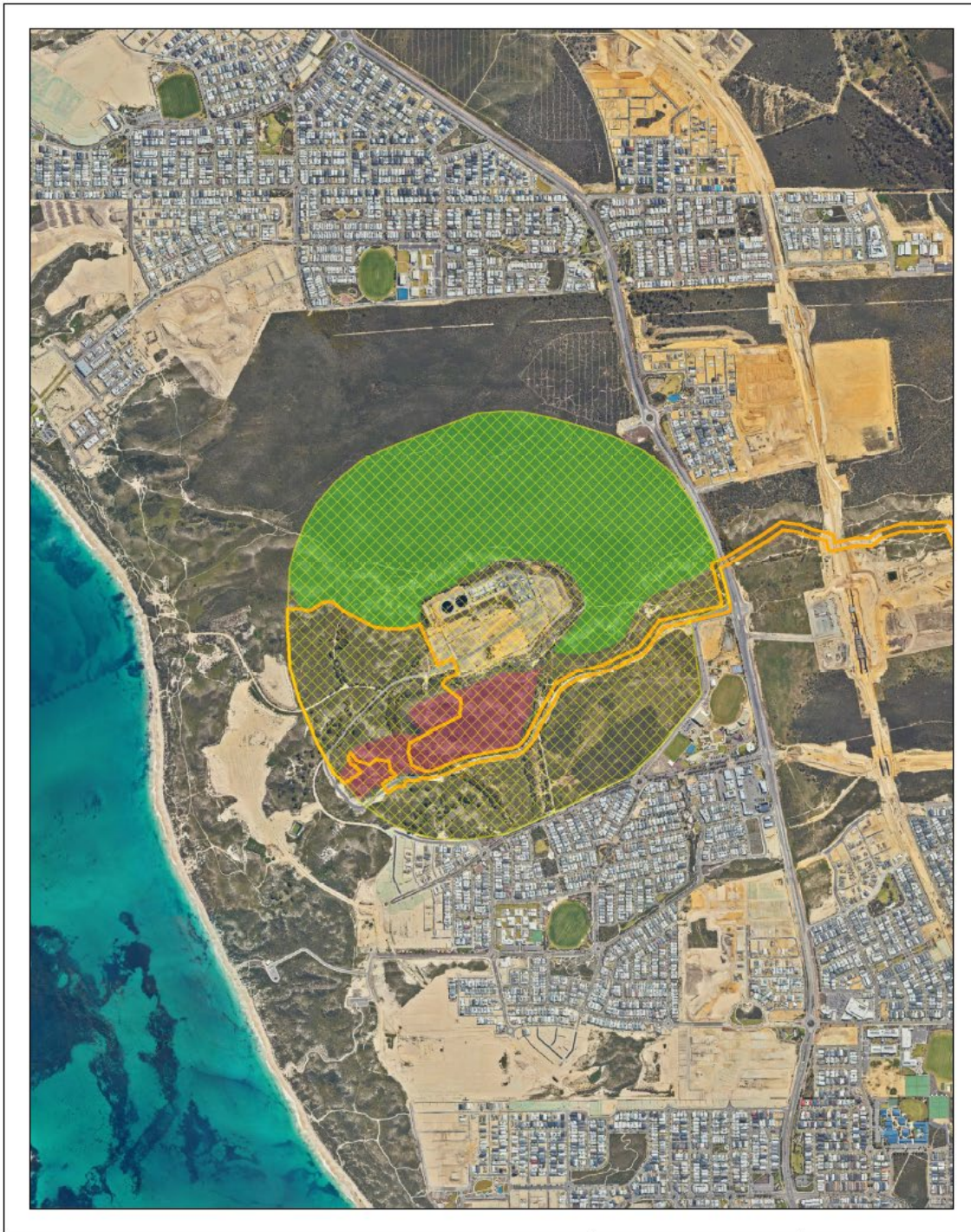
There is a proposal to construct and operate the Alkimos Seawater Desalination Plant (ASDP) and Groundwater Treatment Plant to the west of the Alkimos WWTP, within an approximately 30ha site. The proposed site impacts a 5.17 ha area previously identified for conservation in Ministerial Statement 722.

2.2. Purpose





This management plan has been drafted to manage environmental assets located within the Alkimos Water Precinct, outside impacts approved in specific projects, in accordance with the provisions of Ministerial Statement 722.

The purpose of this Management Plan is to:


- Describe the key environmental values, and identification of environmental outcome to be achieved through the implementation of this plan,
- Clearly delineate the boundaries of the management plan, and significant areas within,
- Manage construction, access and rehabilitation,
- Identify vegetation mitigation strategies,
- Allocate responsibilities and identification of timing and duration of implementation,
- Provide for routine monitoring of environmental values, and
- Identify contingency plans if monitoring indicates development is having an adverse impact on the environmental values.



LEGEND


-  Alkimos Water Precinct
-  ASDP Development Envelope
- Conservation Areas**
-  Area 10b
-  Area 9a and 10a

1:20,000 at A4




Metres

Coordinate System: GDA 1994 MGA Zone 50
Vertical Datum: AHD



Perth

DATE: 13/04/2023
AUTHOR: ZAHRAFI



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Alkimos Water Precinct

Figure 1 – Alkimos Water Precinct



2.3. Key Environmental Values

The Alkimos Water Precinct has been the subject of multiple flora and fauna surveys, including Baseline flora surveys undertaken by Ecoscape (2018), AECOM (2017), Strategen (2017) and Stantec (2020a) were conducted in accordance with the requirements for environmental surveying and reporting for flora and vegetation in Western Australia as outlined in the technical guidance.

Stantec have prepared a Consolidated Flora and Vegetation Report that combines the findings of all other surveys to date.

The site comprises of undulating, occasionally steep sand dunes, and swales supporting coastal heathland vegetation. The majority of the site (excluding cleared areas and areas containing planted eucalypts) contain some degree of foraging habitat for Carnaby's Black Cockatoos (ranging from 'poor' to 'high'). The highest quality foraging habitat is associated with areas of Banksia woodland in the north of the Survey Area.

The site contains a combination of relatively undisturbed land as well as areas which show signs of having been degraded for a long period of time through historical clearing and weed invasion. As such, vegetation condition within the survey area ranges from Completely Degraded to Excellent (Strategen, 2017).

Bushland surrounding the WWTP and owned by the Water Corporation is designated as a buffer zone, the aim of which is to minimise odour impacts on future surrounding residential development. The boundary of the buffer zone, which is circular in shape, has not been delineated on the ground. Sections of the buffer area were cleared or excavated during construction of the WWTP. These areas have been reshaped and rehabilitated, including direct seeding of native vegetation species.

Almost all of the bushland has been subjected to inappropriate use over many years, including fire-lighting, illegal rubbish dumping, vandalism, and trespassing.

The key environmental values of the Alkimos Water Precinct are:

- Vegetation representing Threatened Ecological Communities (TEC) and Priority Ecological Communities (PEC), and
- Significant landforms of the Quindalup Parabolic Dune System.

2.3.1 Threatened Ecological Communities and Priority Ecological Communities

Vegetation representing TECs and PECs were identified within the Alkimos Water Precinct (Stantec 2020a) as shown in Figure 2.

The presence of these significant ecological communities has been determined through either formal assessment according to Commonwealth Approved Conservation Advice criteria or through analysis to establish inferred Floristic Community Types.

Vegetation considered to be representative of:

- *Banksia Woodlands of the Swan Coastal Plain*' (En), and



- Tuart (*Eucalyptus gomphocephala*) woodlands and forest of the Swan Coastal Plain' (Cr)

were recorded within the Alkimos Water Precinct.

Vegetation considered analogous with four State-listed PECs has been recorded within the Alkimos Water Precinct. The occurrence of these PECs was determined through Floristic Community Type analysis and detailed site observations:

- 'Tuart (*Eucalyptus gomphocephala*) woodlands and forest of the Swan Coastal Plain' (P3)
- 'Banksia Dominated Woodlands of the Swan Coastal plain IBRA Region' (P3)
- 'Northern Spearwood shrublands and woodlands' (P3)
- 'Acacia shrublands on taller dunes, Southern Swan Coastal Plain' (P3).

2.3.2 Landforms

The Alkimos Water Precinct also contains the Quindalup Parabolic Dune System on the Swan Coastal Plain which consists of four phases of dune formation (Q1, Q2, Q3 and Q4).

Within the Quindalup Parabolic Dune System, the Alkimos Dune Complex represents a largely intact example of all four dune phases.

The Alkimos Dune Complex completeness and relative lack of later geological reworking is considered as exceptional example of modern dune systems along the Western Australian coast. Of particular note is the fact that the Alkimos site preserves all four main phases of Quindalup dune development – from oldest to youngest, Q1, Q2, Q3 and Q4 (McArthur and Bartle, 1980). The Alkimos Dune Complex, in addition to Q1-Q4, includes two minor associated phases Qs and Qp.

Figure 3 details the Alkimos Dune Complex in proximity to the Alkimos Water Precinct.

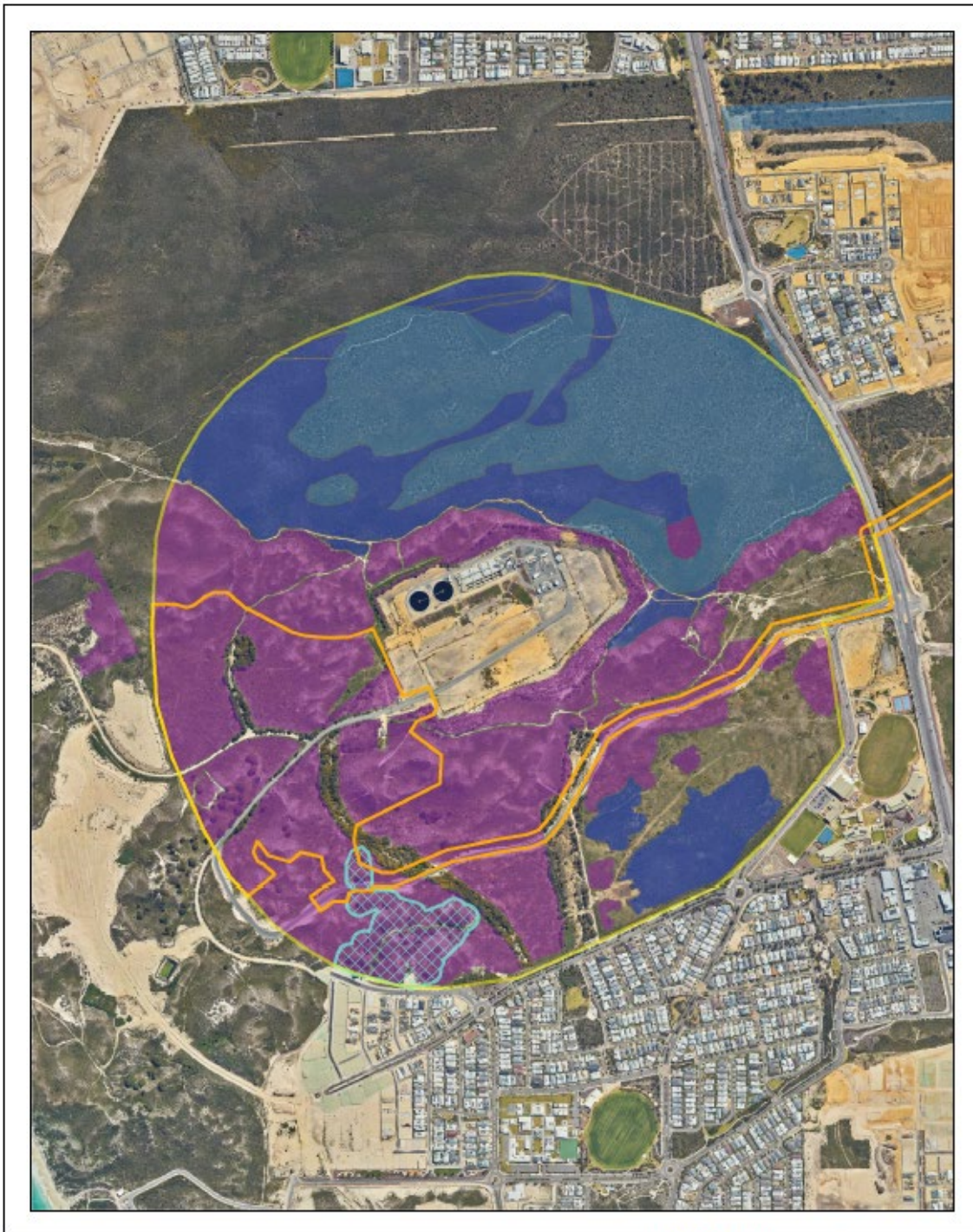
2.3.2 Terrestrial Fauna

The Stantec 2021b consolidated previous terrestrial fauna surveys undertaken on the Alkimos Water Precinct. Fauna values were assigned to the vegetation on the site and have been mapped as shown in Figure 4.

Habitat for significant fauna on the Alkimos Water Precinct includes:

- Woodland,
- Heath and Shrubland,
- Parkland planted vegetation, and
- Scattered Trees.

These habitats are used by conservation significant species such as Black Cockatoos, Quenda, Western Brush Wallaby, Black Striped Burrowing Snake and SCP Shield Backed Trapdoor Spider.



LEGEND

- Alkimos Water Precinct
- ASDP Development Envelope

- Acacia Shrublands on taller dunes, Southern Swan Coastal Plain (P3 PEC)
- Commonwealth Banksia woodlands TEC (Banksia Dominated Woodlands of the Swan Coastal Plain P3 PEC)
- Northern Spearwood Shrublands and Woodlands (P3 PEC)
- Tuart Woodlands of Swan Coastal Plain TEC

1:12,000 at A4

0 120 240 360

Metres

Coordinate System: GDA 1994 MGA Zone 50
Vertical Datum: AHD

DATE: 15/06/2023
AUTHOR: ZW/KSPS



Alkimos Water Precinct
TEC & PEC



Figure 2 - Alkimos Water Precinct TECs and PECs



Figure 3 - Alkimos Water Precinct Alkimos Dune Complex

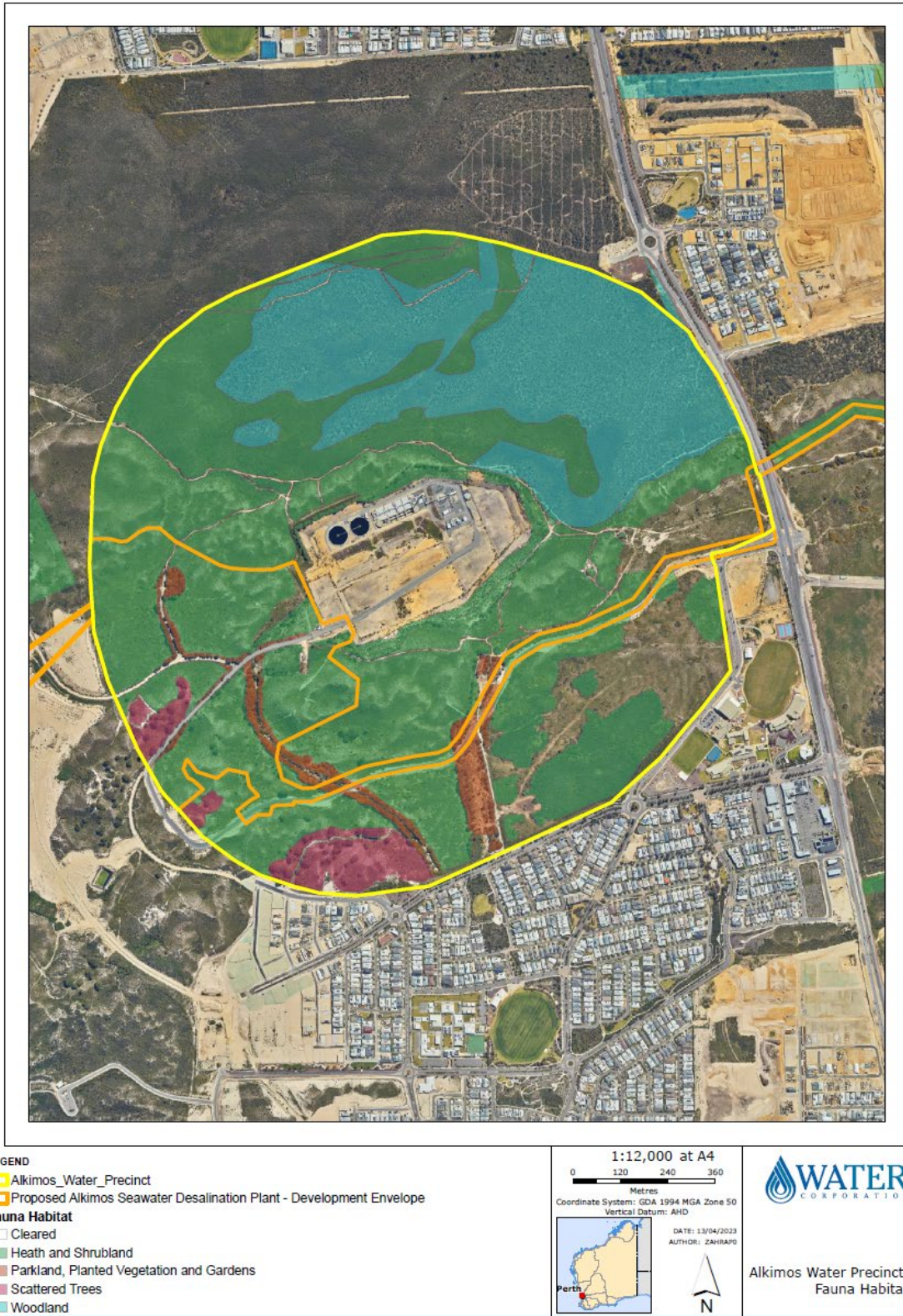


Figure 4 - Alkimos Water Precinct – Terrestrial Fauna Habitat



2.4. Tenure and Land use

Lot 3000 is owned in freehold by the Water Corporation of Western Australia, of which portions are potentially subject to urban development. The lot has multiple land use zonings under the Metropolitan Region Scheme (MRS) including Urban Deferred, Public Purposes – Water Service and Public Purposes – Protected and Managed for Conservation Purposes.

Figure 5 shows the land use classification and future surrounding development.

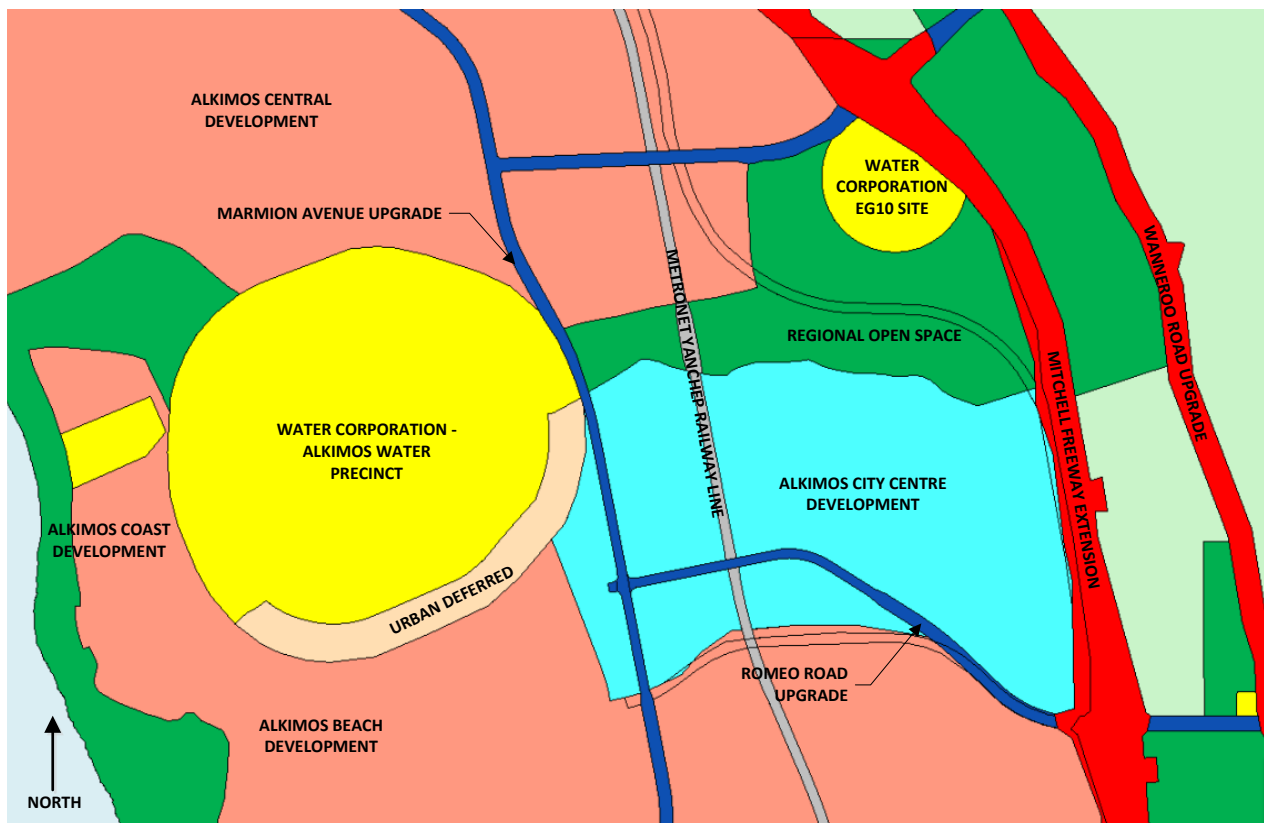


Figure 5 - Land use classification and future surrounding development



3. Environmental management measures

An assessment of the likely risks to the Alkimos Water Precinct has identified the following key environmental factors for the project:

- Flora and vegetation,
- Weeds, pests and disease hygiene
- Terrestrial fauna
- Fire
- Waste and hazardous substance management, and
- Reinstatement and revegetation.

For the main identified risk aspect, the following sections provide background information, objectives, performance criteria and the minimum requirements (controls, monitoring and reporting) for managing these environmental factors.

When undertaking work in the Alkimos Water Precinct Water Corporation and its contractors must:

- Adhere to all identified requirements within this EMP,
- and any other requirements deemed necessary to meet the environmental objectives.

A summary of the actions, monitoring and reporting requirements is included in Appendix A.



3.1. Flora and Vegetation management measures

Potential impacts to flora and vegetation within the Alkimos Water Precinct that need to be considered include:

Direct Impacts

- Authorised planned clearing,
- Dieback and weed incursion,
- Unplanned interactions between mobile plant and vegetation,

Indirect Impacts

- Edge effects, and the fragmentation of native vegetation and habitat, and
- Secondary adverse effects of dewatering

Management measures are proposed in Table 1.

Table 1: Vegetation Management Measures

Objective: No further change to baseline cover of vegetation in areas identified for conservation (Area 9a, 10a and 10b)					
Management target	#	Action	Monitoring	Timing	Reporting
No clearing or damage to vegetation outside of approved project clearing area.	V1	Prior to clearing all relevant permit and approvals shall be reviewed and any clearing requirements identified and communicated to Contractors and site boundaries demarcated.	Aerial imagery audit of vegetation cover.	Annual	5 yearly
	V2	All site visitors and contractors advised of protections to vegetation outside cleared areas.	Confirm inclusion in Alkimos Water Precinct site induction	Annual	
No introduction of dieback from Water Corporation activities	V3	Ensure equipment and machinery is clean on entry.	Dieback survey (if baseline survey identifies potential).	5-year	
	V4	Maintain fences to prevent unauthorised access.	Site inspections	Annual	
No introduction or spread of significant weeds from Water Corporation activities	V5	Ensure equipment and machinery is clean on entry.	Weed survey	5-year	
	V6	Maintain fences to prevent unauthorised access.	Site inspections	Annual	
No impacts to vegetation resulting from groundwater drawdown.	V7	Ensure any water abstraction from Water Corporation activities does not impact vegetation.	Aerial imagery audit of vegetation.	Annual	



3.2. Landforms

Potential impacts to landforms within the Alkimos Water Precinct that need to be considered include:

Direct Impacts

- Authorised disturbance of dunes,
- Unplanned interactions between mobile plant and vegetation,

Indirect impacts

- Unauthorised vegetation removal resulting in erosion.

Management measures are proposed in Table 2.

Table 2: Landforms Management Measures

Objective: No change to significant landforms in the Alkimos Dune Complex within the Alkimos Water Precinct					
Management target	#	Action	Monitoring	Timing	Reporting
No impact to Alkimos Dune Complex outside of approved project area.	L1	Prior to disturbance, approvals shall be reviewed, and any disturbance requirements identified and communicated to Contractors and site boundaries demarcated.	Confirmation through aerial imagery audit and authorised projects that no landforms impacted outside approved area.	Annual	5 yearly
	L2	Maintain fences to prevent unauthorised access.	Site inspections	Annual	



3.3. Terrestrial Fauna

Potential impacts to terrestrial fauna within the Alkimos Water Precinct that need to be considered include:

Direct Impacts

- Authorised disturbance of vegetation (habitat),
- Interactions between mobile plant and fauna,
- Fire,
- Pest fauna (foxes),

Indirect impacts

- Unauthorised vegetation (habitat) removal resulting in erosion.

Management measures are proposed in Table 3.

Table 3: Terrestrial Fauna Management Measures

Objective: No impacts to terrestrial fauna in the Alkimos Water Precinct					
Management target	#	Action	Monitoring	Timing	Reporting
No impact to terrestrial fauna habitat outside of approved project area.	F1	Prior to disturbance, approvals shall be reviewed, and any disturbance requirements identified and communicated to Contractors and site boundaries demarcated.	Confirmation through aerial imagery audit and authorised projects that no vegetation (fauna habitat) impacted outside approved area.	Annual	5 yearly
	F2	Maintain fences to prevent unauthorised access.	Site inspections	Annual	
No fauna interactions or deaths as a result of Water Corporation vehicles	F3	Enforce speed limits on roads and tracks to prevent fauna interaction.	Site inspections	Annual	
Minimise fire impacts to native fauna	F4	Manage firebreaks to minimise uncontrolled burns and allow for fauna egress.	Site inspections	Annual	
Minimise impacts to native fauna from introduced species	F5	Undertake pest management to minimise impacts to fauna	Fauna survey	Biennial	



4. Adaptive management and review

In the event that the monitoring identified above requires additional management actions to be implemented, the following adaptive management measures in Table 4 will be applied.

Table 4: Adaptive Management Measures

#	Action	Monitoring	Timing	Adaptive management
V1	Prior to clearing all relevant permit and approvals shall be reviewed and any clearing requirements identified and communicated to Contractors and site boundaries demarcated.	Confirmation through aerial imagery audit and authorised projects that no vegetation cleared outside approved area.	Annual	<ul style="list-style-type: none"> - Coordinate meeting with Operations and Projects Teams to educate on clearing requirements. - Investigate revegetation measures. - Implement additional measures on site to prevent access (fencing)
V2	All site visitors and contractors advised of protections to vegetation outside cleared areas.	Confirm inclusion in Alkimos Water Precinct site induction	Annual	Coordinate meeting with Operations and Projects Teams to educate.
V3	Ensure equipment and machinery is clean on entry.	Dieback survey (if baseline survey identifies potential).	5-year	If dieback is identified, develop dieback management plan in accordance with DBCA advice.
V4	Maintain fences to prevent unauthorised access.	Site inspections	Annual	If continued access occurs, consider more significant fencing options.
V5	Ensure equipment and machinery is clean on entry.	Weed survey	5-year	If weeds are identified, develop weed management plan for site.
V6	Maintain fences to prevent unauthorised access.	Site inspections	Annual	If continued access occurs, consider more significant fencing options.
V7	Ensure any water abstraction from Water Corporation activities does not impact vegetation.	Confirmation through aerial imagery audit that no vegetation impacted.	Annual	Investigate potential causes of vegetation decline and causes and investigate reduced abstraction.
L1	Prior to disturbance, approvals shall be reviewed, and any disturbance requirements identified and communicated to Contractors and site boundaries demarcated.	Confirmation through aerial imagery audit and authorised projects that no landforms impacted outside approved area.	Annual	<ul style="list-style-type: none"> - Coordinate meeting with Operations and Projects Teams to educate on landform requirements. - Investigate measures to stabilise landform. - Implement additional measures on site to prevent access (fencing)



L2	Maintain fences to prevent unauthorised access.	Site inspections	Annual	If continued access occurs, consider more significant fencing options.
F1	Prior to disturbance, approvals shall be reviewed, and any disturbance requirements identified and communicated to Contractors and site boundaries demarcated.	Confirmation through aerial imagery audit and authorised projects that no vegetation (fauna habitat) impacted outside approved area.	Annual	<ul style="list-style-type: none"> - Coordinate meeting with Operations and Projects Teams to educate on vegetation (fauna habitat) requirements. - Investigate revegetation measures. - Implement additional measures on site to prevent access (fencing).
F2	Maintain fences to prevent unauthorised access.	Site inspections	Annual	If continued access occurs, consider more significant fencing options.
F3	Enforce speed limits on roads and tracks to prevent fauna interaction.	Site inspections	Annual	If continued impacts occur, consider reducing speed limits further.
F4	Manage firebreaks to minimise uncontrolled burns and allow for fauna egress.	Site inspections	Annual	Investigate additional firebreak options to prevent fire impacts to fauna habitat.
F5	Undertake pest management to minimise impacts to fauna	Fauna survey	Biennial	Investigate more regular pest control to isolate specific species.



5. Revegetation management

Where a change in the vegetation cover has resulted from Water Corporation activities and revegetation is required, the following specifications will apply:

- Undertake site stabilisation to prevent erosion,
- Direct seeding in appropriate weather conditions to maximise success, using provenance seed collected from the surrounding area and site,
- Targeted weed control,
- Seedling propagation for specific species (where required),
- Targeted Rabbit control / Kangaroo exclusion, and
- Meet a completion criterion of 1.6 plants/m² and less than 20% weed cover. Species diversity should be at least 70% of species defined in Table 5.

Success will be measured through conducting an inspection of the rehabilitation sites annually for two years post construction then biannually for a further 4 years for any new rehabilitation (to assess weeds, vehicular damage and resultant vegetation loss) and where required, undertake weeding, repair and infill seeding in May/June using provenance seed.

Table 5: Provenance species to be used in infill seeding

Species List	
<i>Acacia cyclops</i>	<i>Ficinia nodosa</i>
<i>Acacia lasiocarpa</i>	<i>Frankenia pauciflora</i>
<i>Acacia pulchella</i>	<i>Gompholobium tomentosum</i>
<i>Acacia saligna</i>	<i>Hakea lissocarpha</i>
<i>Acacia truncata</i>	<i>Hakea prostrata</i>
<i>Acanthocarpus preissii</i>	<i>Hakea trifurcata</i>
<i>Adriana quadripartita</i>	<i>Hardenbergia comptoniana</i>
<i>Allocasuarina humilis</i>	<i>Hemiandra pungens</i>
<i>Allocasuarina lehmanniana</i>	<i>Hibbertia racemosa</i>
<i>Alyogyne huegelii</i>	<i>Jacksonia furcellata</i>
<i>Atriplex cinerea</i>	<i>Jacksonia sternbergiana</i>
<i>Atriplex isatidea</i>	<i>Kennedia prostrata</i>
<i>Banksia attenuata</i>	<i>Lepidosperma gladiatum</i>
<i>Banksia grandis</i>	<i>Macrozamia fraseri/riedlei</i>
<i>Banksia menziesii</i>	<i>Melaleuca cardiophylla</i>
<i>Banksia sessilis</i>	<i>Melaleuca huegelii</i>
<i>Calothamnus quadrifidus</i>	<i>Melaleuca lanceolata</i>



Species List	
<i>Calothamnus sanguineus</i>	<i>Melaleuca systema</i>
<i>Carpobroun virescens</i>	<i>Nitraria billardierei</i>
<i>Clematis linearifolia</i>	<i>Olearia axillaris</i>
<i>Conostylis aculeata</i>	<i>Phyllanthus calycinus</i>
<i>Conostylis candicans</i>	<i>Rhagodia baccata</i>
<i>Conostylis sp.</i>	<i>Scaevola crassifolia</i>
<i>Eremaea pauciflora</i>	<i>Spinifex longifolius</i>
<i>Eremophila glabra</i>	<i>Spyridium globulosum</i>
<i>Eucalyptus utilis</i>	<i>Threlkeldia diffusa</i>
<i>Eucalyptus gomphocephala</i>	<i>Trymalium ledifolium</i>
<i>Eucalyptus todtiana</i>	<i>Xanthorrhoea preissii</i>
<i>Exocarpos sparteus</i>	



6. References

AECOM, 2017, Flora, Vegetation and Fauna Assessment - Spring 2017.

Ecoscape 2018, CW03472 Eglinton Groundwater Investigations Flora, Vegetation, Fauna and Dieback Survey: Site 2, Prepared for Water Corporation, February 2018.

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Strategen Environmental 2017, Flora and Vegetation Survey – Spring 2016. Prepared for Water Corporation of Western Australia, November 2017.

Stantec 2020a, Alkimos Seawater Desalination Plant: Flora and Vegetation Consolidation Report, Unpublished report for the Water Corporation of Western Australia.

Stantec 2020b Alkimos Seawater Desalination Plant: Terrestrial Fauna Consolidation Report, Unpublished report for the Water Corporation of Western Australia.



7. APPENDICES



Appendix A – Summary of actions, monitoring and reporting requirements

List of commitments and requirements (Audit Table)



#	Action	Monitoring	Timing	Adaptive management	Status	Evidence / Comment
V1	Prior to clearing all relevant permit and approvals shall be reviewed and any clearing requirements identified and communicated to Contractors and site boundaries demarcated.	Aerial imagery audit.	Annual	- Coordinate meeting with Operations and Projects Teams to educate on clearing requirements. - Investigate revegetation measures. - Implement additional measures on site to prevent access (fencing)		
V2	All site visitors and contractors advised of protections to vegetation outside cleared areas.	Confirm inclusion in Alkimos Water Precinct site induction	Annual	Coordinate meeting with Operations and Projects Teams to educate.		
V3	Ensure equipment and machinery is clean on entry.	Dieback survey (if baseline survey identifies potential).	5-year	If dieback is identified, develop dieback management plan in accordance with DBCA advice.		
V4	Maintain fences to prevent unauthorised access.	Site inspections	Annual	If continued access occurs, consider more significant fencing options.		
V5	Ensure equipment and machinery is clean on entry.	Weed survey	5-year	If weeds are identified, develop weed management plan for site.		
V6	Maintain fences to prevent unauthorised access.	Site inspections	Annual	If continued access occurs, consider more significant fencing options.		
V7	Ensure any water abstraction from Water Corporation activities does not impact vegetation.	Confirmation through aerial imagery audit that no vegetation impacted.	Annual	Investigate potential causes of vegetation decline and causes and investigate reduced abstraction.		
L1	Prior to disturbance, approvals shall be reviewed, and any disturbance requirements identified and communicated to Contractors and site boundaries demarcated.	Aerial imagery audit	Annual	- Coordinate meeting with Operations and Projects Teams to educate on landform requirements. - Investigate measures to stabilise landform. - Implement additional measures on site to prevent access (fencing)		
L2	Maintain fences to prevent unauthorised access.	Site inspections	Annual	If continued access occurs, consider more significant fencing options.		
F1	Prior to disturbance, approvals shall be reviewed, and any disturbance requirements identified and communicated to Contractors and site boundaries demarcated.	Aerial imagery audit.	Annual	- Coordinate meeting with Operations and Projects Teams to educate on vegetation (fauna habitat) requirements. - Investigate revegetation measures. - Implement additional measures on site to prevent access (fencing).		
F2	Maintain fences to prevent unauthorised access.	Site inspections	Annual	If continued access occurs, consider more significant fencing options.		
F3	Enforce speed limits on roads and tracks to prevent fauna interaction.	Site inspections	Annual	If continued impacts occur, consider reducing speed limits further.		
F4	Manage firebreaks to minimise uncontrolled burns and allow for fauna egress.	Site inspections	Annual	Investigate additional firebreak options to prevent fire impacts to fauna habitat.		
F5	Undertake pest management to minimise impacts to fauna	Fauna survey	Biennial	Investigate more regular pest control to isolate specific species.		

