ATTACHMENTS

ORDINARY COUNCIL MEETING

to be held at
the Council Chamber (Level 1), Civic Centre,
23 Dundebar Road, Wanneroo
on 10 September 2024 commencing at 6:00PM

PLANNING AND SUSTAINABILITY

PS04-09/24 Consideration of Precinct 15 - Central Mariginiup Local Structure Plan Following Advertising

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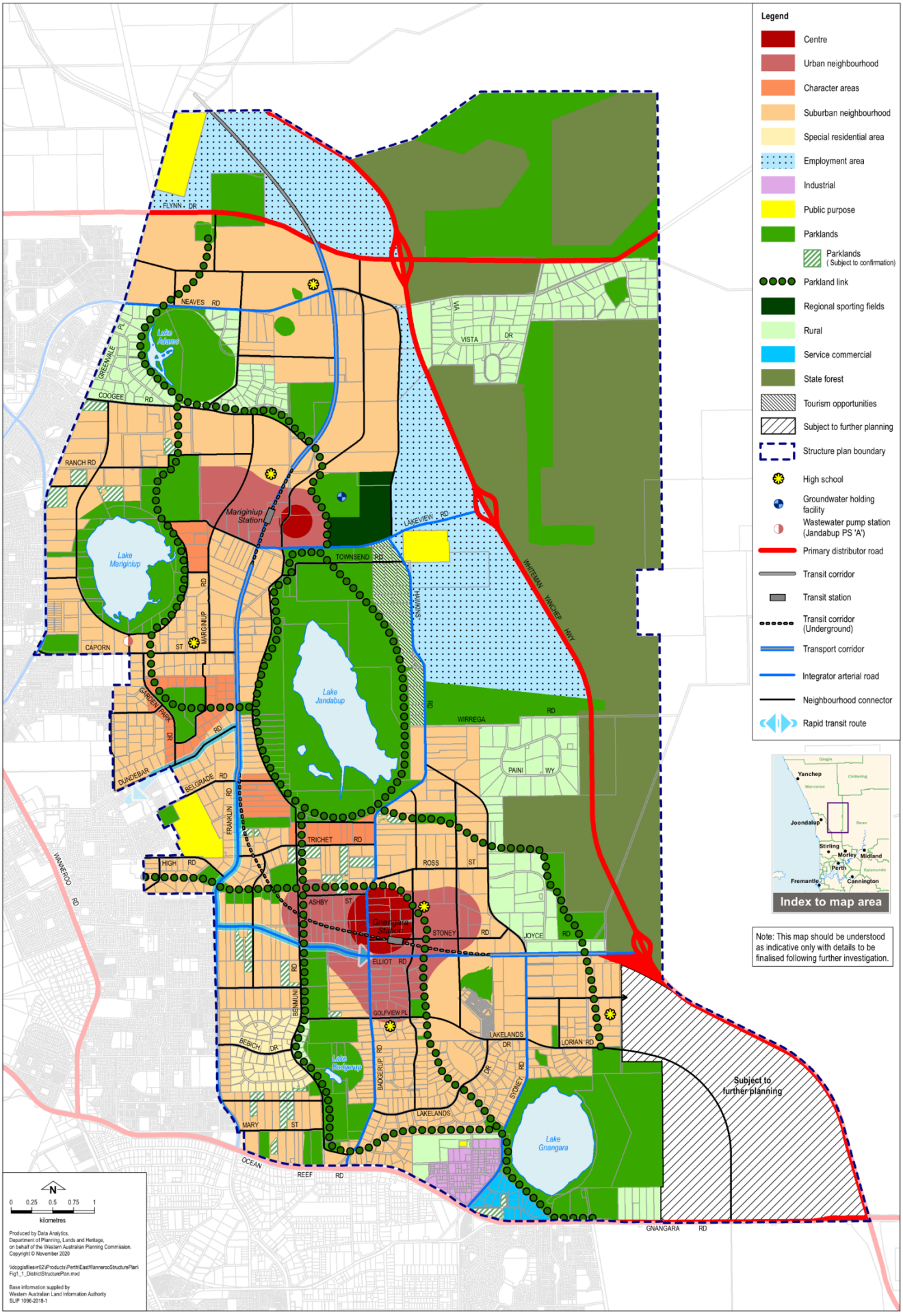
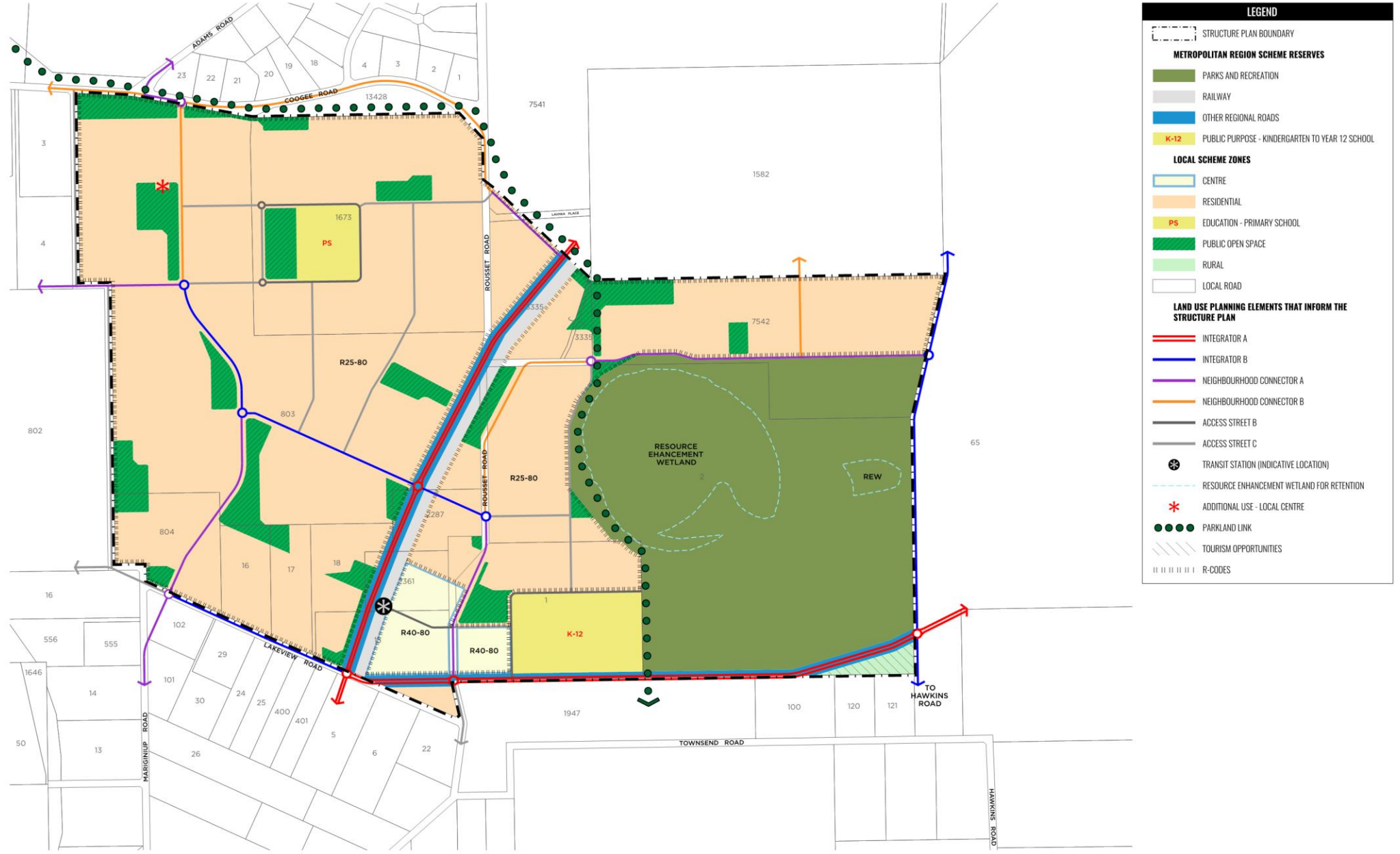
Figure 1.1 East Wanneroo District Structure Plan



East Wanneroo District Structure Plan



PRECINCT 15 - LOCAL STRUCTURE PLAN MAP

Plan 1 - Structure Plan Map

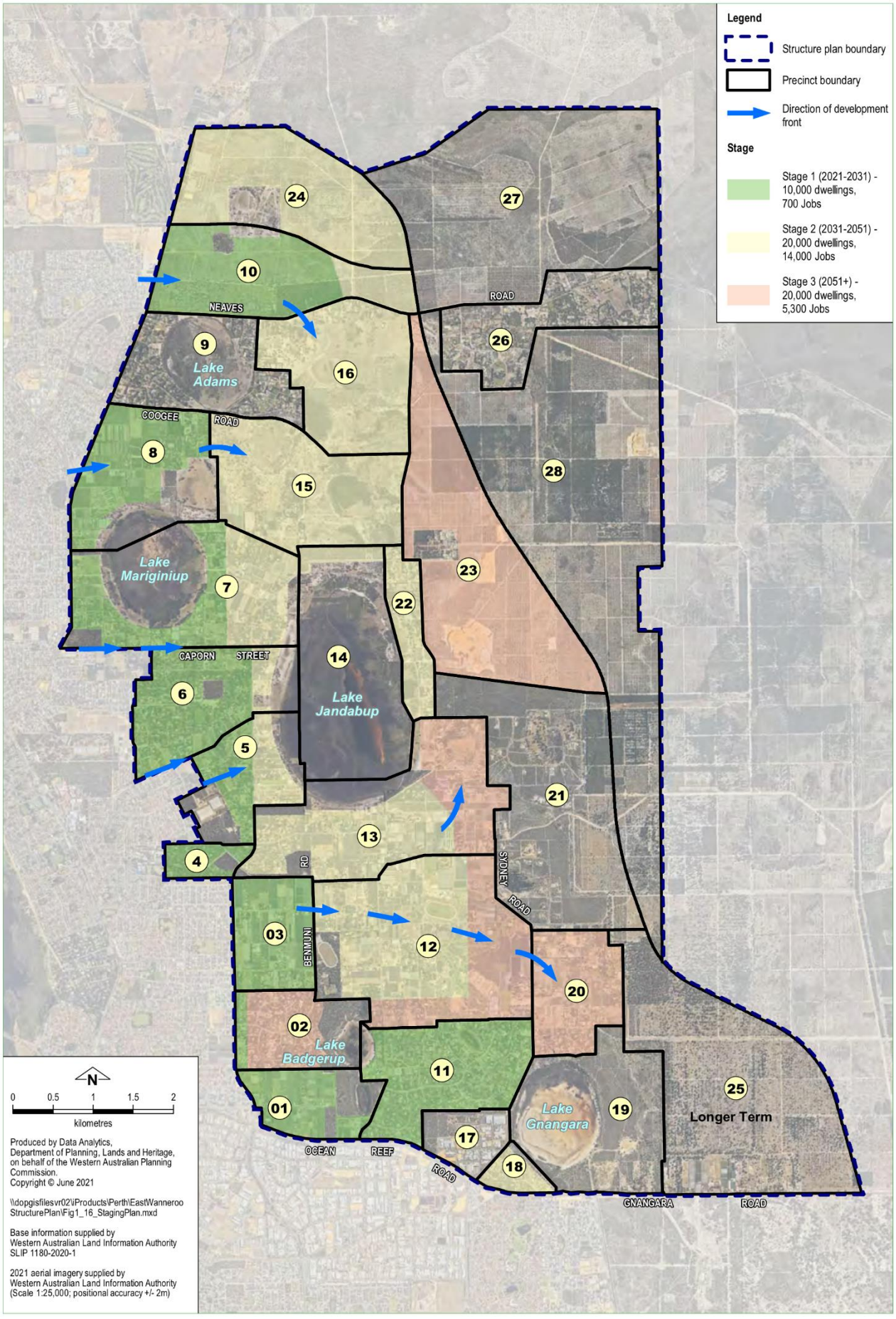


Figure 1.16: Staging Plan

Schedule of Modifications:

No.	Recommended Modification	Administration Comment
Preamble		
1	The Executive Summary and Table 1 being updated	The proposed modification has been recommended due to the range of recommended modifications proposed by Administration in response to the proposal's compliance with the Planning Framework.
2	The anticipated dwelling yield being recalculated based upon revised locational criteria.	The proposed modification has been recommended due to Administration's subsequent modifications to residential density code locational criteria.
Part 1 – Implementation		
3	Local Structure Plan to be reformatted in accordance with the WA Planning Manual: Guidance for Local Structure Plans.	The proposed modification has been recommended in accordance with the *Planning and Development (Local Planning Schemes) Regulations 2015* which requires that Structure Plans are prepared in a manner and form as approved by the WAPC. In August 2023 the WAPC released the WA Planning Manual: Guidance for Structure Plans which sets out the manner and form of Local Structure Plans (LSP) and Precinct Structure Plans (PSP) providing a consistent format in which these should be developed. As such, it is recommended that the LSP is required to be amended to be in accordance with this manner and form.
4	Staging to be discussed in more detail with reference to any higher order infrastructure to service the LSP area.	The proposed modification has been recommended given that the development of the LSP area will be constrained by the capacity of the utility network. This is discussed further in the body of the report.

No.	Recommended Modification	Administration Comment
5	The second dot point of 4.1 Land Use Permissibility being deleted: ~~Land identified as 'Additional Use – Local Centre' on the Structure Plan Map may also be used for the following additional uses as though they were 'D' uses in the zoning table of the City of Wanneroo's District Planning Scheme No.2:~~ • ~~Convenience Store;~~ • ~~Fast Food Outlet;~~ • ~~Lunch Bar;~~ • ~~Office;~~ • ~~Restaurant/Café; and~~ • ~~Shop.~~ ~~And such uses, in aggregate, shall not exceed 500m^2 of net lettable area.~~	The proposed modification has been recommended as 'Additional Uses' cannot be proposed by a Local Structure Plan. Therefore, Administration recommends that this section of the LSP is deleted. This is discussed further in the body of the report.
6	In the Table of Contents, Section 4.8 of Part One: Implementation is titled ~~4~~Residential.	This modification is to rectify a typographical error.
7	In Clause 4 adding a series of dot points to discuss the objectives of the 'Residential', 'Rural' and 'Commercial' zones. The Rural zone specifically should provide objectives that facilitate the delivery of rural tourism uses on site.	The proposed modification has been recommended so that the LSP provides guidance regarding the objectives of 'Residential, 'Rural' and 'Commercial' zoned land within the LSP area. In accordance with the EWDSP, the land located in the south easternmost corner is identified as a tourism opportunity and as such, the objectives should facilitate this development intent.
8	The first dot point of Clause 4.2 Environmental & Heritage Features being amended as follows: Resource Enhancement Wetlands UFI 14261, UFI 14254, UFI 15443 and UFI 14244 are located within the proposed Parks and Recreation Reserve. These wetlands with a ~~30~~50m buffer, are to be retained and protected. The development of Regional Playing Fields is to occur outside of the ~~30~~50m buffer of these wetlands.	The proposed modification has been recommended in accordance with Administration's assessment of the proposal and the comments provided by Department of Water and Environmental Regulation (DWER) and Department of Biodiversity, Conservation and Attractions (DBCA) which do not agree with that a 30m buffer is sufficient. As such, the standard buffer size of 50m is required in

No.	Recommended Modification	Administration Comment
		accordance with the EPA Guidance Statement 33 Environmental Guidance for Planning and Development (2008).
9	The second dot point of Clause 4.2 Environmental & Heritage Feature being amended as follows: A Parkland Link is to be provided in the general location shown on the Structure Plan Map. This will comprise well defined linkages through open spaces and landscape boulevards using tree canopies, landscaping, nature-based education and well designed pedestrian and cyclist infrastructure.	The proposed modification has been recommended to reference the Structure Plan Map for clarity. In addition, to ensure the LSP responds to the development intent for Parkland Links as stipulated in the East Wanneroo District Structure Plan (EWDSP), the requirement for 'nature-based education' is recommended to be included.
10	Clause 4.5 being modified as follows: "Prior to subdivision and development of the Neighbourhood Centre, a Local Development Plan is to be prepared for the Neighbourhood Centre (land shown as ~~Centre Zone~~ Commercial Zone on Plan 1 – Local Structure Plan Map) and endorsed by the ~~WAPC~~City of Wanneroo.	The proposed modification has been recommended given Administration's recommendation to remove the 'Centre' zone and designate this land as 'Commercial' zone. Additionally, despite the EWDSP requiring the preparation of a PSP, Administration in conversations with the Applicant and the Department of Planning, Lands and Heritage (DPLH) recommends that a Local Development Plan is utilised to guide the built form envisaged for the Neighbourhood Centre. Further, Local Development Plans are endorsed by the Local Government and accordingly the body endorsing the document is recommended to be modified to the City of Wanneroo.
11	Clause 4.4 being renamed to 'Transit Station Infrastructure' and the section being modified to remove the terms 'railway' and 'railway reserve' and being replaced with the terms 'transit corridor'.	The proposed modification has been recommended given that based upon the latest advice from the Public Transport Authority (PTA) and DPLH the transit corridor will not be accommodating rail based transit infrastructure.

No.	Recommended Modification	Administration Comment
12	A provision added to Clause 4.5 to state: Unless otherwise agreed to by the City of Wanneroo, any development application incorporating buildings or the public realm within the Neighbourhood Centre must be referred to the City's Design Review Panel for consideration.	The proposed modification has been recommended given that development of a Neighbourhood Centre would satisfy the threshold for referral to the City's Design Review Panel in accordance with section 1.1 of the City's Local Planning Policy 4.23: Design Review Panel (LPP 4.23).
13	The addition of the following to section 4.5 to state: Prior to the submission of a development application for the neighbourhood centre, the following is required to be undertaken: • Adoption of a Car Parking Strategy; • Approval of Public Realm Design Guidelines; and • A Local Development Plan being approved.	The proposed modification has been recommended as in accordance with the EWDSP which requires a parking strategy and public realm design guidelines to be developed. The public realm design guidelines will establish the local sense of place of the Neighbourhood Centre and adequately address the Local Sense of Place Station (LSoPS) required by Local Planning Policy 5.3: East Wanneroo (LPP 5.3). As discussed in the body of the report, the EWDSP requires a PSP to be prepared for the neighbourhood centre. Administration is of the opinion that a LDP will sufficiently address this requirement particularly in combination with the public realm design guidelines to be established. Therefore, this requirement is considered appropriate.
14	In Clause 4.8.2 Density, modification of dot point 2 as follows: "A Residential Code Plan is to be submitted at the time of subdivision/amalgamation and shall be consistent with the Structure Plan, and the Residential Density ranges identified on Plan 1 and the locational Criteria contained in Clause 4.8.3".	This modification has been recommended given that assigning a R-Code to a lot which has been created that is capable of accommodating residential development is consistent with orderly and proper planning.

<table>
<tr><th>No.</th><th>Recommended Modification</th><th>Administration Comment</th></tr>
<tr><td>15</td><td>In Clause 4.8.2 Density, modification of dot point 6 as follows:

Residential Density Code Plans are not required if the WAPC considers that the subdivision is for one or more of the following:

• ~~The amalgamation of lots;~~
• Consolidation of land for ‘superlot’ purposes to facilitate land assembly for future development;
• Purpose of facilitating the provision of access, services or infrastructure; or
• Land by virtue of its zoning or reservation under the Structure Plan cannot be developed for residential purposes.</td><td>The modification has been recommended as a result of modification 14.</td></tr>
<tr><td>16</td><td>Clause 4.8.3 Locational Criteria being amended in accordance with the below:

A base code of R25 applies to all land capable of accommodating residential uses within the entire Local Structure Plan Area.

<table><tr><th>Density Code</th><th>Locational Criteria</th></tr><tr><td>R30 - R40</td><td>• Lots that have frontage or located adjacent to a public open space; or
• Lots fronting a regional open space</td></tr><tr><td>R50 – R60</td><td>• Lots located within 400m of a Neighbourhood Centre; or
• Lots located within 100m of a high frequency public transport stop/station.</td></tr><tr><td>R80</td><td>• Lots located in or within 100m of a Neighbourhood Centre; or
• Lots located within 100m of a high frequency public transport stop/station</td></tr></table></td><td>The modification has been recommended given that the locational criteria established as part of the LSP result in significant portions of the LSP area being capable of being developed at a residential density code of R60 or higher. The revised locational criteria will provide more development certainty and ensure that higher dwelling densities are concentrated in areas with greater residential amenity and convenience such as near POS and high frequency transit stations. This is discussed further in the body of the report.</td></tr>
</table>

<table>
<tr><th>No.</th><th>Recommended Modification</th><th>Administration Comment</th></tr>
<tr><td>17</td><td>Clause 4.9 Local Development Plans being amended to also include:

○ Lots located within the Neighbourhood centre to address: built form orientation and active frontage locations, setbacks, view corridors, pedestrian connections, vehicular access locations, vehicle parking, glazing, awning locations, service locations, building height, interface with high frequency transit corridor.
○ Lots located opposite from the Resource Enhancement Wetland addressing: primary orientation, fencing, bin collection locations and garage locations.
○ Laneway lots addressing: Primary orientation, fencing, bin collection locations and garage locations.</td><td>The modification has been recommended to provide further clarity as to LDP's are required to address. The Neighbourhood Centre LDP will address various built form aspects of the proposal and holistically consider pedestrian and vehicle based movement.

Additionally, where lots are proposed opposite a Resource Enhancement Wetland (REW) or a laneway; dwelling orientation, garage location, bin collection locations and street surveillance will be required to be addressed. This will ensure that development is designed in a manner which provides an adequate interface to the street and outlook over the open spaces.</td></tr>
<tr><td>18</td><td>Clause 4.11 to be amended to:

The following technical reports/documents are to be prepared and submitted at the time of lodgement of a subdivision application/development application (where applicable):

• ~~Bushfire Management Plan (BAL Assessment)~~
• ~~R-Code Plan~~
• ~~Acoustic Assessment~~
• ~~Servicing Strategy~~

<table><tr><th>Additional Information/Purpose</th><th>Approval Stage</th><th>Responsible Agency</th></tr><tr><td>Bushfire Management Plan/ BAL Assessment</td><td>Upon Lodgement of Subdivision/Development Application</td><td>Department of Fire and Emergency Services</td></tr></table></td><td>The modification has been recommended in accordance with the recommendations of the various technical reports provided by the applicant. Further the formatting is in accordance with the WA Planning Manual: Guidance for Structure Plans.

Acoustic Assessment to be renamed to Integrator Arterial Noise Management Response consistent with the EWDSP. The servicing strategy is recommended to be removed as all servicing requirements should be addressed as a result of satisfying the requirements to lift the urban deferment. Further information regarding this is in the body of the report. In addition to the other</td></tr>
</table>

<table>
<tr><th>No.</th><th>Recommended Modification</th><th>Administration Comment</th></tr>
<tr>
<td></td>
<td>
<table>
<tr><td>Residential Density Code Plan</td><td>Upon Lodgement of Subdivision Application</td><td>WAPC</td></tr>
<tr><td>Integrator Arterial Noise Management Response</td><td>Upon Lodgement of Subdivision/ Development Application</td><td>City of Wanneroo</td></tr>
<tr><td>Vegetation Fauna Management Plan and Tree Retention Plan</td><td>Upon Lodgement of Subdivision/ Development Application</td><td>City of Wanneroo</td></tr>
<tr><td>Aboriginal Cultural Heritage Management Plan prepared in consultation with the local Knowledge Holders</td><td>Upon Lodgement of Subdivision Application/Development Application</td><td>Department of Planning, Lands and Heritage</td></tr>
<tr><td>Wetland Management Plan (incl. but not limited to a midge management plan)</td><td>Upon Lodgement of Subdivision/ Development Application</td><td>City of Wanneroo/ Department of Water and Environmental Regulation</td></tr>
<tr><td>Transport Impact Statement/Assessment</td><td>Upon Lodgement of Subdivision Application</td><td>City of Wanneroo</td></tr>
</table>
Studies to be required as a condition of subdivision/development approval:
<table>
<tr><th>Condition of Subdivision Approval</th><th>Responsible Agency</th></tr>
<tr><td>Urban Water Management Plan;</td><td>City of Wanneroo</td></tr>
<tr><td>Integrator Arterial Landscape Management Response</td><td>City of Wanneroo/ Main Roads Western Australia/ Department of Planning Lands and Heritage (as applicable)</td></tr>
<tr><td>Notification on Title - Spray Drift, Noise (heavy machinery use), Vibration, Dust, Midges, Bushfire Prone Area</td><td>City of Wanneroo/WAPC (as applicable)</td></tr>
</table>
</td>
<td>matters identified by the Applicant, the following additional items are required:

A Vegetation and Fauna Management Plan is required to ensure that vegetation and fauna is adequately managed within the precinct. This should include a tree retention plan demonstrating that vegetation worthy of retention has been incorporated into POS and road reserves.

Aboriginal Cultural Heritage Management Plan is a recommendation of the Aboriginal Cultural Heritage Assessment Report.

Wetland Management Plan is a required due to Wetlands being retained within the Precinct.

Transport Impact Assessment/ Transport Impact Statement is required to demonstrate that the surrounding rural road network can accommodate the envisaged volumes of traffic resulting from the proposed development.

<u>Studies to be required as a condition of subdivision/development approval:</u>

In relation to studies to be imposed as a condition of approval, notifications on title are recommended due to the continued operation of some rural land uses and proximity to wetlands etc.</td>
</tr>
</table>

No.	Recommended Modification	Administration Comment
	<table><tr><td>Acid Sulphate Soil & Dewatering Management Plan;</td><td>City of Wanneroo</td></tr><tr><td>Access Restriction to Other Regional Roads</td><td>City of Wanneroo/Department of Planning, Lands and Heritage</td></tr><tr><td>Soil Contamination investigation</td><td>Department of Water and Environmental Regulation</td></tr><tr><td>Construction Area Management Plan (CAMP)</td><td>Department of Planning, Lands and Heritage, In consultation with the City of Wanneroo.</td></tr><tr><td>Wetland Rehabilitation Plan</td><td>City of Wanneroo</td></tr></table>	The Integrator Arterial Landscape Management Response is a requirement of the EWDSP. An Acid Sulphate Soil (ASS) and Dewatering Management Plan is required to mitigate the impact of ASS on development. Access Restrictions are required to higher order roads as required. A Construction Area Management Plan is required to manage the development of land in proximity to Bush Forever reserves. A Wetland Rehabilitation Plan will be required to be submitted to ensure that the environmental value of retained wetlands on site is enhanced.
19	A new section being created titled ‘Reserves’ discussing the arrangements for other public reserves (eg. Foreshore, Conservation, Regional Open Space, School Sites, Utilities etc)	This modification is recommended noting that a range of reserves will be required to be created as part of the subdivision and development of the LSP area. Further, the modification aligns with the formatting contained within the WAPC’s WA Planning Manual: Guidance for Structure Plans.
20	A new section being created to discuss the range of community facilities to be provided including: ○ District Community Centre; ○ District Indoor Recreation Centre; ○ Regional Playing Field; ○ District Playing Field; and ○ Neighbourhood Playing Field and Pavilion.	This modification is recommended given that in accordance with the City of Wanneroo’s Community Facilities Plan, five community facilities are required to be provided within Precinct 15.

No.	Recommended Modification	Administration Comment
21	A new section being incorporated within Part 1 titled 'Heritage'.	This modification is recommended to discuss the mechanisms required to be implemented to protect heritage features both within and adjoining the Precinct.
22	An additional section being added providing information regarding the proposed road reserves to be incorporated within the LSP area.	As discussed in the body of the report, this modification is recommended to align the proposed road reserves with Local Planning Policy 5.3: East Wanneroo (LPP 5.3). This requirement will enable road reserves to be delivered in a consistent manner across the EWDSP area.
23	A new section being created titled Protection and management of environmental features, which includes the provision: where possible trees and native vegetation are retained within road reserves and public open spaces, subject to detailed design.	This modification is recommended to ensure that where possible trees and native vegetation are retained within road reserves and public open spaces within the LSP area.
24	Specific provisions being incorporated to demonstrate how the LSP will address the City's 'Place Framework'.	This modification is recommended to ensure that the LSP incorporates key aspects which address the District Sense of Place Statement (DSoPS) included within LPP 5.3 and create a distinct Local Sense of Place for Precinct 15.
25	The LSP Map, Part 2 and the Technical Documentation amended to address Administrations recommended modifications accordingly.	This modification is recommended noting the range of other recommended modifications by Administration which will impact both Part 2 and the associated technical documentation.
LSP Map		
26	The map being modified to incorporate Coogee Road, Mariginiup Road, Lakeview Road, Roussett Road and the eastern boundary road to the extent where is abuts other zoned land.	This modification is recommended so that the perimeter roads surrounding the precinct are included and subject to being upgraded to an urban standard as a result of the development of the LSP area.

No.	Recommended Modification	Administration Comment
27	All community facilities being identified on Plan 1.	This modification is recommended to accord with a previous modification to Part 1 of the LSP.
28	All necessary utilities required to service the development being identified on the LSP Map.	This modification is recommended in response to the advice from Water Corporation which stipulates that two waste water pumping stations (WWPS) will be required to service the LSP area. WWPS are required to be identified on the LSP Map and should be located outside of areas of public open space (POS).
29	Odour buffers to Waste Water Pumping Stations (WWPS) are to be detailed on the LSP Map	This modification is recommended in accordance with the advice provided from Water Corporation which requires that a 30 metre radius odour buffer is established surrounding all WWPS. Further, buffers are required to be represented on the Structure Plan Map in accordance with the WA Planning Manual: Guidance for Structure Plans.
30	The 'ridgeline 'being identified for retention being illustrated on the LSP Map.	This modification is recommended in order to retain this environmental feature. The 'ridgeline' is also referenced within the LSoPS as a crucial environmental asset that is reflective of the local sense of place of the precinct. The identification of this natural landscape feature on the LSP Map is consistent with the requirements detailed within the WA Planning: Guidance for Structure Plans.
31	The 50m wetland buffer surrounding the retained wetland being illustrated on the on the LSP Map	This modification is recommended in accordance with the advice from DWER and DBCA as discussed in the body of the report. The requirement for buffers to be represented

No.	Recommended Modification	Administration Comment
		on an LSP Map is detailed within the WA Planning Manual: Guidance for Structure Plans.
32	The primary school being modified to be a minimum of 3.75 hectares in area or an alternative size as agreed to by the Department of Education.	This modification is recommended in accordance with the advice provided by the Department of Education which requires that 2,500m^2 is provided for Childcare Facilities.
33	The High School being amended to be a minimum of 10 hectares in area or an alternative size as agreed by the Department of Education and the District Open Space being co-located with the High School.	The modification is recommended in accordance with the requirements of Operational Policy 2.4: Planning for School Sites (OP 2.4) which requires that high schools are a minimum of 10 ha in area. The co-location of the District Open Space with the High School is consistent with the envisaged development outcome under LPP 4.3: Public Open Space.
34	An additional 4.25 hectare primary school being provided within the LSP area or an alternative size as agreed to by the Department of Education.	This modification is recommended to address the advice from the DoE which is not supportive of the combined primary and secondary school site (K – 12). In accordance with OP 2.4, primary schools require a minimum of 4 hectares of land area plus an additional 2,500m^2 for Childcare Facilities and as such a 4.25 hectare site is recommended to be provided.
35	LSP Map being updated to indicate the trees to be retained within the LSP area.	This modification is recommended so that trees to be retained within the LSP area are depicted on the LSP Map in accordance with the WA Planning Manual: Guidance for Structure Plans.
36	All land designated as ‘Centre’ being designated ‘Commercial’ with a density code of R80.	This modification is recommended as a result of Administration’s recommended modifications relating to points 7 and 10

No.	Recommended Modification	Administration Comment
		above which remove the reference to the 'Centre' zone and replaces this zone with 'Commercial' in Part 1. In addition the density code range of R40 – R80 has been narrowed to R80 encourage the development of a built form consistent with that of the EWDSP.
37	The LSP Map being amended based upon the refined locational criteria within Table 2.	This modification is recommended as a consequence of modification16.
38	The 'Tourism Opportunities' category being removed from the LSP Map.	This modification is recommended given that the intent for 'Rural' land to be used for tourism purposes should be discussed in the objectives of the 'Rural' zone.
39	That a road reserve is located around the entire periphery of the REW and Regional Open Space.	This modification is recommended to enable sufficient vehicle movement adjoining the REW and Regional Open Space. Additionally, this modification will result in greater physical separation between dwellings and the bushfire risk posed by the REW and Regional Open Space.
40	Maps and Figures within the technical appendices and Part 2 being amended to reflect the LSP Map.	This modification is recommended as a consequential amendment from Administration's other recommended modifications pertaining to the increased Wetland Buffer, the modified educational facilities, and the modified LSP boundaries.
Part 2 – Explanatory		
41	POS 7 being reconfigured to have a uniform shape and Figure 20 being updated accordingly.	This modification is recommended given the POS is considered to be so irregular in shape that is of no community benefit. This is discussed further in the body of the report.
42	POS 9 being increased in area to a minimum of 4.5 hectares.	This modification is recommended given that POS 9 is required to accommodate a full size

No.	Recommended Modification	Administration Comment
		oval and a neighbourhood playing field and local pavilion/community centre in accordance with the endorsed Community Facilities Plan.
43	POS 18 being removed from the POS schedule and Figure 20 being updated.	This modification is recommended given the POS is considered to be too small to be of any community benefit and functions as a Public Access Way. This is discussed further in the body of the report.
44	Figure 25 of the LSP Map being updated to incorporate a shared path which connects to the parkland link.	This modification is recommended given that in accordance with the EWDSP the parkland link is to provide for pedestrian and cyclist movements. A shared path will provide connectivity both within the precinct and to the wider EWDSP area.
45	Figure 25 of the LSP Map being updated to incorporate a shared path between the Regional Playing Field and the transit station.	This modification is recommended to strengthen the pedestrian and cyclist connectivity between these two landmarks.
46	Clause 4.15.6 being updated to discuss potential telecommunications tower locations on site.	This modification is recommended given that in accordance with LPP 2.5: Telecommunications Infrastructure, structure planning proposals are required to give some consideration to demand for telecommunication services. As such, further commentary is required to discuss where opportunities for telecommunications infrastructure exist within the LSP area.
47	Table 4 being updated to assign a plan reference number to the last opportunity in the built form and renumbering of the remaining items. Additionally, Figures 16 and 17 being updated accordingly.	This medication is recommended as a result of a minor numbering error within this table.
48	Reference and discuss the North West Corridor Water Supply Strategy	This modification is recommended given that the LSP does not discuss the proposal with reference to the North West Corridor Water Supply Strategy.

No.	Recommended Modification	Administration Comment
49	The relationship between the Parkland Link and the mapped Ecological Linkage is to be discussed.	This modification is recommended given that the LSP does not discuss the relationship between the Ecological Linkage and the Parkland Link.
50	The High School being modified to incorporate perimeter roads on all boundaries.	This modification is recommended to maximise physical separation from Lakeview Road and ensure adequate separation from the Regional Playing Fields so as to maximise vehicular access and minimise bushfire risk.
51	All intersections along Franklin Road being modified on the plan to be signalised.	This modification is recommended so as to ensure consistency between the proposed road designs for Franklin Road as contained within the District Development Contributions Plan (DDCP).
52	Perimeter roads established along all boundaries of the High School site to permit sufficient vehicular access to the Regional Open Space.	This modification is recommended so as to maximise vehicular access to the high school site and adequate access to the Regional Playing Field.
Part 3 – Technical Documentation		
General		
53	All technical appendices being modified to consider changes to the boundaries of the LSP.	This modification is recommended given that the modification of LSP boundaries will have implications for some of the technical reports to date including but not limited to the LWMS, POS Masterplan and Bushfire Management Plan.
Appendix 1 – Environmental Assessment Report		
54	Section 3.1.2.1 of the Environmental Assessment Report being updated to further discuss the proposed LSPs impact upon terrestrial fauna.	This modification is recommended in accordance with the advice provided by DWER.
55	Update to discuss the quantification of impacts to environmental values.	This modification is recommended in accordance with the advice provided by DWER.

No.	Recommended Modification	Administration Comment
56	Updated to consider land use risk of contamination.	This modification is recommended in accordance with the advice provided by DWER.
57	Section 2.3.2 Site Specific Investigations in the second paragraph, refers to Figure 2 of Appendix B. This figure does not exist and should reference Appendix C.	This modification is recommended to resolve an inconsistency in the Figures referred to in this section.
58	Section 2.3.2 Site Specific Investigations in the third paragraph, refers to an assessment report in Appendix B which is incorrectly referenced. This report is not included in this Appendix.	This modification is recommended to reference the correct assessment report in the document.
59	Update to discuss how the Bush Forever sites adjacent to the precinct will be managed.	This modification is recommended so that the report is amended to discuss how construction and earthworks will be managed so as to prevent impact on adjoining Bush Forever sites.
60	Section 2.4.1 Terrestrial Fauna Site Specific surveys and investigations makes reference to Appendix C Assessment report. Appendix C relates to a Flora Assessment.	This modification is recommended so that the section makes reference to the correct Appendix.
Appendix 2 – Bushfire Management Plan		
61	The BMP being updated to ensure that the 'post development' contours account for vegetation retention in all POS.	This modification is recommended so that the Bushfire Management Plan is updated to address the concerns raised by DFES.
62	The BMP being updated to adequately consider the retention of vegetation within POS to ensure adequate tree canopy can be retained; and	This modification is recommended so that the Bushfire Management Plan is updated to address the concerns raised by DWER.
63	The report being updated to consider how rehabilitation of Lake Adams and Lake Mariginiup will impact the post development BAL contour map.	This modification is recommended so that the rehabilitation of Lake Adams and Lake Mariginiup is adequately factored into the resultant bushfire hazard levels within the LSP area.
64	Administration recommends within its schedule of modifications that photographic evidence is provided to support the vegetation classification within Plot 2.	This modification is recommended to substantiate that the vegetation classification of Plot 2 is Forest (Class A) and is downslope as contended by the applicant.

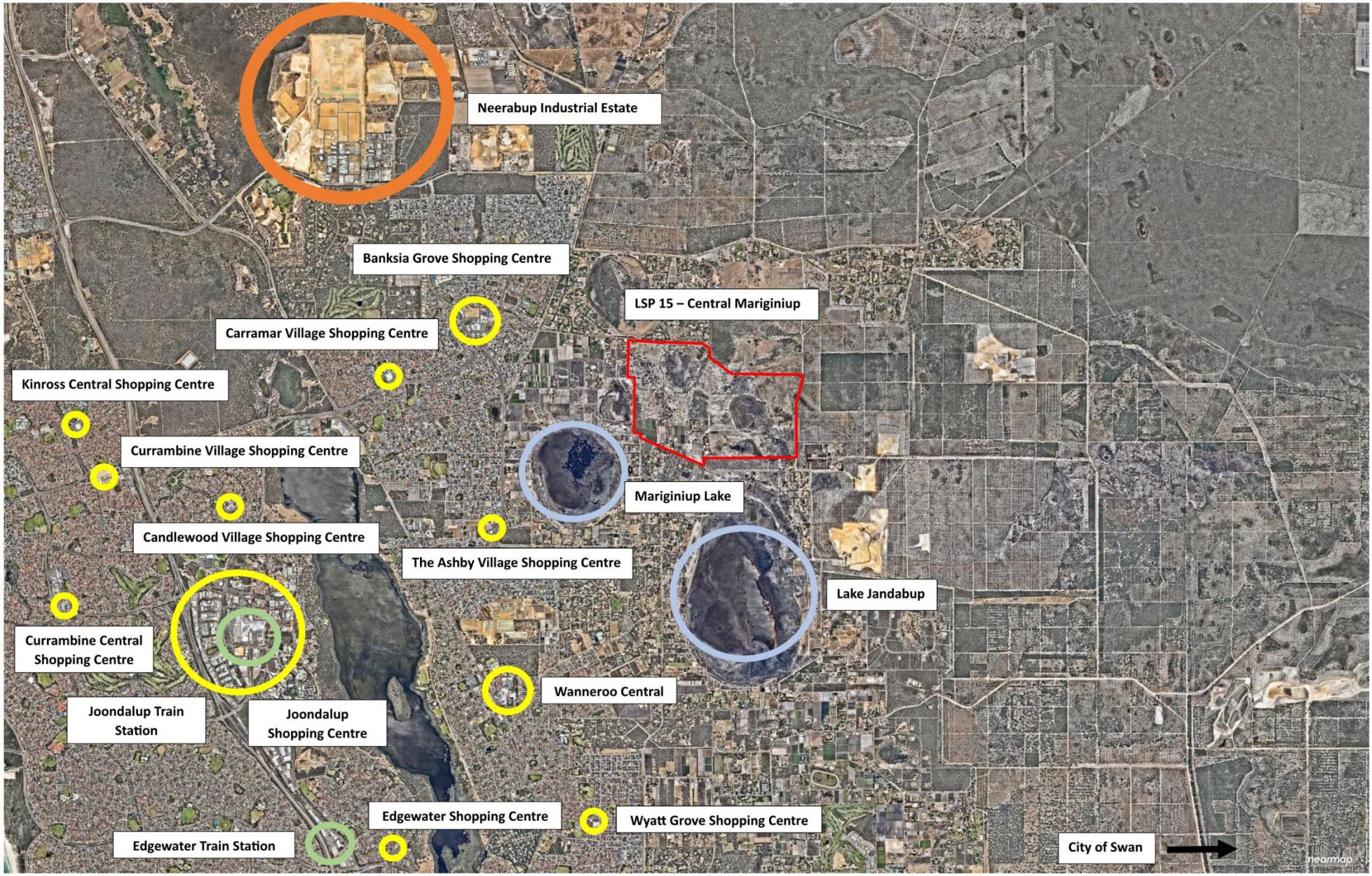
No.	Recommended Modification	Administration Comment
65	Table 3 of the BMP is amended to state the highest BAL impact for each vegetation plot on development areas and the BAL Contour Map is to be updated to differentiate between residential and public open spaces.	This modification is recommended to detail the worst case BAL rating. Figure 3 is to be amended to distinguish between residential zoned land and POS. This modification will also clarify the intended extent of vegetation to be retained within the proposed POS.
66	The report being amended to consider the retention of significant bushland identified in Figure 16 of EAR.	This modification is recommended to ensure that some preservation of the natural environment is achieved within the LSP area.
Appendix 3 – Aboriginal Heritage Assessment Report		
-	No modifications proposed by Administration.	N/A
Appendix 4 – Acoustic Assessment		
-	No modifications proposed by Administration.	N/A
Appendix 5 – Economic Development and Employment Report		
67	The report being amended to discuss the revised forecasted dwelling yield anticipated as a result of revised locational criteria.	The modification is recommended in response to Administration's recommended modification to the anticipated dwelling yield within the LSP area.
Appendix 6 – Public Open Space Master Plan		
68	The POS Masterplan being amended to demonstrate that vegetation retention, pedestrian and cyclist connectivity and nature based education is achieved within the Parkland Link	This modification is recommended to ensure that the parkland link delivers on its envisaged purpose as prescribed within the EWDSP.
69	The POS Masterplan, Preliminary Earthworks plan and the Post Development Surface Drainage Plan as contained within the Local Water Management Strategy being amended to be consistent with one another.	This modification is recommended to ensure consistency between the Local Water Management Strategy (LWMS), Preliminary Earthworks Plan and the POS Schedule.
Appendix 7 - Transport Impact Assessment		
70	TIA being modified to identify that all intersections along Franklin Road are signalised.	This modification is recommended to align with the proposed intersection designs of Franklin Road as contained within the District Development Contributions Plan.
71	Figure 10 in the TIA to be amended to allow for Dual Use Paths/Shared paths on roads adjacent to school sites	This modification is recommended in accordance with the advice from the

No.	Recommended Modification	Administration Comment
		Department of Education to facilitate improved pedestrian connectivity between school sites and their surrounds.
72	The trip distribution being revised to consider a wider area, including key distributor roads. The traffic generated from the structure plan to access employment and other commercial opportunities will likely impact distributor roads such as Ocean Reef Road, Wanneroo Road, Neaves Road as there is limited road network surrounding the structure plan area.	These modifications are recommended in accordance with the advice received from Main Roads Western Australia.
73	The revised trip distribution is to consider future roads such as the Whiteman-Yanchep highway. The land for this highway is currently reserved under Planning Control Area 173. This corridor will be less than 800m from the Structure Plan area.	This modifications are recommended in accordance with the advice received from Main Roads Western Australia.
74	The TIA being amended to discuss speed management.	These modifications are recommended in accordance with the advice received from Traffic Services.
75	All proposed integrator roads and Neighbourhood Connector Roads to provide adequate pedestrian crossing points.	These modifications are recommended in accordance with the requirements of the WAPC Transport Impact Assessment Guidelines Volume 3.
76	TIA being updated to indicate what specific pedestrian crossing provisions will be required to facilitate a walkable catchment. updated to confirm that safe pedestrian crossings will be provided to facilitate access across major roads.	These modifications are recommended to demonstrate that the LSP achieves pedestrian crossings that will be safe.
77	The TIA being updated to discuss the left in/left out arrangement at the intersection adjoining K-12 School as detailed in Figure 12. Noting that the K – 12 site is not supported by the DoE.	This modifications are recommended to provide clarity regarding the proposed access arrangements to the school site.
78	The north eastern on road cycle lane which being extended to connect to the other on road cycle lane abutting the neighbourhood centre.	This modification is recommended to improve cyclist connectivity within the Precinct. The extension of the on road cycle lane will provide a continuous on road cycle network along the eastern side of the precinct.
Appendix 8 - Local Water Management Strategy		

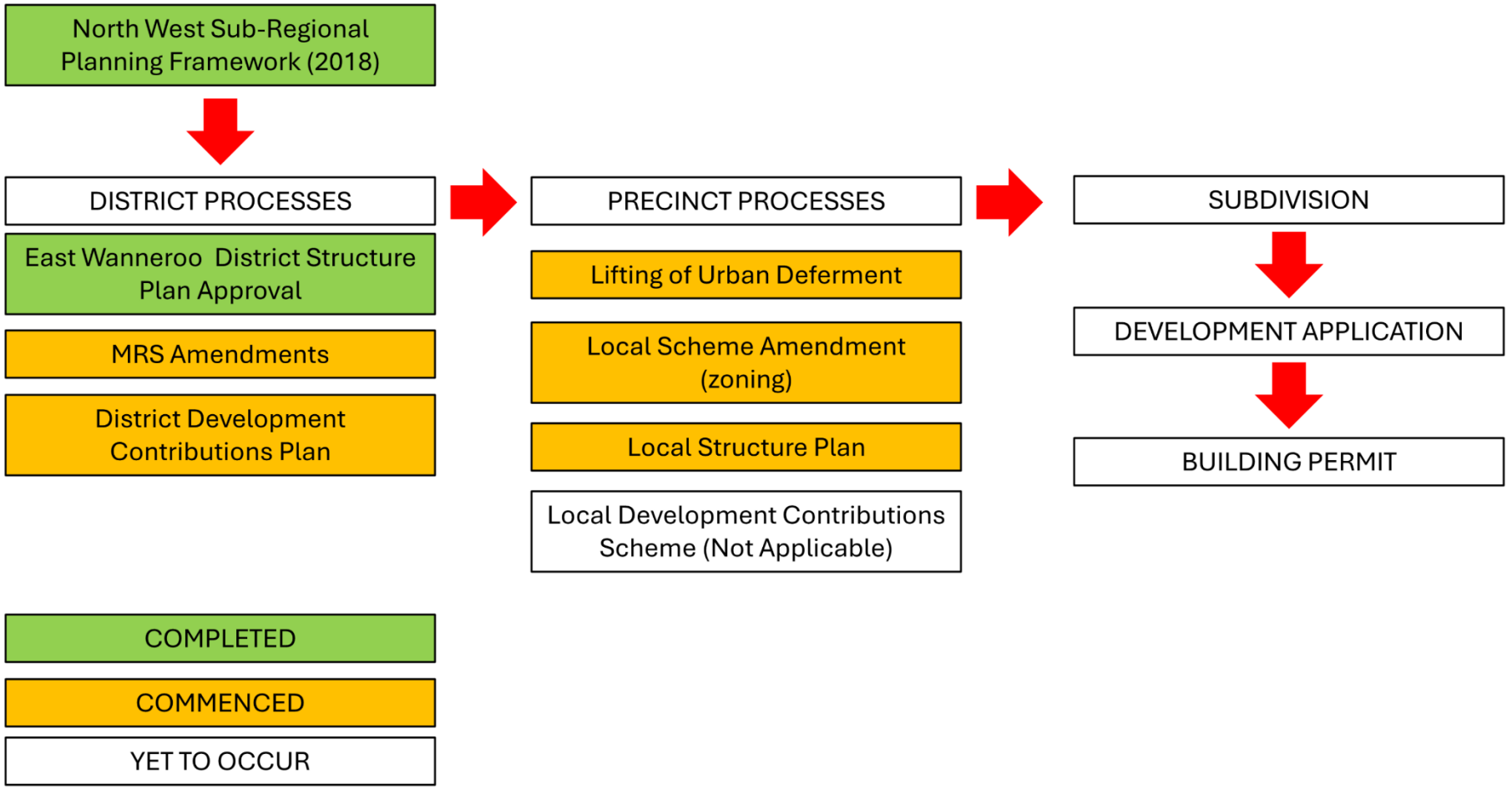
No.	Recommended Modification	Administration Comment
79	LWMS is to be updated to address soil contamination issues.	This modification is recommended in accordance with the advice provided by DWER.
80	LWMS is to be updated to discuss how groundwater nutrient levels will be managed within the Precinct.	This modification is recommended in accordance with the advice provided by DWER.
81	The LWMS being amended to demonstrate that Precinct 15 can adequately manage flooding, surface water and groundwater within the Precinct in accordance with the District Ground Water Management Scheme (DGWMS).	This modification is recommended in response to Administration and DWER's concern regarding water management within precinct 15. The LWMS must be updated to demonstrate that water is adequately managed in accordance with the approved DGWMS (once known).
82	Drainage Basin 16 being removed from the LWMS and the drainage calculations revised to demonstrate that water is adequately managed within the LSP area.	This modification is recommended given that the Regional Open Space is subject to detailed design and is not being delivered by the Proponent and as such, use of Basin 16 to service the adjoining residential area to the north of the basin is not considered appropriate. Further as discussed in the body of the report, in accordance with LPP 4.3: Open Space, Regional Open Spaces should be free of encumbrances so as to maximise their viability. As such, the LWMS is to be revised to demonstrate how water will be adequately managed within the LSP area.
83	The LWMS being amended to establish how water licences will be sourced and transferred to the City at subdivision to sufficiently irrigate the future POS.	This modification is recommended given the significant shortfall in water licences currently capable of being sourced from landowners within Precinct 15. The modification will provide certainty that adequate water licences will be obtained and transferred prior to the ceding of POS to the City for management.

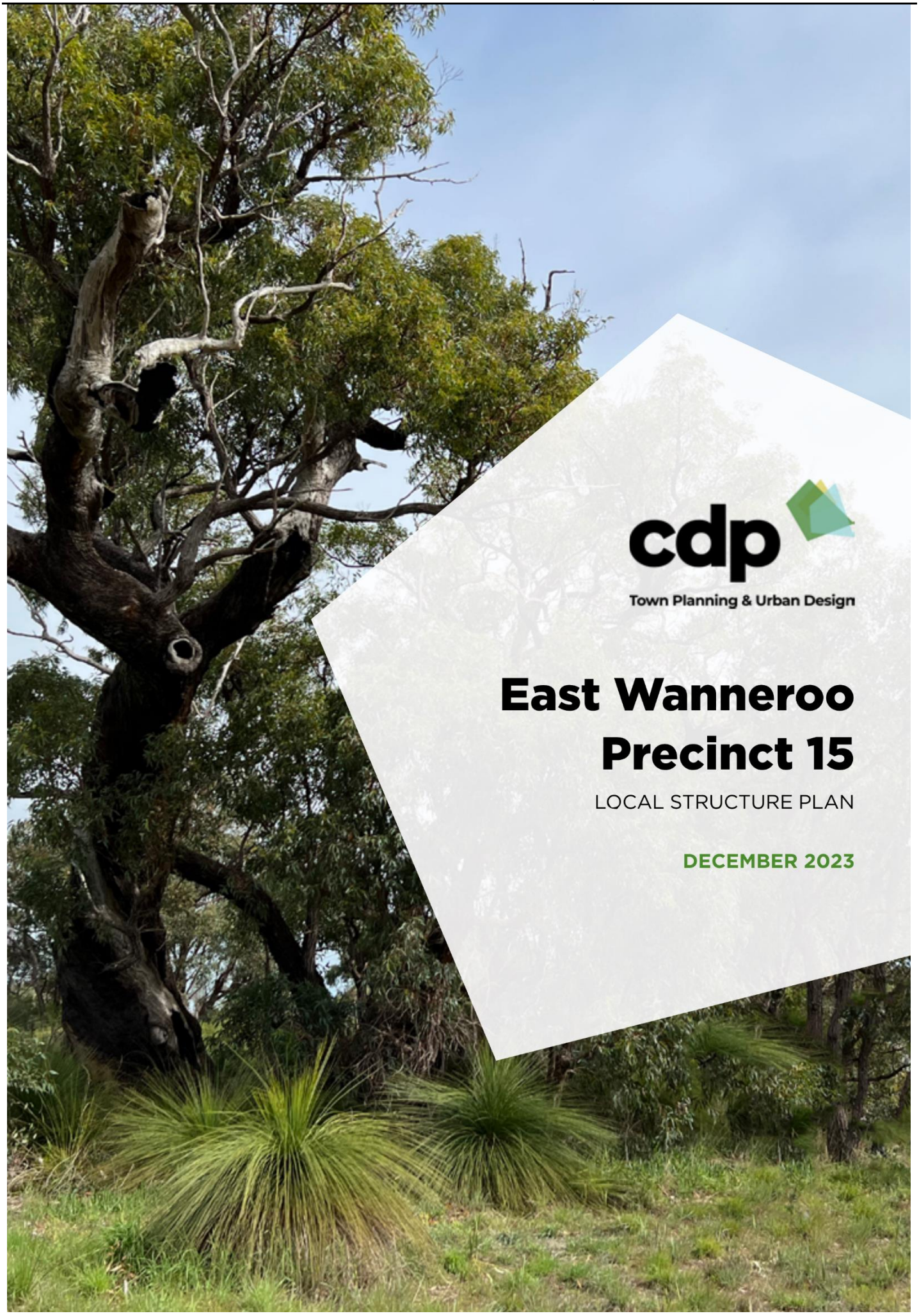
No.	Recommended Modification	Administration Comment
Appendix 9 – Engineering Report		
84	The report being updated to discuss what interim servicing requirements may be required instance where capacity in existing utility infrastructure is insufficient.	This modification is recommended given that in accordance with the engineering report approximately 1,300 lots are capable of being serviced by waste water infrastructure which is contrary to the advice provided by the Water Corporation. As such, interim servicing arrangements may be required.
85	The report discussing what infrastructure may be needed to prefunded by the developer to service the development	This modification is recommended given that the engineering report details that interim servicing measures may be required to service the LSP area in the absence of other high order infrastructure being delivered.

LOCATION PLAN



EAST WANNEROO PROCESS CHART

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Town Planning & Urban Design
East Wanneroo
Precinct 15
LOCAL STRUCTURE PLAN
DECEMBER 2023

East Wanneroo Precinct 15.

LOCAL STRUCTURE PLAN

DECEMBER 2023

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Cossill & Webley Consulting Engineers

Pracsys

Horizon Heritage

Herring Storer Acoustics

Document Status.

Version	Comment	Prepared	Reviewed	Issued
1.		C.H	K.B	19 Dec 2023

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Endorsement.

IT IS CERTIFIED THAT THIS STRUCTURE PLAN WAS APPROVED BY RESOLUTION OF THE WESTERN AUSTRALIAN PLANNING COMMISSION ON:

_____ Date

Signed on and behalf of the Western Australian Planning Commission:

_____

an officer of the Commission duly authorised by the Commission pursuant to section 16 of the Planning and Development Act 2005 for that purpose, in the presence of:

_____ Witness

_____ Date

_____ Date of Expiry

Table of Amendments.

Amendment No.	Summary of Amendment	Amendment Type	Date Approved by WAPC

Table of Density Plans.

Density Plan No.	Area of Density Plan Application	Date Endorsed by WAPC

Executive Summary.

The *East Wanneroo Precinct 15 Local Structure Plan* (Structure Plan) has been prepared to guide the subdivision and development of approximately 310 ha of land in Mariginiup, within the City of Wanneroo municipality. The expected dwelling yield is between 3,200 – 3,500 dwellings, developed across a range of densities (R25 – R80) and located in response to community infrastructure and amenity to provide for housing and lifestyle diversity. The Structure Plan provides for the development of key community infrastructure including regional playing fields, regional open space, a railway station and transit corridor, a neighbourhood centre, a high school and two primary schools.

The Structure Plan has been prepared on behalf of Stockland Pty Ltd by the following specialist consultant team:

- CDP Town Planning and Urban Design – Urban design, Town planning
- Pentium – Hydrology
- Emerge – Environment, Landscaping and Bushfire
- Cossill & Webley – Engineering
- Horizon Heritage – Heritage analysis
- Pracys – Economic and employment analysis
- Transcore – Traffic and transport analysis

Purpose

This Structure Plan provides an overarching planning framework to guide and facilitate the development of the Structure Plan area for urban purposes and has been prepared in accordance with the East Wanneroo District Structure Plan and the provisions of Schedule 2 Part 4 of the Planning and Development (Local Planning Scheme) Regulations 2015.

The plan provides for an integrated and coordinated approach to the delivery of urban land uses and infrastructure pursuant to the over-arching East Wanneroo District Structure Plan. The land uses and connectivity networks proposed by the Precinct 15 Structure Plan will create a new, vibrant residential community in East Wanneroo.

Design Approach

The design approach has been a rigorous multidisciplinary process with continuous reflection upon the purpose of the Structure Plan and improving project outcomes. Key design principles and considerations which have informed the design approach include:

- Retention of the western ridgeline, eastern wetland and a number of significant trees onsite to convey a strong sense of place.
- A strong Parkland Link and pedestrian network connecting the retained ridgeline, neighbourhood centre, train station, schools and regional open space.
- Capitalising on opportunities to co-locate community and educational land uses within a 'Community Hub', being Transit Station, Neighbourhood Centre, K-12 School, Regional Playing Fields and Regional Open Space.
- Neighbourhood Centre to become the focal point of commercial and community activity for the structure plan area and surrounding residents, providing opportunities for medium to higher-density residential living to deliver housing affordability and diversity.
- Creation of a pedestrian focused main street within the neighbourhood centre creating a strong spine between the transit station and the regional sporting complex to the east.

Table 1 - Land Use Summary

Item	Data	LSP Reference
Total Structure Plan Area	310.537 ha	Table 2
Area of each land use proposed: • Residential • Neighbourhood Centre • High School • Primary School • Transport corridor • Rural (Tourism Opportunities)	 185 ha 6.5 ha 8.0 ha 3.5 ha 8.87 ha 1.15 ha	Part 2
Estimated Lot Yield	3,200 – 3,500	4.2
Estimated Residential Density	15 – 25 dwellings/gross urban zone	4.2
Estimated Population	9,000 – 10,000	4.2
Number of High Schools	1	4.4
Number of Primary Schools	2	4.4
Estimated Commercial Floor Space (for activity centres if appropriate)	6,000m^2 GLA	4.3
Employment Self Sufficiency Targets	60%	4.12
Estimated number and area of Public Open Spaces: • Regional Open Space • District Open Space • Neighbourhood / Local Parks	 1 @ 74.5 ha 0 @ 0 ha 22 parks @ 22.5 ha	4.5 and 4.6
Estimated number and area of natural area and biodiversity assets	2 x REW core and buffer @ 29.73 ha	4.5

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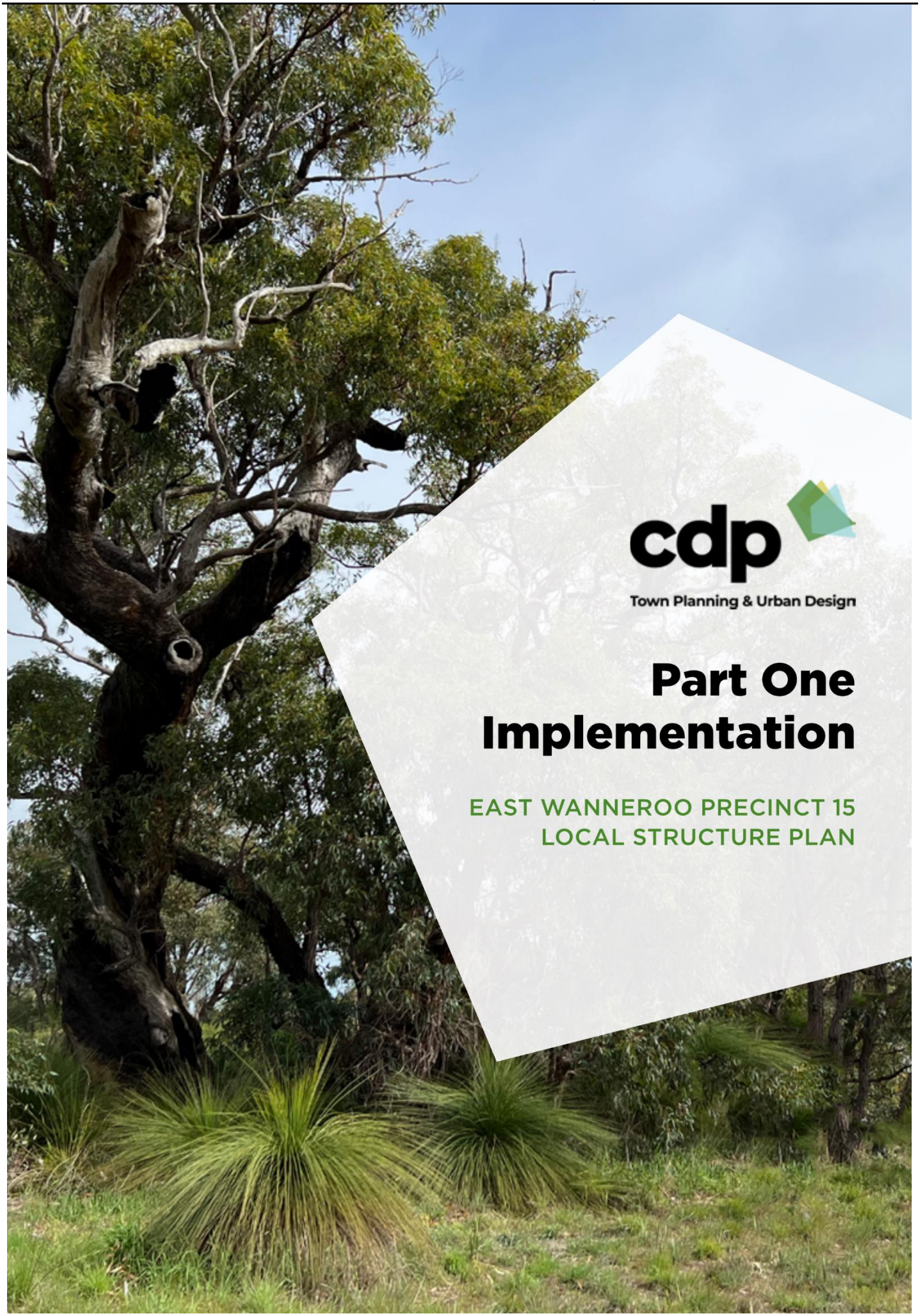

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Town Planning & Urban Design

Part One Implementation

EAST WANNEROO PRECINCT 15 LOCAL STRUCTURE PLAN

1. STRUCTURE PLAN AREA

This Structure Plan applies to the land contained within the inner edge of the line denoting the Structure Plan boundary on **Plan 1 - Structure Plan Map**. The Structure Plan is identified as the East Wanneroo Precinct 15 Local Structure Plan.

2. OPERATION

The date the Structure Plan comes into effect is the date the Structure Plan is approved by the Western Australian Planning Commission (WAPC). The structure plan is to be given due regard when considering applications for subdivision and development approval.

3. STAGING

Development staging will follow an orderly sequence supported by the extension of essential servicing infrastructure or constructed road access. The first stages are intended to be developed as an extension of existing residential development to the northwest of the site.

4. SUBDIVISION & DEVELOPMENT REQUIREMENTS

4.1 LAND USE PERMISSIBILITY

- Land use permissibility within the Structure Plan area is to be in accordance with the corresponding zone or reserve under City of Wanneroo's District Planning Scheme No.2 (DPS2), or as otherwise outlined in this Structure Plan.

- Land identified as 'Additional Use – Local Centre' on the Structure Plan Map may also be used for the following additional uses as though they were 'D' uses in the zoning table of the City of Wanneroo's District Planning Scheme No.2:
  - Convenience Store;
  - Fast Food Outlet;
  - Lunch bar;
  - Office;
  - Restaurant/Café; and
  - Shop.

and such uses, in aggregate, shall not exceed 500m^2 of net lettable area.

4.2 ENVIRONMENTAL & HERITAGE FEATURES

- Resource Enhancement Wetlands UFI 14261, UFI 14254, UFI 15443 and UFI 14244 are located within the proposed Parks & Recreation Reserve. These wetlands, with a 30m buffer, are to be retained and protected. The development of Regional Playing Fields is to occur outside of the 30m buffer of these wetlands.

- A Parkland Link is to be provided in the general location shown on the Structure Plan. This will comprise well defined linkages through open spaces and landscape boulevards using tree canopies, landscaping and well designed pedestrian and cyclist infrastructure.

4.3 HAZARDS & SEPARATION DISTANCES

- Residential lots identified within a Bushfire Prone Area as designated under the Department of Fire and Emergency Services Mapping of Bushfire Prone Areas will require a Bushfire Attack Level assessment to be undertaken at subdivision stage.

- Subdivision and development on land identified as containing a medium to high risk of Acid Sulphate Soils under the Department of Water and Environmental Regulation ASS mapping portal will require an Acid Sulphate Soil Management Plan.

- At subdivision stage an Acoustic Assessment & Noise Management Plan is to be prepared and implemented in accordance with State Planning Policy 5.4 Road and Rail Transport Noise and Freight Considerations in Land Use Planning for land identified as affected by rail or road noise.

- Subdivision and development on land within 500m of existing market gardens, orchards and plant or tree nurseries etc will require management strategies to be prepared and implemented as appropriate to address any impacts of these land uses on residential land uses.

- Subdivision and development on land within 500m of an operational sand or limestone extractive industry or within 500m of a site mapped by State Planning Policy 2.4 as an 'extraction site' will require management strategies to be prepared and implemented as appropriate to address any impacts of these land uses on residential land uses.

4.4 RAILWAY INFRASTRUCTURE

- Prior to a subdivision application for land within 500m of the proposed Railways Reserve, the applicant is to liaise with the Public Transport Authority (PTA). The funding and construction of the railway is not the responsibility of the developer. Subdivision design is to ensure optimum lot orientation and road positioning to accommodate the proposed railway.

- Prior to a subdivision application for land that incorporates a proposed Railway Station, the applicant is to liaise with the Public Transport Authority (PTA) on all relevant matters including the provision of Park & Ride facilities. The funding and construction of the railway station and Park & Ride facility is not the responsibility of the developer. Subdivision design is to accommodate the proposed railway station and a Park & Ride facility if required.

4.5 NEIGHBOURHOOD CENTRE

- Prior to subdivision or development of the Neighbourhood Centre, a Precinct Structure Plan is to be prepared for the Neighbourhood Centre (land shown in the Centre Zone on **Plan 1 – Structure Plan Map**) and endorsed by the WAPC.

- The estimated floorspace (retail and commercial) required at the Neighbourhood Centre is 6,000m^2 pursuant to the East Wanneroo District Structure Plan. In accordance with the requirements of *State Planning Policy 4.2 Activity Centres*, any proposal to increase this indicative activity centre floorspace must be supported by a Net Benefit Test that demonstrates that the additional floorspace has a net benefit to the community.

4.6 PARKS & RECREATION RESERVE

- Subdivision applications will be required to set aside the Parks & Recreation Reserve generally in accordance with Plan 1, with an indicative area of 74.5 hectares. The Resource Enhancement Wetlands (UFI 14261, 14254 and 15443, 14244) are to be wholly contained, including a 30m buffer, within the Parks & Recreation Reserve.

- The Parks & Recreation Reserve is to be set aside for acquisition by the State and will be subsequently reserved under the Metropolitan Region Scheme and developed as Regional Open Space and Regional Playing Fields. The funding of the construction of the Regional Open Space and Playing Fields facility is not the responsibility of the developer.

- Subdivision design is to ensure optimum lot orientation and road positioning to accommodate the proposed Regional Open Space and Regional Playing Fields.

4.7 PUBLIC OPEN SPACE

- The provision of a minimum of 10% POS being provided across the Structure Plan area, generally in accordance with that shown in **Plan 1**.

- An updated Public Open Space schedule is to be provided at the time of subdivision for determination by the WAPC upon advice of the City of Wanneroo.

- Variations to the location, size and function of POS areas can be considered as part of subdivision applications and in response to detailed design processes.

4.8 RESIDENTIAL

4.8.1 *DENSITY AND DWELLING TARGETS*

- The Structure Plan area is to target the provision of between 3,200 and 3,500 dwelling units.
- Subdivision and development within the Structure Plan area will target 15 dwellings/gross urban hectare. Subdivision and development will target 20 - 25 dwellings/gross urban hectares in areas within 200m of the neighbourhood centre and railway station.

4.8.2 *DENSITY*

- Plan 1 defines the residential density ranges that apply to specific areas within the Structure Plan. Lot specific residential densities, will be subsequently assigned in accordance with a Residential Code Plan approved by the WAPC at subdivision stage.
- A Residential Code Plan is to be submitted at the time of subdivision to the WAPC and shall be consistent with the Structure Plan, and the Residential Density Ranges identified on Plan 1 and the locational criteria contained in Clause 4.8.3.
- The Residential Code Plan is to include a summary of the proposed dwelling yield of the subdivision.
- Approval of the Residential Code Plan shall be undertaken at the time of determination of the subdivision application by the WAPC. The approved Residential Code Plan shall then form part of the Structure Plan and be used for the determination of future development applications.
- Variations to the Residential Code Plan will require further approval of the WAPC.
- Residential Code Plans are not required if the WAPC considers that the subdivision is for one or more of the following:
  - The amalgamation of lots;
  - Consolidation of land for 'superlot' purposes to facilitate land assembly for future development
  - Purpose of facilitating the provision of access, services or infrastructure; or
  - Land which by virtue of its zoning or reservation under the Structure Plan cannot be developed for residential purposes.

4.8.3 *LOCATIONAL CRITERIA*

A base density code of R25 applies to all residential lots.

A R25 – R80 density range applies to the Structure Plan area. Any areas of Residential density above R25 should generally be located based on the following locational criteria:

Table 2 - Residential Density Criteria

Density Code	General Location Principles
R30	• No locational criteria applies
R40	• Lots that front POS or have a clear view of POS • Lots abutting integrators and neighbourhood connectors

Density Code	General Location Principles
R60	• Lots fronting or directly abutting POS • Lots fronting Regional Open Space • Lots within 800m of neighbourhood centre • Lots within 800m of future high frequency public transport
R80	• Lots fronting or directly abutting POS • Lots fronting Regional Open Space • Lots within 400m of neighbourhood centre • Lots within 400m of future high frequency public transport

4.9 LOCAL DEVELOPMENT PLANS

Local Development Plans are to be prepared for the Structure Plan areas pursuant to the WAPC's Local Development Plan Framework and Schedule 2, 'Deemed Provisions for Local Planning Schemes' of the Planning and Development (Local Planning Schemes) Regulations 2015.

Local Development Plans are to be required as a condition of subdivision approval, for the following:

- Lots that directly abut Regional and Public Open Space to address: built form orientation, visually permeable fencing and window openings from habitable rooms to overlook POS and provide for passive surveillance.
- Lots which are affected by rail and road noise, to address quiet house design in accordance with the recommendations of the Acoustic Assessment prepared at subdivision.

4.10 OTHER REQUIREMENTS

4.10.1 NOTIFICATIONS ON TITLE

In respect of applications for the subdivision of land the City of Wanneroo shall recommend to the WAPC that a condition be imposed as part of a subdivision approval for a notification to be placed on the Certificate of Title to advise that lots are, or may in the future, be affected by transport noise. This notification should be applied in accordance with the Acoustic Assessment submitted with the subdivision application.

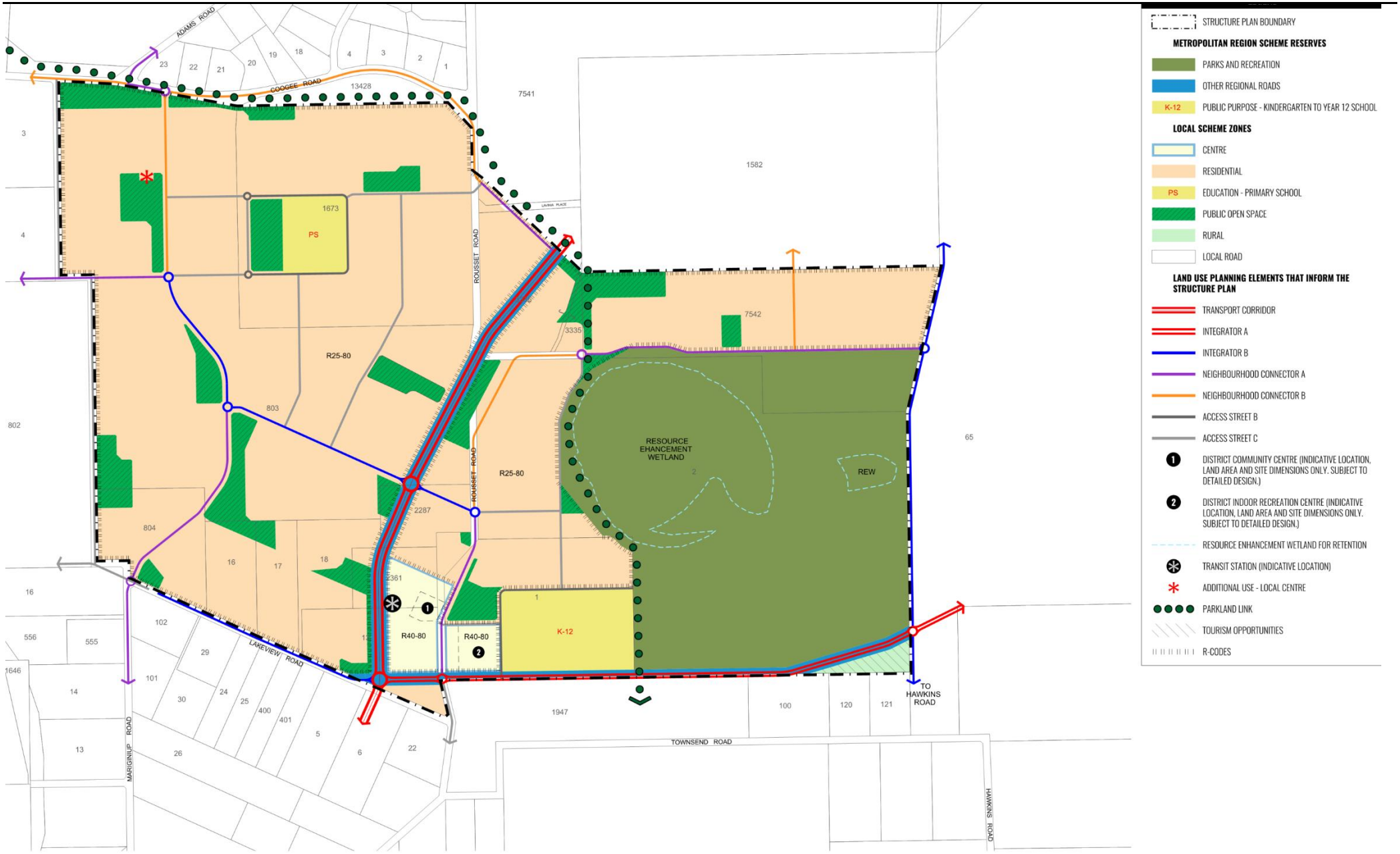
4.10.2 DEVELOPER CONTRIBUTIONS

The Structure Plan area will be included within a District Development Contribution Area (DCA) via a future Local Planning Scheme Amendment and will be required to make contributions under a District Developer Contribution Scheme (DDCP) to district level infrastructure. The DDCP will be guided by the following documents the East Wanneroo District Structure Plan and the City of Wanneroo Community Facilities Plan.

4.11 ADDITIONAL INFORMATION

The following technical reports / documents to be prepared and submitted at the time of lodgement of a subdivision application (where applicable):

- Bushfire Management Plan (BAL Assessment)
- R Code Plan
- Acoustic Assessment
- Servicing Strategy



RECINCT 15 STRUCTURE PLAN

arious Lots, MARIGINIUP

NORTH

Scale: 1:10 000 @ A3

0 100 200 300m

PLAN: STOMA-2-001 REVISION: F

DATE: 06/08/2024 DRAWN: JP

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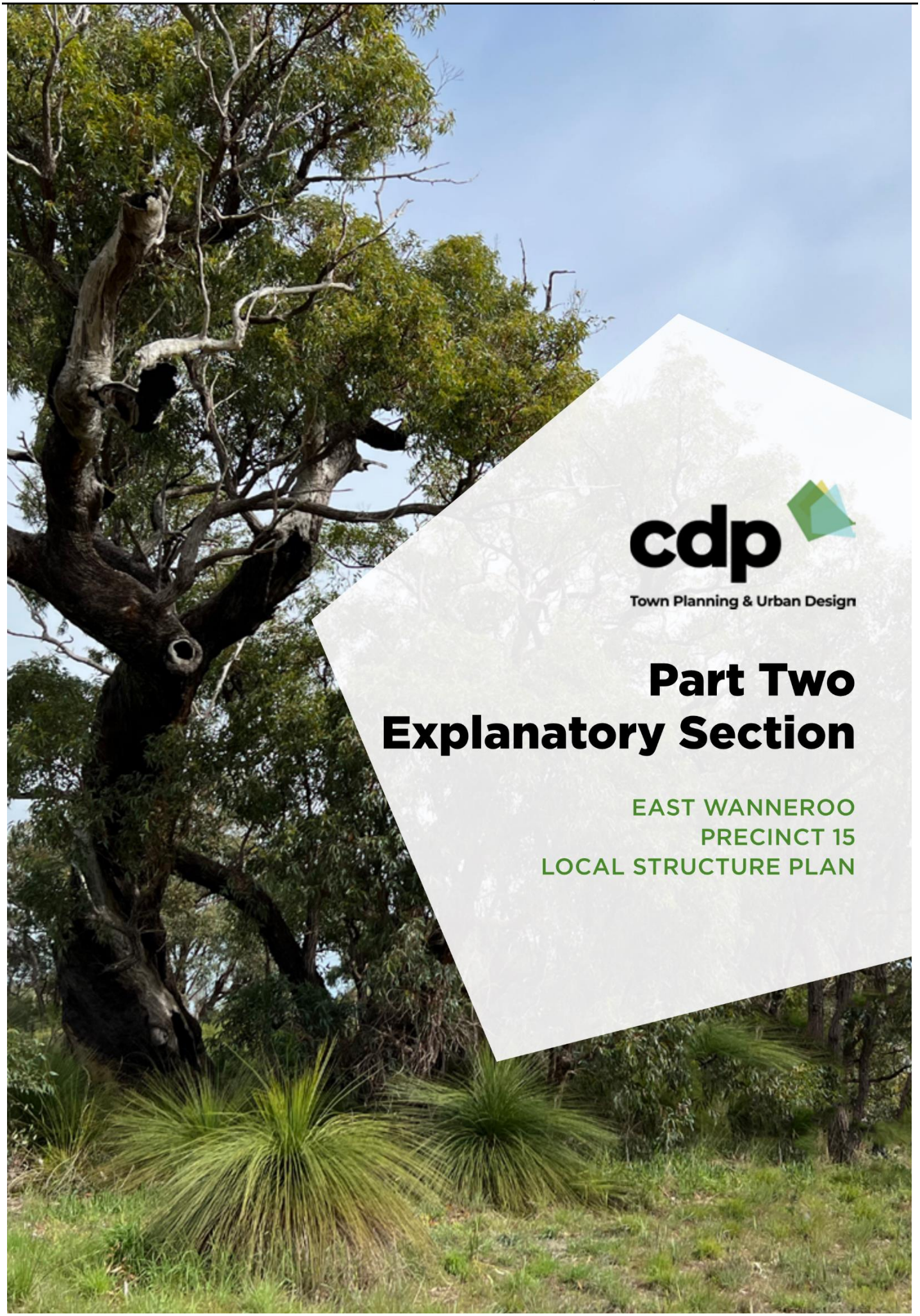


cdp
Town Planning & Urban Design

Part Two Explanatory Section

EAST WANNEROO PRECINCT 15 LOCAL STRUCTURE PLAN

1. PLANNING BACKGROUND

1.1 INTRODUCTION & PURPOSE

The purpose of the East Wanneroo Precinct 15 Local Structure Plan is to provide for the orderly and proper subdivision and development of the Structure Plan area for 'Urban' purposes. The information contained in this section provides justification and support for the comprehensive and co-ordinated design response provided for the Structure Plan.

This report, consistent with the Western Australian Planning Commission's Structure Plan Framework (2015), comprises a Part 1 section outlining implementation requirements and the plan, with Part 2 outlining the background, policy context and rationale for Part 1. Technical Appendices have been prepared to inform and support Part 1 and 2.

The Technical Appendices are as follows:

- Environmental Assessment Report
- Transport Impact Assessment
- Engineering & Servicing Report (including Basic Raw Materials Assessment)
- Transportation Acoustic Assessment
- Bush Fire Management Plan
- Local Water Management Strategy
- Landscape Master Plan
- Aboriginal Heritage Assessment Report
- Economic Development and Employment Report

The LSP has been prepared in the context of the East Wanneroo District Structure Plan (EWDSP), which covers the site and surrounding area. Its objective is to facilitate coordinated development of the site in conjunction with the surrounding area, taking into consideration the specific attributes of the site, the intentions of the landowner and the various policy requirements impacting its design and delivery as an urban development site.

1.2 LAND DESCRIPTION

1.2.1 LOCATION

The Structure Plan area is located within the municipality of the City of Wanneroo and in the locality of Mariginiup (refer **Figure 1 – Location Plan**), generally bound by Coogee Road to the North and Lakeview Street to the south. The Structure Plan area is situated approximately 45km north of Perth CBD and 6km north east of the Joondalup Regional Activity Centre.

1.2.2 AREA AND LAND USE

The Structure Plan area encompasses 310.537ha of land that has historically been cleared and used for grazing and semi-rural activities. The site has been subject to extensive historical disturbance, primarily associated with clearing of most vegetation across the site. Some remnant vegetation remains today, along with areas that have naturally regenerated over time. Overall however, the site is primarily vacant land with there being limited semi-rural and market garden activities and homesteads within the southern portion.

Refer **Figure 2 – Orthophoto**.

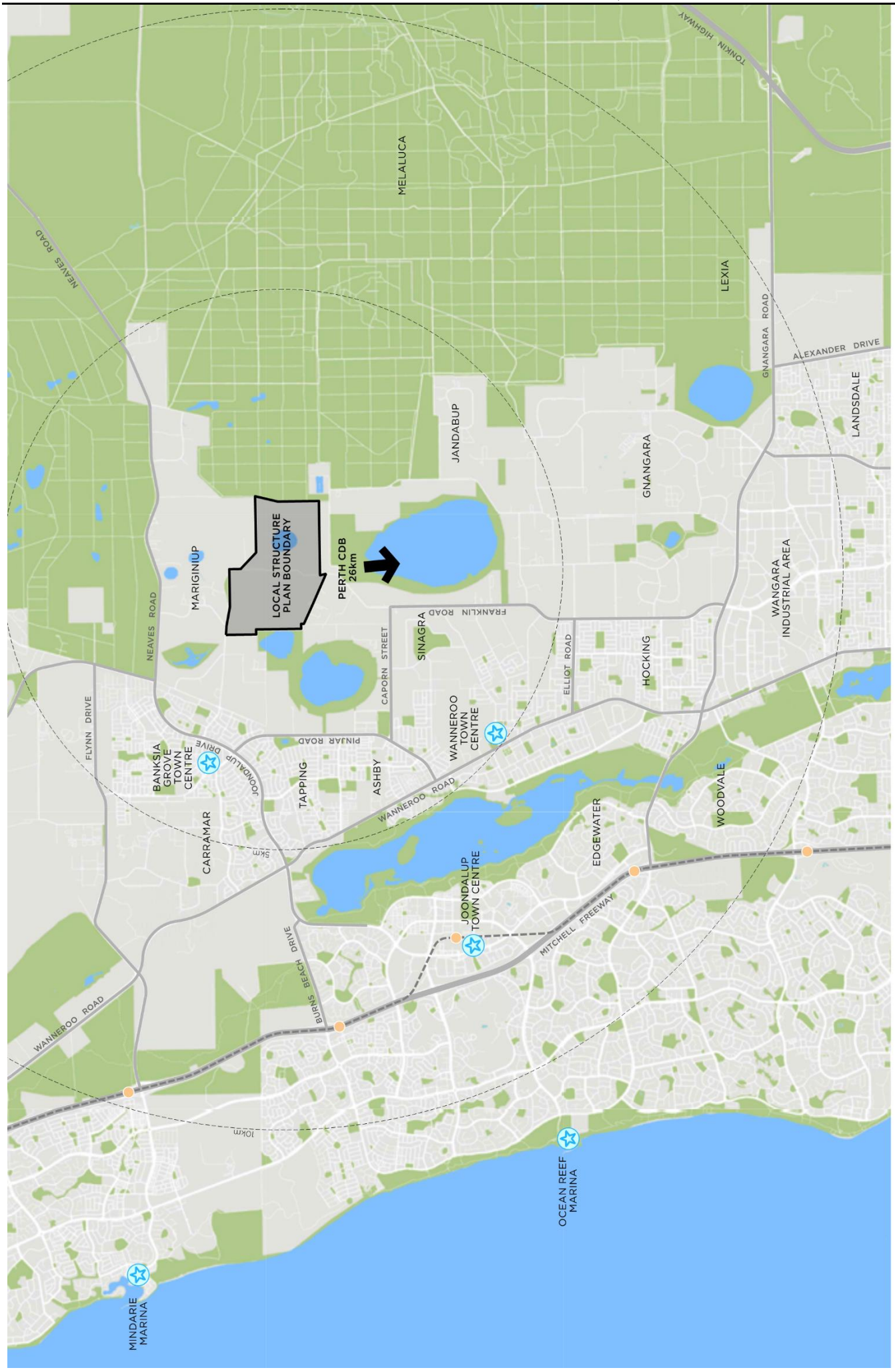


Figure 1 - Location Plan



Figure 2 - Orthophoto



Figure 3 - Site Plan

1.2.3 LEGAL DESCRIPTION AND OWNERSHIP

The Structure Plan area incorporates lots defined in **Table 3** below.

A site plan is included at **Figure 3 – Site Plan**.

A small portion of land from Precinct 16 as mapped by the EWDSP is also incorporated in the Structure Plan, being the north-eastern corner of Lot 1673 and equates to an area of 2.54 hectares.

Table 3 - Lot Details

Lot	Owner	Area (ha)
803	Shafto Pty Ltd & Justin Corporation Pty Ltd	83.114
1673	Ramat Pty Ltd & Milino Pty Ltd	40.725
804	Shafto Pty Ltd & Justin Corpoation Pty Ltd	8.091
16	Andrew J. Tedesco	4.061
17	Lakewood Estate Development (No 2) Pty Ltd	4.014
18	Vincenzo & John Guida	4.639
13	Lakewood Estate Development (No 1) Pty Ltd	8.22
2361	Mara & Dujo Delich	4.047
2287	Kevin Stubbs	4.047
1	Agostino Nominees Pty Ltd & Natalina Agostino	20.236
2	Justin Corporation Pty Ltd	84.555
7542	Michael Neil Pty Ltd	30.379
3335 (part)	Milino Pty Ltd & Leghorn Pty Ltd	9.586
7541 (part)	John E. Squarcini & Shafto Pty Ltd	0.3407
44 (part)	State of Western Australia	0.253
Lavinia Road	Road Reserve	0.2104
Rousett Road	Road Reserve	4.0189
	TOTAL AREA	**310.537**

1.2.4 SURROUNDING LAND USE AND CONTEXT

The land surrounding the Structure Plan area is predominantly semi-rural and vacant land. Rural residential development is established in the area to the north west in the vicinity of Lake Adams. State Forest land and pine plantations exist to the immediate east. All surrounding land is encompassed by the EWDSP which will guide future urbanisation of the area.

1.3 PLANNING FRAMEWORK

1.3.1 ZONING & RESERVATIONS

METROPOLITAN REGION SCHEME

The Structure Plan area is zoned 'Urban Deferred' under the Metropolitan Region Scheme (MRS), with the exception of a small area at the eastern extent of the site which is zoned 'Rural – Water Protection' (refer **Figure 4 – Metropolitan Region Scheme**).

In order for development to proceed, a Lifting of Urban Deferment is required and a MRS Amendment is required to rezone the 'Rural-Water Protection' land to 'Urban'. Lifting of Deferment process for a portion of the Structure Plan area will be lodged with the Western Australian Planning Commission concurrently with this Local Structure Plan. MRS Amendments to rezone the 'Rural Water Protection' land and to implement public purpose reservations will be pursued by others subsequent to the approval of this Local Structure Plan. It is only at this point that the exact extent of the required public purpose reservations can be known with enough certainty to inform an MRS Amendment.

LOCAL PLANNING SCHEME

The Structure Plan area is zoned 'General Rural' and 'Rural Resource' under the City of Wanneroo's District Structure Plan No.2. Refer to **Figure 5 – District Planning Scheme No.2**.

Rezoning to 'Urban Development' under DPS2 is expected to occur concurrently and automatically as part of the Lifting of Urban Deferment process. This will allow for the implementation of the Structure Plan.

1.3.2 NORTHWEST SUB-REGIONAL PLANNING FRAMEWORK

The Framework identifies the Structure Plan area as Urban Expansion.

1.3.3 EAST WANNEROO DISTRICT STRUCTURE PLAN

The Structure Plan area is located within the East Wanneroo District Structure Plan (EWDSP), within Precinct 15 and a small area of Precinct 16 at the north eastern corner (Refer **Figure 6 – East Wanneroo District Structure Plan Precincts**).

The EWDSP was prepared to guide the progressive urbanisation of 8,300ha of land in East Wanneroo and to guide more detailed local structure planning of the area. The EWDSP was endorsed by the WAPC in August 2021.

The EWDSP references a dwelling target of 3,800 dwellings. Precinct 15 is defined as a shopping and community hub that services the northern areas of East Wanneroo, The Precinct should comprise a neighbourhood centre and urban neighbourhoods integrated carefully with natural features and a 50ha regional sporting facility in the eastern areas of the Precinct.

The EWDSP provides for the following land uses within the Structure Plan area:

- Centre
- Urban Neighbourhood
- Suburban Neighbourhood
- Parkland and Parkland Link
- Regional Sporting Fields
- Neighbourhood Connector roads
- Transit Station
- Transport corridor
- Groundwater holding facility
- High school

Refer **Figure 7 and 8 – East Wanneroo District Structure Plan**.

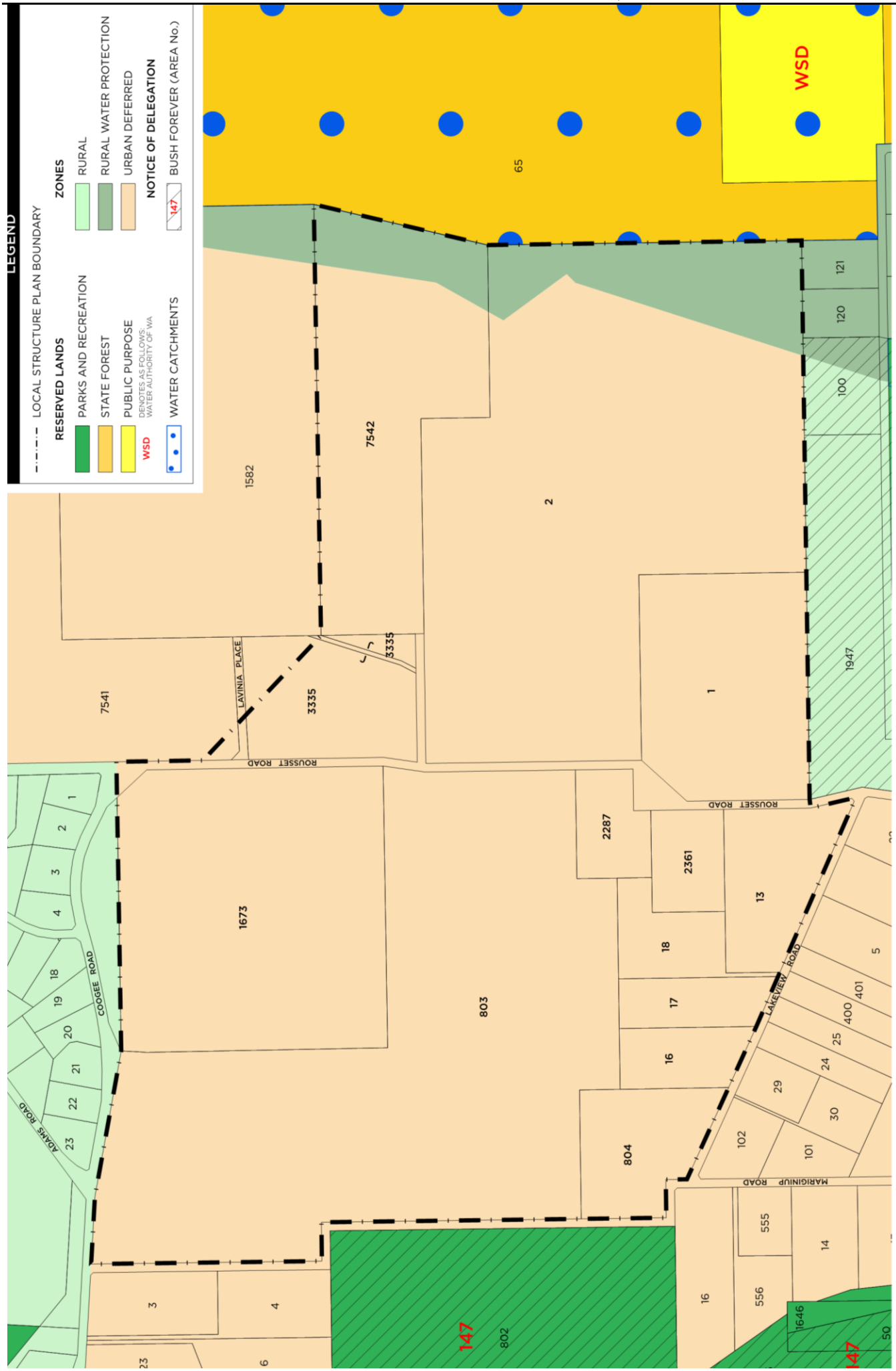


Figure 4 - Metropolitan Region Scheme Zoning

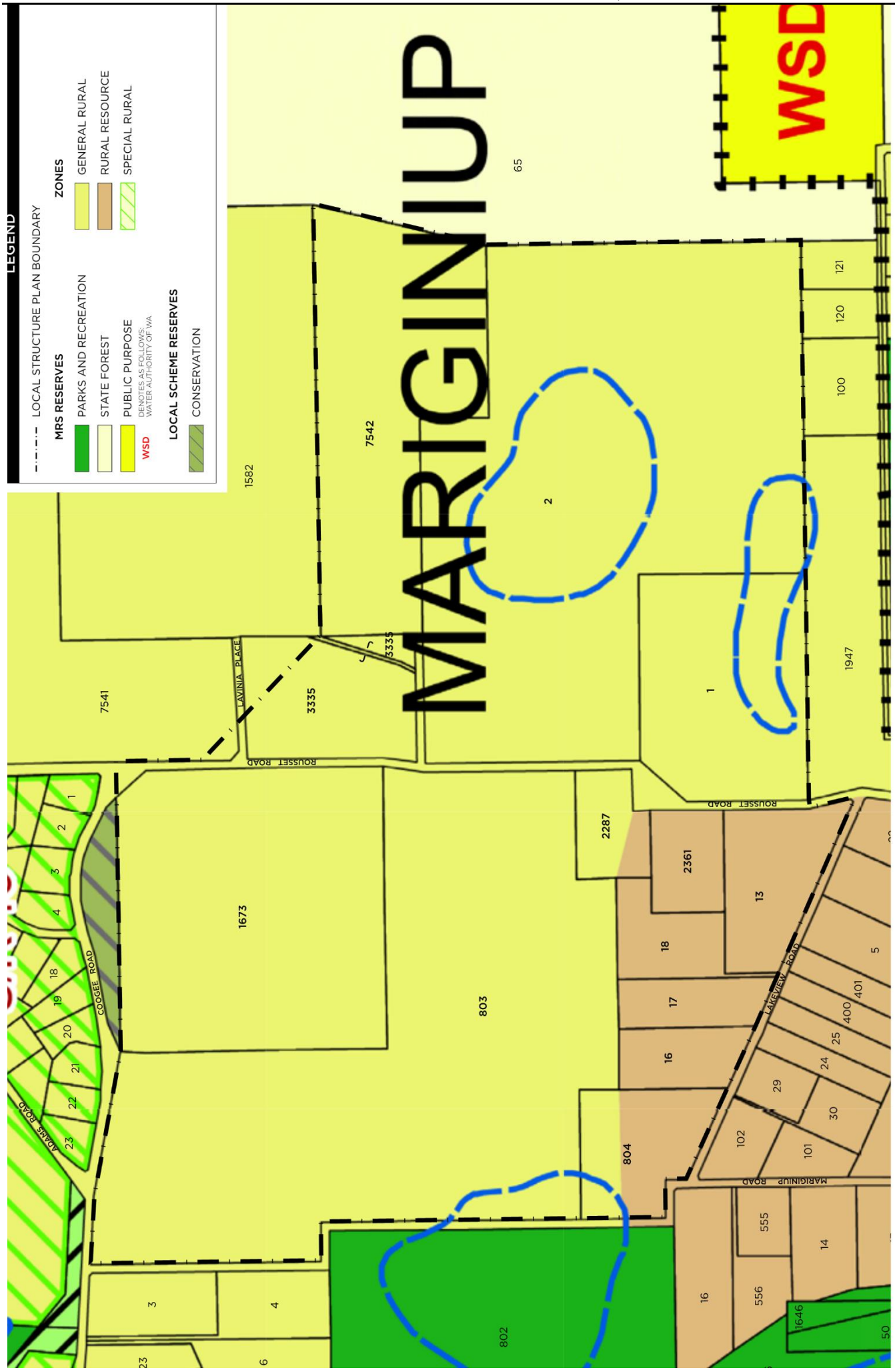


Figure 5 - District Local Planning Scheme No.2 Zoning

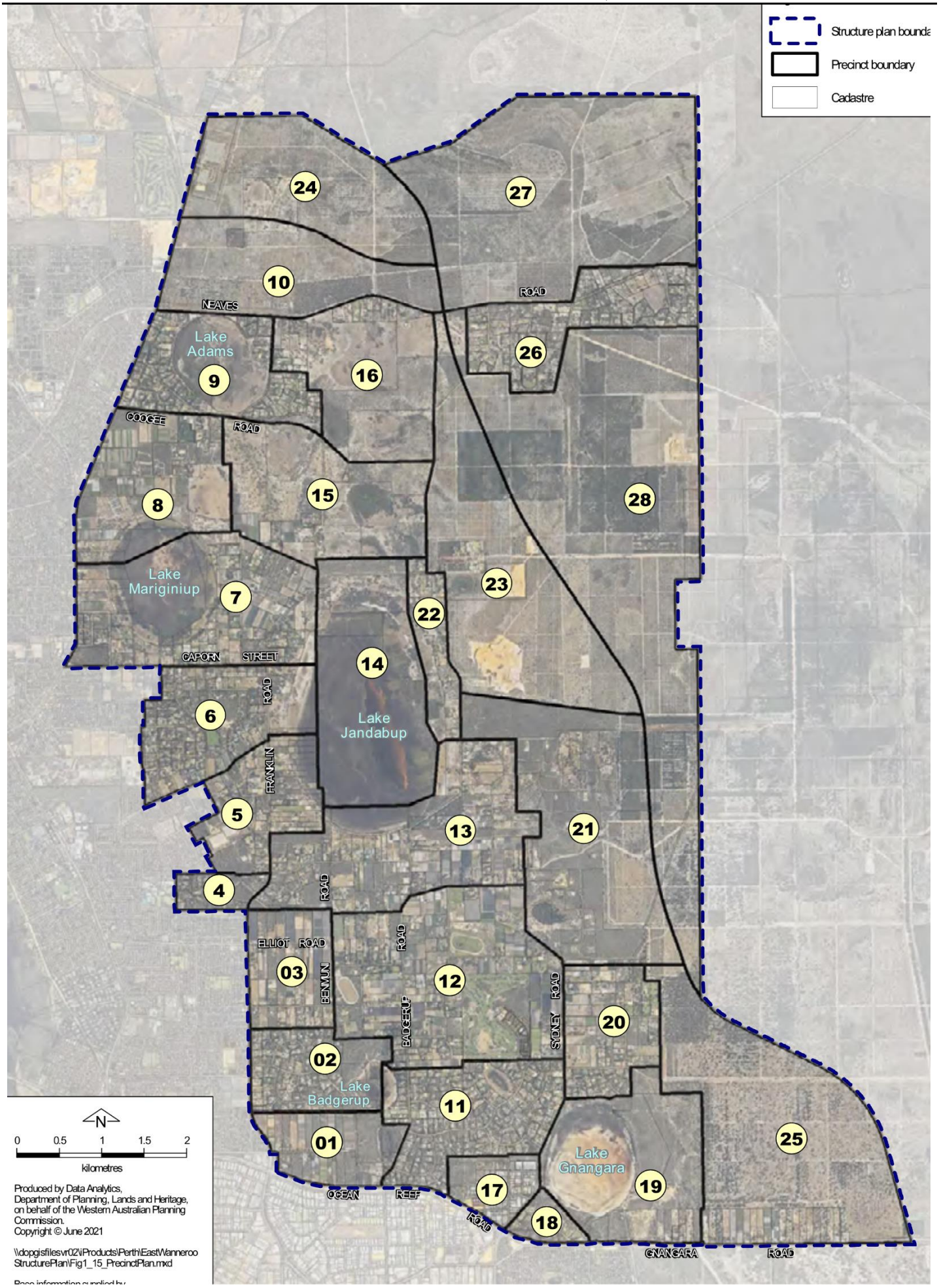


Figure 6 - East Wanneroo District Structure Plan Precincts

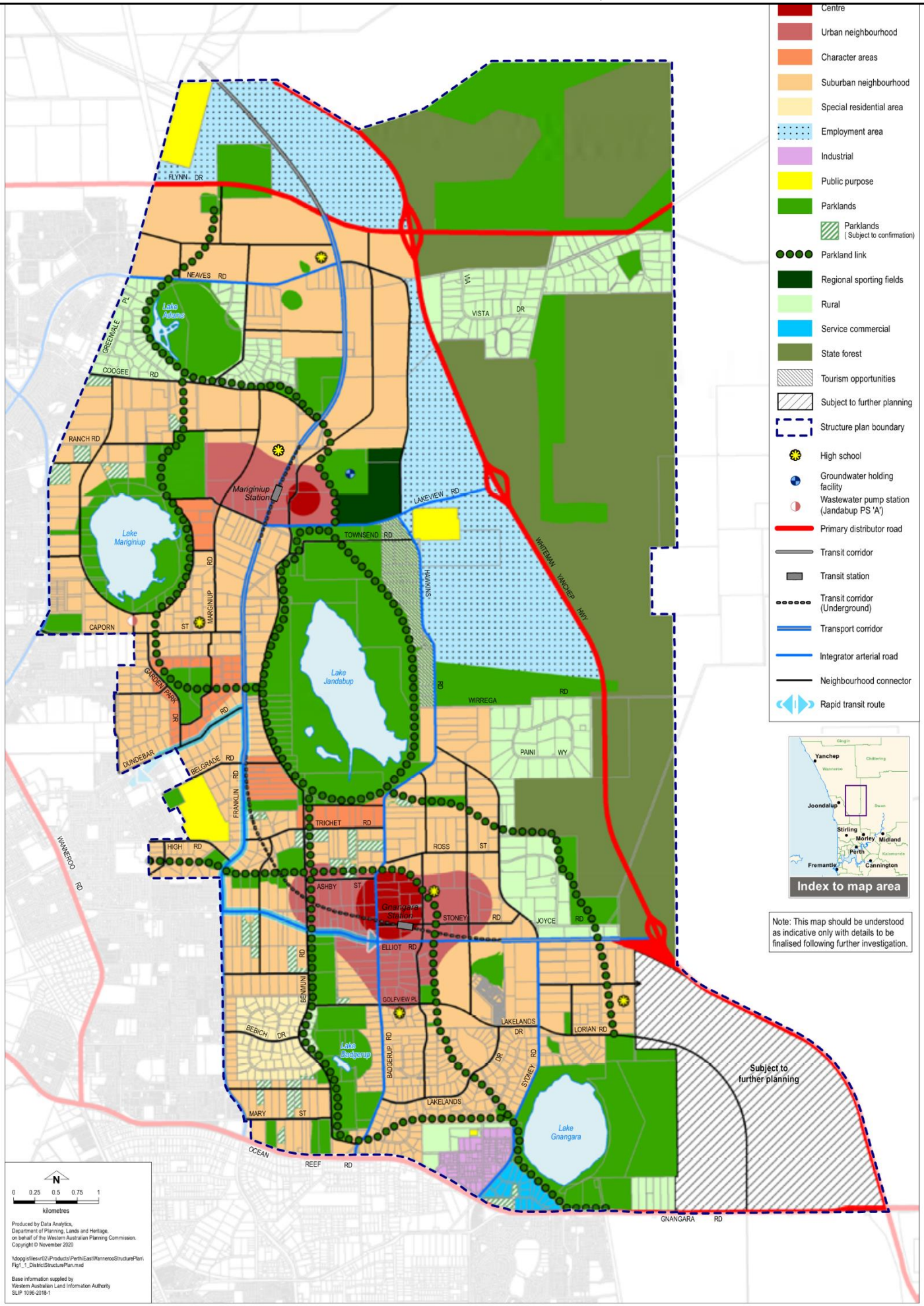


Figure 7 - East Wanneroo District Structure Plan

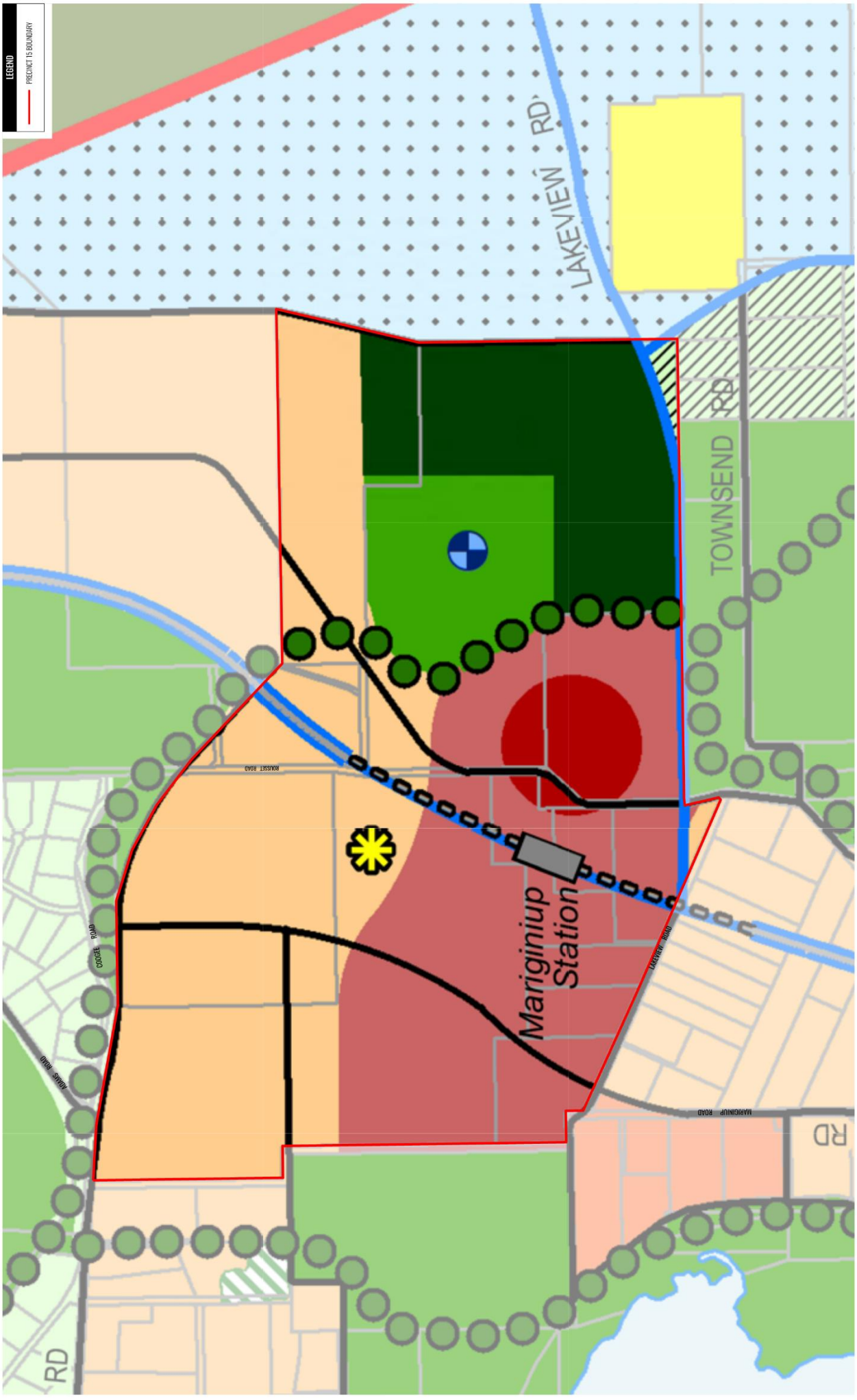


Figure 8 - East Wanneroo District Structure Plan (Precinct 15)

1.3.4 CITY OF WANNEROO LOCAL PLANNING POLICY 5.3 - EAST WANNEROO

Local Planning Policy 5.3 provides guidance on the consideration of planning proposals within the EWDSP area. The policy aims to ensure that any subdivision and development will not compromise the progression of development in accordance with the EWDSP.

The policy notes that the following matters are to be considered for proposals within the EWDSP area:

- The impact of the proposal on the staging of the EWDSP and the likely timeframe for the planning and development of the related precinct and surrounding areas to progress in accordance with the EWDSP;
- The impact of urbanisation on existing lawful rural land uses, particularly where urbanisation is proposed ahead of the staging plan outlined in the EWDSP.

It is noted that the policy also states that City will not accept any local structure plans for assessment until the district level development contribution scheme is substantially commenced (including public consultation) and an amendment to DPS 2 to rezone the precinct to an urban development zone is substantially commenced (including public consultation). The East Wanneroo District Developer Contribution Plan has been prepared and is currently being assessed by the DPLH and the City. An amendment to DPS2 to rezone the Structure Plan area to Urban Development Zone is proposed to occur automatically and concurrently with the Lifting of Urban Deferment application.

The policy requires local structure plans include a Local Sense of Place Statement. This has been included at Section 3.

1.3.5 PRE-LODGEMENT CONSULTATION

The LSP has been prepared in consultation with a range of stakeholders including:

- City of Wanneroo;
- Department of Planning, Lands and Heritage;
- Water Corporation;
- Public Transport Authority;
- Department of Biodiversity and Conservation;
- Department of Water and Environmental Regulation;
- Department of Education.

2. SITE CHARACTERISTICS & CONSTRAINTS

The site conditions and constraints have been detailed and mapped within the Environmental Assessment Report (EAR) prepared by Emerge to support this Structure Plan (refer **Appendix 1**). The below sections are a summary of the more detailed information in this EAR, in addition to the information contained in the Local Water Management Strategy where appropriate.

2.1 BIODIVERSITY AND NATURAL AREA ASSETS

2.1.1 FLORA & VEGETATION

Emerge completed a detailed flora and vegetation assessment of the site on multiple dates between August 2022 and February 2023, including during the spring flowering period. The survey recorded 17 broad plant communities within the site and determined that vegetation condition within the site ranges from 'Very Good' to 'Completely Degraded'.

Refer **Figure 9 – Vegetation Condition** (Source: Emerge)

The structure, composition and patch sizes of portions of plant communities within the site indicates that it represents 12.1 ha of the Commonwealth listed Banksia Woodlands Threatened Ecological Community (TEC) across four patches. Within this, there is approximately 6.9ha of low lying Banksia attenuata shrubland Priority Ecological Community (PEC). No other TECs or PECs occur within the site.

One priority flora species was recorded within the site, namely Jacksonia sericea (P4), during the detailed survey. Jacksonia sericea (P4) is locally common within the western portion of the site. The species is also common across calcareous and sandy soils of the Swan Coastal Plain from the south of Mandurah to the north of Joondalup, with numerous records occurring within 10 km of the site. No other priority or threatened flora species were recorded within the site.

Refer **Figure 10 – Conservation Significant Flora and Vegetation** (Source: Emerge)

2.1.2 BUSH FOREVER

No Bush Forever sites occur within the site. Bush Forever Site 147 (Mariginiup Lake and Adjacent Bushland, Mariginiup) directly abuts the south-western corner of the site, and Bush Forever Site 324 (Jandabup Lake and Adjacent Bushland, Jandabup/Mariginiup) lies adjacent to the southern boundary.

2.1.3 ECOLOGICAL LINKAGES

The Perth Biodiversity Project have identified and mapped regional ecological linkages within the Perth Metropolitan Region. Regional Ecological Linkage No. 16 extends over the south eastern portion of the site further to the south and east intersecting with Ecological Linkage No. 12, which runs in a north to south direction adjacent to the western site boundary. However, review of aerial imagery indicates that native vegetation within the site is contiguous with smaller patches of native vegetation to the north-west, north and south of the site, but is otherwise disconnected from vegetation in the broader area likely due to intensive historical agricultural uses in the area.

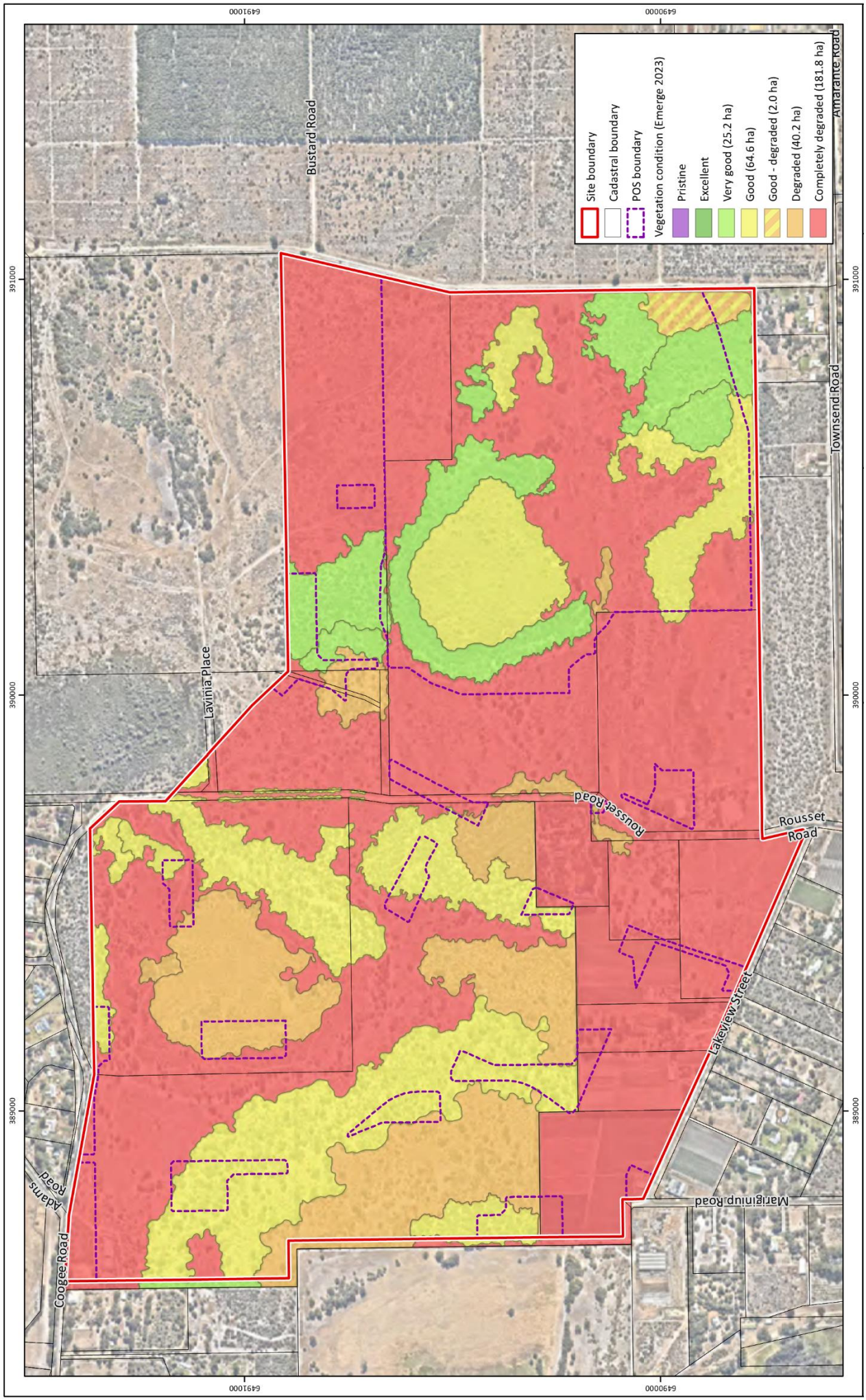


Figure 9 - Vegetation Condition (Source: Emerge)

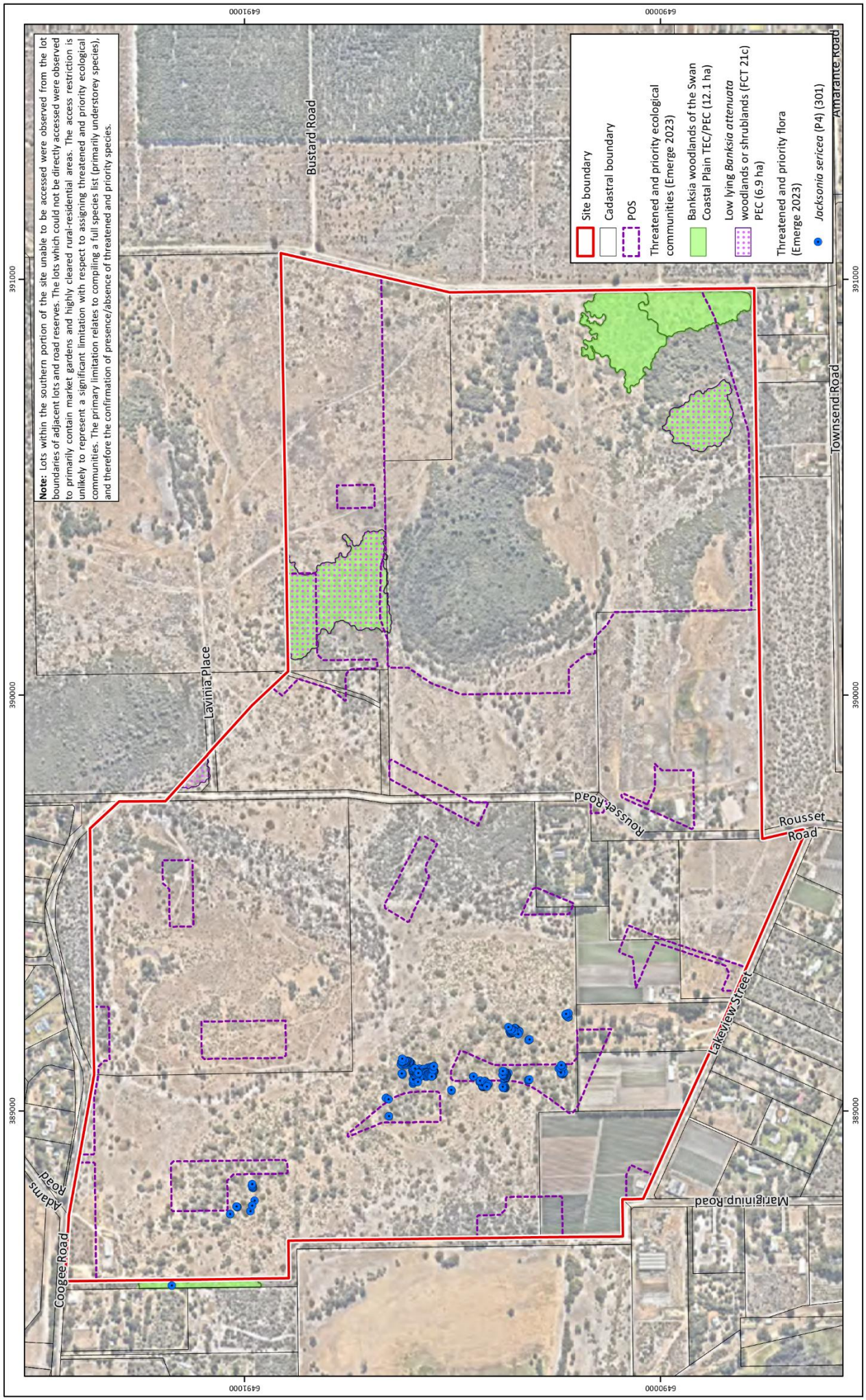


Figure 10 - Conservation Significant Flora and Vegetation (Source: Emerge)

2.1.4 FAUNA

Emerge completed a detailed fauna and targeted black cockatoo assessment of the site between 28 March and 12 December 2022. The survey identified 11 broad fauna habitats within the site.

The majority of the site (59%) comprises cleared fauna habitat, which consist of heavily disturbed areas of grassland with the occasional scattered native tree or shrubs and would potentially only provide suitable habitat for common and widespread non-native species. The highest fauna habitat values are associated with the jarrah forest, banksia woodland, and jarrah woodland habitats which occur over approximately 12.05% of the site. The remainder of the site comprises various forest, woodland and shrubland habitats with little to no understorey.

Emerge recorded four fauna species of conservation significance within the site: Caranby's black cockatoo (CBC), Forest red-tailed black cockatoo(FRTBC), black striped burrowing snake and quenda.

A total of up to 38.5 ha of potential primary foraging habitat for CBC and up to 19.5 ha of secondary foraging habitat for CBC was recorded within the site. Up to 29.2 ha of potential native primary foraging habitat for FRTBC was recorded within the site, These areas are likely an over-estimation of actual CBC foraging habitat, given they are based on broad fauna habitat type mapping which does not exclude cleared areas between patches of vegetation and trees (which are common across this highly disturbed site), nor does it exclude flora species within these areas which are not known to be foraged upon by black cockatoos.

Carnaby's black cockatoo (CBC) were observed flying over the site, Forest red-tailed black cockatoo (FRTBC) were observed foraging within the site. A total of 365 black cockatoo habitat trees were recorded within the site. An internal hollow inspection was undertaken for 37 habitat trees that were determined to potentially contain suitable hollows based on the initial inspection from ground level. Of the 37 trees inspected, none were determined to contain suitable hollows. The remaining trees also contained no suitable hollows for breeding by black cockatoos. In addition, no evidence of roosting activity was observed within the site.

Refer **Figure 11 and 12 – Conservation Significant Fauna Habitat Cockatoos (Source: Emerge)**

Quenda inhabit vegetation with dense understorey. Thus, occurrence of the species within the site would likely be limited to where vegetation provides suitable habitat, likely excluding any areas comprising sparse grassland with little to no native vegetation cover. However, quenda may also forage across or traverse other habitats within the site.

The banksia woodland habitat is considered ideal for the black-striped burrowing snake. The banksia woodland vegetation, which is common across the local area, has likely supported a healthy population of this species for some time.

2.2 LANDFORM AND SOILS

2.2.1 SOILS

The site occurs within the transition between the Spearwood dune system and the Bassendean dune system. The Spearwood Dunes system typically consists of siliceous sands over limestone, with hilly to undulating terrain, whilst the older Bassendean Dune system is characterised by lower relief, with variable depth to groundwater, consisting of lower sandy hills interspersed with permanent and seasonal wetlands.

Geotechnical investigations in 2022 over a large portion of the site indicate that the site is generally underlain by sand derived from tamala limestone and Bassendean sands. Ground conditions across the site generally comprise a layer of sandy topsoil between 0.05 - 0.2 m thick followed by a 1 - 3 m thick layer of sand, whilst localized cement soils and organic soils were also encountered in portions of the site.

No restricted landforms or unique geological features within the site have been identified to date, with the exception of a prominent dunal ridgeline in its western extent.

2.2.2 TOPOGRAPHY

The Structure Plan Area is generally flat with the exception of the dunal ridgeline in the western portion of the site marking the transition from the Bassendean to the Spearwood dunal system.

Elevations across the site range from a minimum of 46 m Australian height datum (AHD) in the central portion of the site, largely associated with existing wetland features, to 59 mAHD along the dunal ridgeline in the western portion.

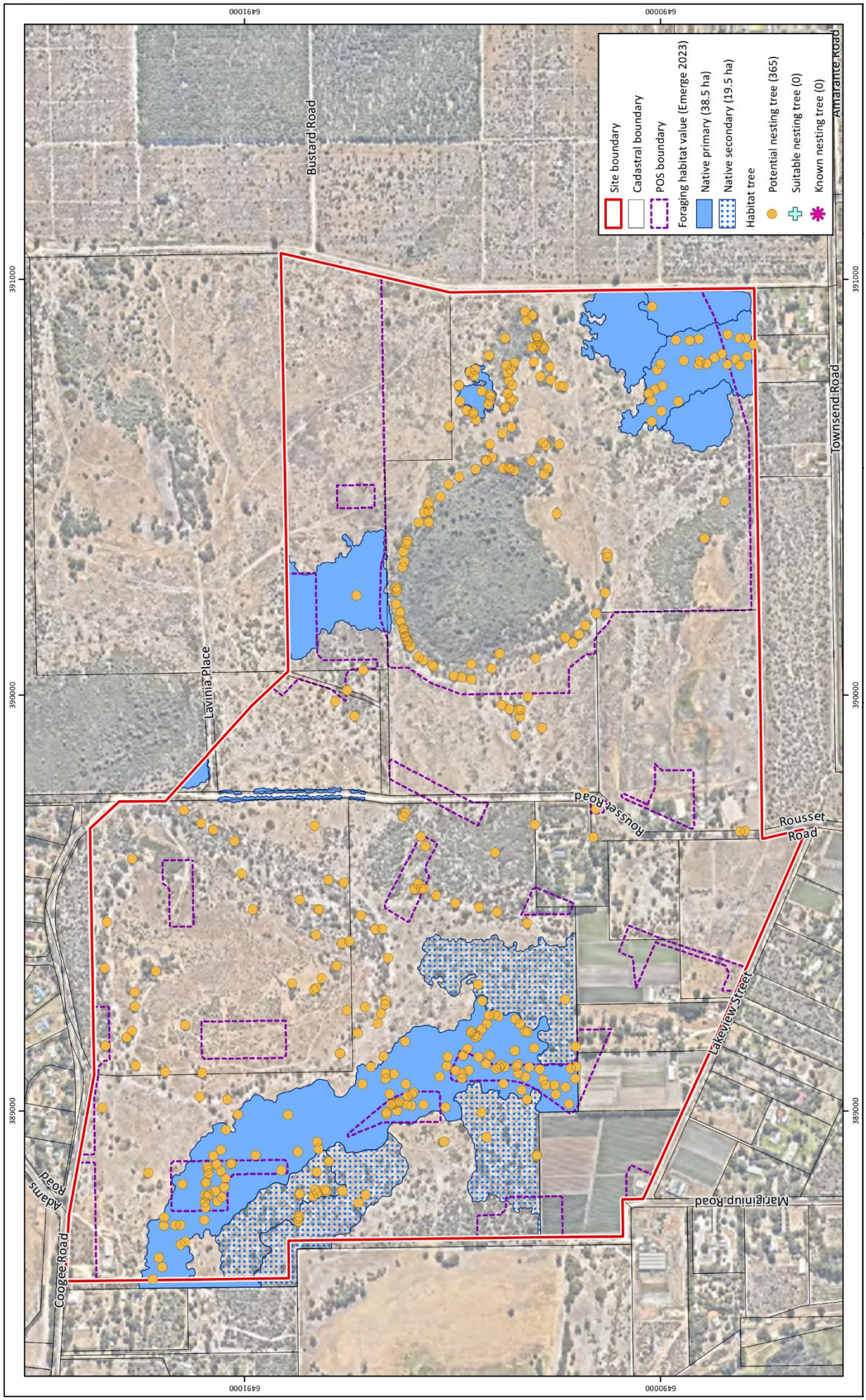


Figure 11 - Conservation Significant Fauna Habitat Carnaby's Cockatoos (Source: Emerge)

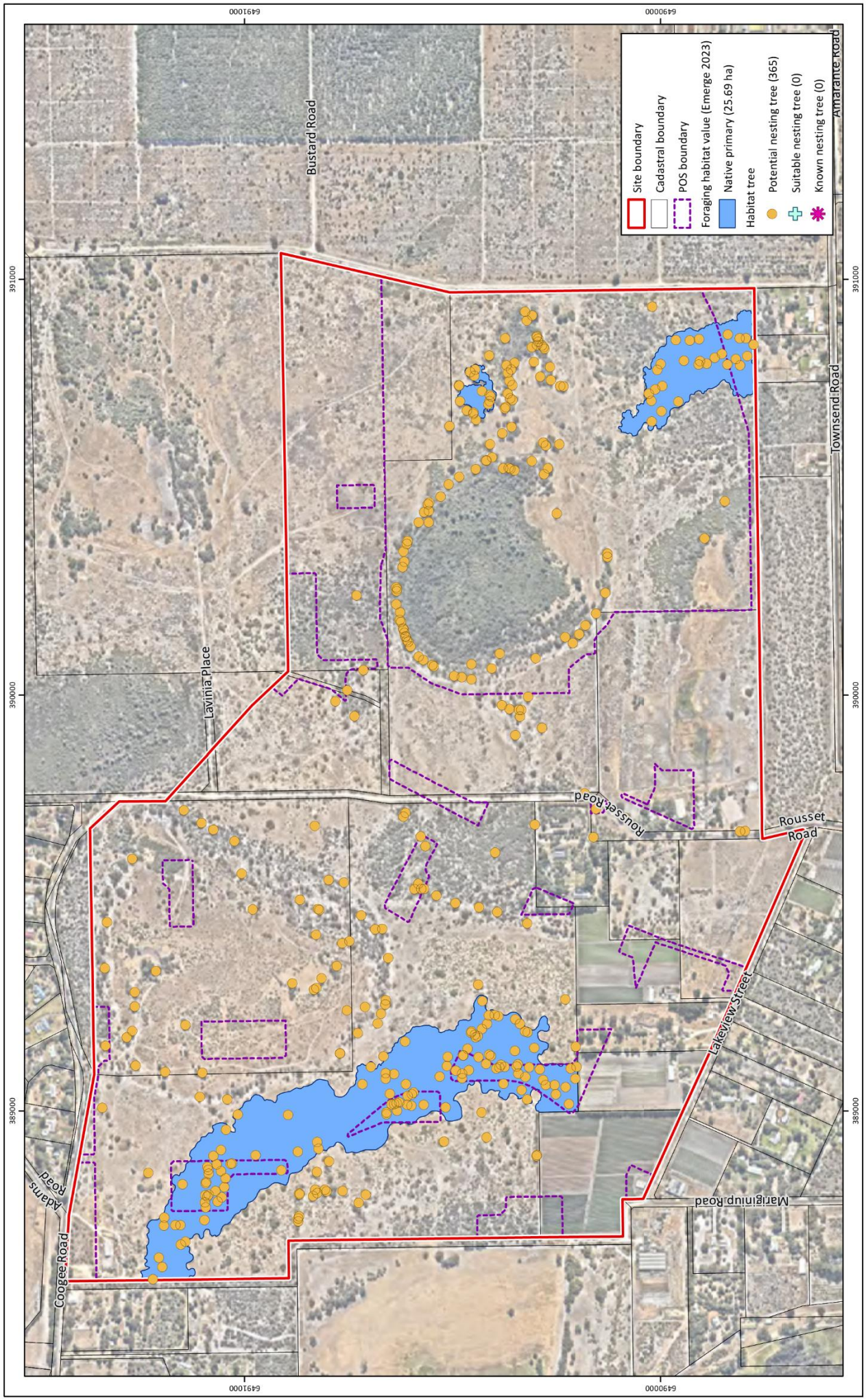


Figure 12 - Conservation Significant Fauna Habitat Forest Red Tailed Black Cockatoos (Source:Emerge)

2.2.3 *ACID SULFATE SOILS*

A review of the Department of Water and Environmental Regulation (DWER) broad-scale mapping of potential Acid Sulfate Soils (ASS) risk indicates that discrete areas in the eastern portion of the site are classified as having a 'high to moderate' risk of ASS occurring within 3 m of the natural soil surface, which generally aligns with mapped resource enhancement wetland features within the site. Additionally, a large portion of the site is classified as having a 'moderate to low' risk of ASS occurring within 3 m of the natural soil surface but 'high to moderate' risk of ASS beyond 3 m of the natural soil surface. The western portion of the site associated with the ridgeline is classified as having no known risk of ASS occurring. Management of ASS will occur as an ongoing part of subdivision and development processes.

2.2.4 *CONTAMINATION*

A review of the DWER Contaminated Sites Database indicates that the site is not registered as a contaminated site.

2.3 GROUNDWATER

The site is underlain by a multi-layered aquifer system – Superficial Swan, Leederville, Yarragadee North. The Perth Groundwater Map (DWER 2022a), which provides an indication of regional groundwater levels, shows the historic Maximum Groundwater Level (MGL) at the site to be approximately 48 mAHD in the north-easternmost corner of the site. The lowest historic MGL on site is approximately 43 mAHD and is mapped in the south-westernmost corner of the site.

Groundwater bores were installed by Pentium in May and August 2022 for the purpose of pre- and post development monitoring, with groundwater monitoring being undertaken on site monthly during winter and otherwise quarterly since installation. Relative to existing surface levels, the measured groundwater levels ranged from a minimum of 0.86 metres below ground level (mbgl) to a maximum of 8.63 mbgl. Groundwater flows generally east to west.

2.4 WETLANDS & SURFACE WATER

There are a number of Resource Enhancement Wetlands and Multiple Use Wetlands occurring within the site.

Refer **Figure 13 – Wetlands (Source: Emerge)**

2.5 PUBLIC DRINKING WATER SOURCES

The eastern portion of the site zoned 'Rural – Water Protection' under the MRS (refer **Figure 4**) is associated with the Priority 2 (P2) Gnangara Underground Water Pollution Control Area. This Public Drinking Water Source Area (PDWSA) runs through the eastern part of Precinct 15. There is also a Wellhead Protection Zone for bores in the area. Parts of multiple wellhead protection zones intersect the eastern portion of the site, associated with the nearby location of the Wanneroo Groundwater Treatment Plant (WGTP).

A review of the Water Quality Protection Note (WQPN) 25 Landuse Compatibility Tables for Public Drinking Water Source Areas (DoW 2016) indicates that subdivision of land for residential purposes within a P2 in an area zoned 'Urban Residential' or 'Urban Deferred' and the creation of recreational parks and/or sporting ovals is incompatible. However, it is envisaged that the rezoning of the land within the PDWSA to the future urban land use will trigger reclassification of the areas of P2 to P3* (areas that are changed from P1 or P2 as a result of government-approved strategic planning for urban development in the MRS), as outlined in WQPN 38 (DWER 2018). All developments will require connection to deep sewerage.

2.6 BUSHFIRE HAZARD & MANAGEMENT

The majority of the Structure Plan area is identified within a 'bushfire prone area'. State Planning Policy 3.7 (SPP 3.7) requires structure plans to include a bushfire hazard level assessment. A Bushfire Management Plan (BMP) has been prepared by Emerge (refer **Appendix 2**).

The BMP identified a variety of bushfire hazards within and surrounding the site, including different patches of forest, woodland, scrub and grassland hazards. The BMP provides an assessment of how future development within the site can satisfy the policy measures of SPP 3.7.

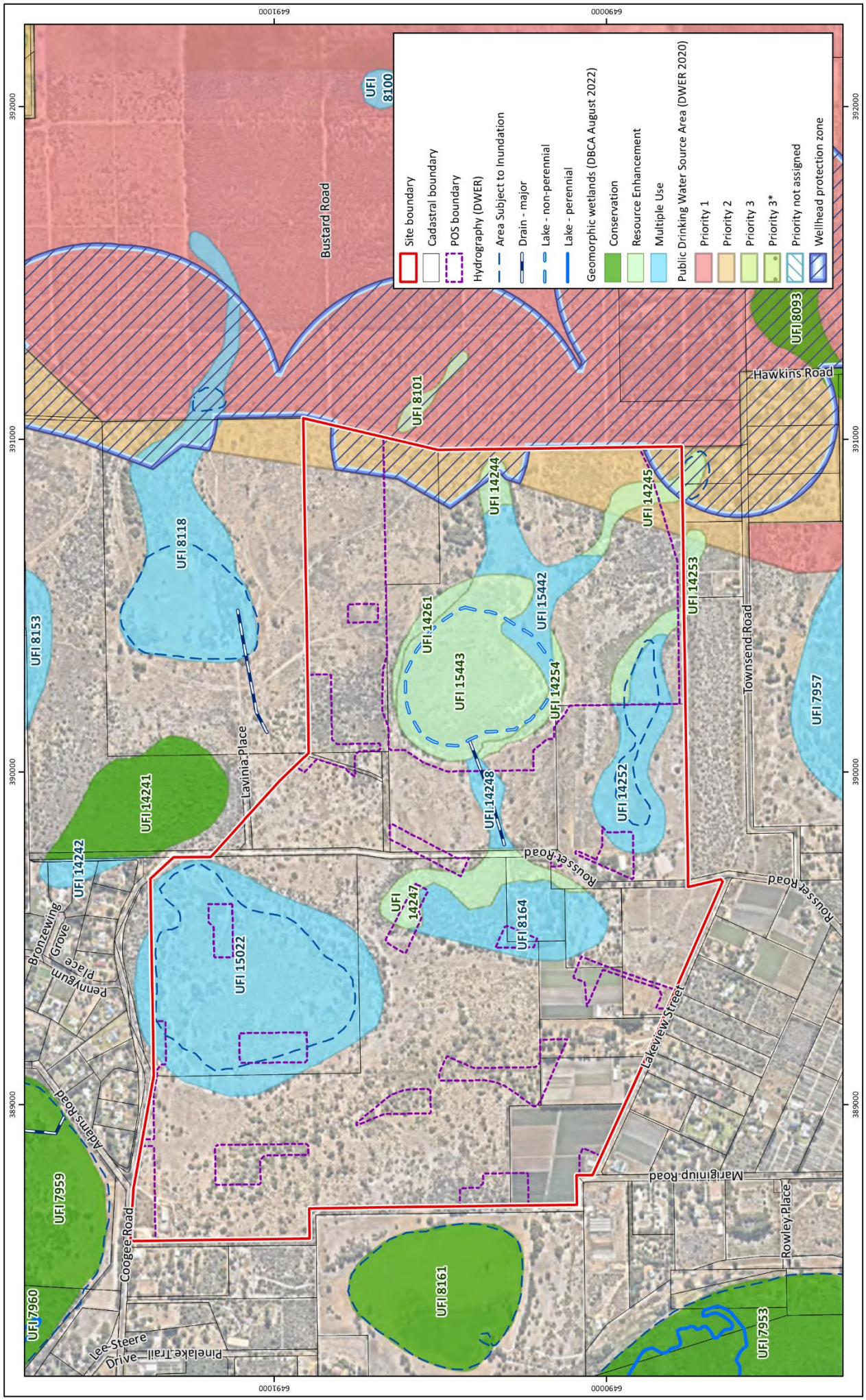


Figure 13 - Wetlands (Source: Emerge)

2.7 HERITAGE

2.7.1 *ABORIGINAL HERITAGE*

A desktop assessment of the DPLH's Aboriginal Heritage Inquiry System (AHIS) did not identify any registered Aboriginal Heritage Sites within the site. Three other features are mapped in proximity to the site, whilst one slightly intersects into the northern site boundary. Place ID 22160 Marrynginup is mapped on the DPLH register with a large polygon, which restricts publicly displaying its reliable location and site boundary.

Horizon Heritage Management completed an Aboriginal Heritage Desktop Assessment of the site and surrounding area in January 2023 (refer **Appendix 3**). The custodian of Place ID 22160 gave Horizon Heritage Management permission to access and geographically define the actual site boundary. Refer **Figure 14 – Aboriginal Heritage (Source: Emerge)**.

The Aboriginal Heritage Desktop Assessment completed by Horizon Heritage Management finds and concludes as follows:

- The true extent and spatial boundary of Place ID 22160 Marrynginup is largely associated with the Conservation Category Wetland to the north of the site and only slightly intersects into the north central portion of the site.
- It was determined to be a very significant and sensitive area (healing area) important for Aboriginal spiritual health and cultural well-being.
- It is recommended Place ID 22160 is afforded protection under the Aboriginal Heritage Act 1972.
- The site-specific assessment determined that no registered archaeological sites are within the site.
- However, it is possible that surface expressions of in situ cultural material (artefacts) could be present. These are potentially around the margins of landscape features like lakes, swamps, wetlands and any sand hill features that may occur within the site.
- Any wetland features within and surrounding the site have been determined to be of particular significance as numerous camp sites have previously been identified in proximity of freshwater lakes in the broader Wanneroo area.
- A small southern portion of Place ID 22160 intersects the site and extends beyond the extent of the conservation wetland feature to the north of the site. This area has been subject to historical vegetation clearing and ground disturbances and therefore it is unlikely in situ cultural materials (artefacts) would be present.
- An Aboriginal Cultural Heritage Management Plan will be developed in consultation with the Whadjuk People in accordance with the relevant Act(s) and legislation prior to vegetation clearing and other ground disturbance works associated with the development of the site.

2.7.2 *NON-INDIGENOUS HERITAGE*

A desktop search of the Australian Heritage Database (Department of the Environment 2019), the State Heritage Office database indicates there are no registered non-Indigenous heritage sites located within, or in proximity to the site.

2.8 ACOUSTIC CONSIDERATIONS

Pursuant to the EWDSP, the Structure Plan contains a future passenger rail line. This railway is proposed to be underground with the exception of the section located in the northern area of the Structure Plan area. Herring Storer prepared an acoustical assessment of the Structure Plan in this regard the compliance with State Planning Policy 5.4 Road and Rail Noise (SPP 5.4) (refer **Appendix 4**). The acoustic assessment was conducted over that portion of the railway that will not be underground pursuant to the EWDSP. Noting that the railway does not yet exist, predictive noise modelling software was utilised for the purpose of assessing future noise levels.

The results of the acoustic assessment indicate that noise received at residences located adjacent to the passenger rail line would exceed the "Noise Targets" as outlined in SPP 5.4. To address this the possible noise amelioration options that are can be considered at subdivision stages are setbacks or buffer areas, noise bunds and / or barriers (noise walls) and "Quiet House" design.

The acoustic assessment is provided as overall guidance for the Structure Plan. Once detailed information is available at subdivision stage, such as final levels heights, lot placements etc, more detailed acoustic advice can be provided.

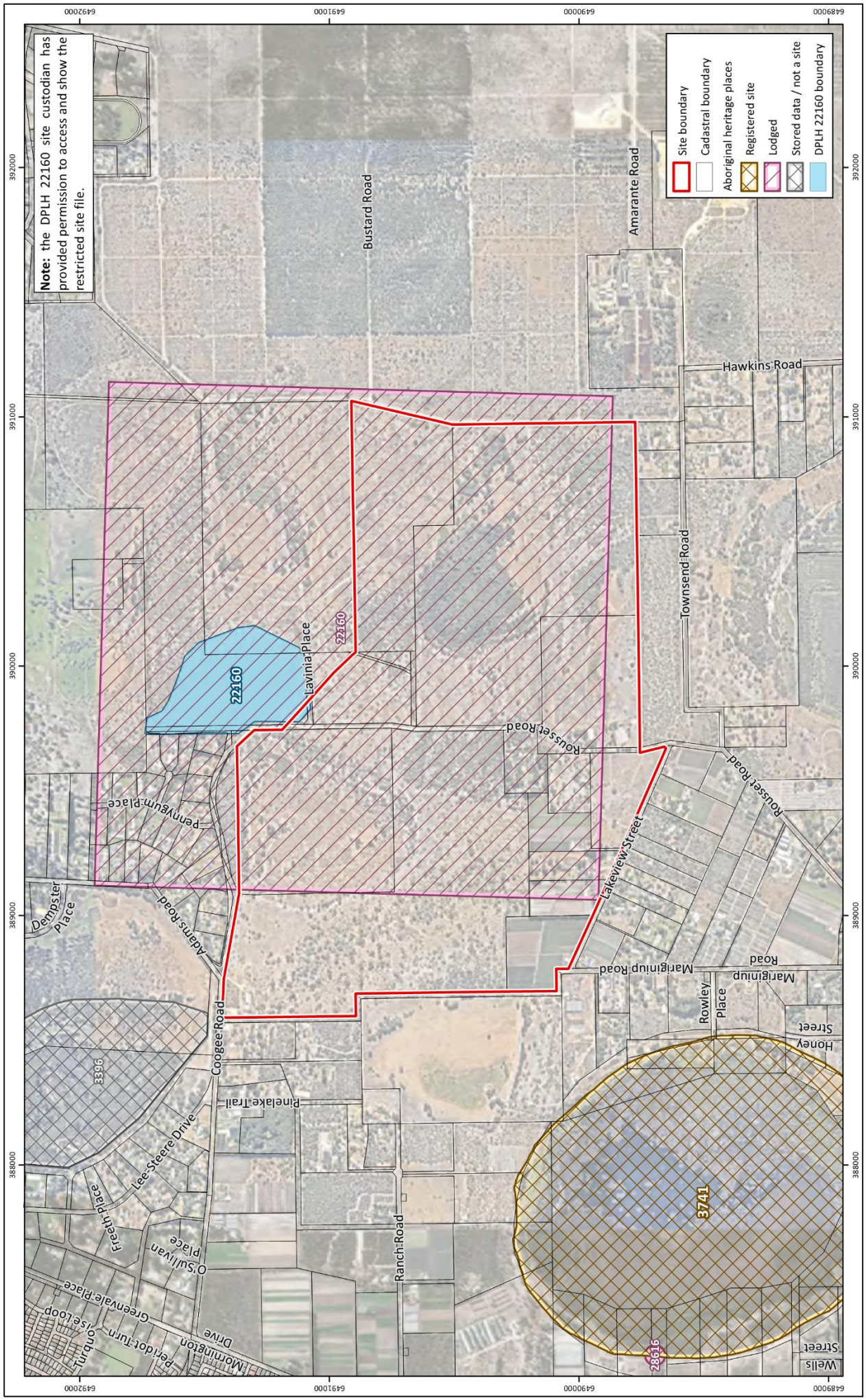


Figure 14 - Aboriginal Heritage (Source: Emerge)

2.9 SURROUNDING LAND USES

The East Wanneroo area supports a variety of exiting land uses, some of which may be incompatible within sensitive urban land uses due to the potential for amenity impacts associated with dust, noise, gaseous or odour emissions. Such land uses applicable to the site and surrounding area include existing poultry farms, basic raw materials extraction, market gardens, turf farms and nurseries. Refer **Figure 15 – Surrounding Land Uses (Source: Emerge)**.

2.9.1 POULTRY FARMS

No existing poultry farms are known to occur within or nearby to the site. The closest known poultry farm operation is situated approximately 1.3 km west of the site, this being greater than the generic separation distance of 300-1000m recommended by the EPA.

2.9.2 MARKET GARDENS AND NURSERIES

The south-western portion of the site contains existing market garden land uses, which will ultimately transition to urban land uses through implementation of the Structure Plan. However, a range of market gardens, orchards and plant or tree nurseries occur in proximity to the site, some within 500m (refer Figure 15 of EAR). The EPA's recommended generic separation varies between 100 – 500m for such uses. This matter will be addressed as required as part of subdivision applications.

2.9.3 BASIC RAW MATERIALS

State Planning Policy (SPP) 2.4 Basic Raw Materials (BRM) (WAPC 2021) provides a policy framework to ensure BRM and extractive industries matters are considered during planning and development decision-making, to facilitate the responsible extraction and use of the State's BRM resources. No SPP 2.4 Significant Geological Supplies (SGS) or extraction sites are mapped within the site. The nearest SPP 2.4 SGS is approximately 5km south-east of the site, part of which is subject to active sand resource extraction.

Large areas immediately east of the site are mapped within a SPP 2.4 'extraction site'. Two existing sand quarries currently operate within a small portion of the mapped SPP 2.4 'extraction site', one approximately 0.9 km east of the site and the other approximately 1.2 km south-east of the site.

The EPA (2005) recommends a generic separation distance of 300-500 m between sensitive land uses and extractive industries – sand and limestone. This matter will be addressed as required as part of subdivision applications.

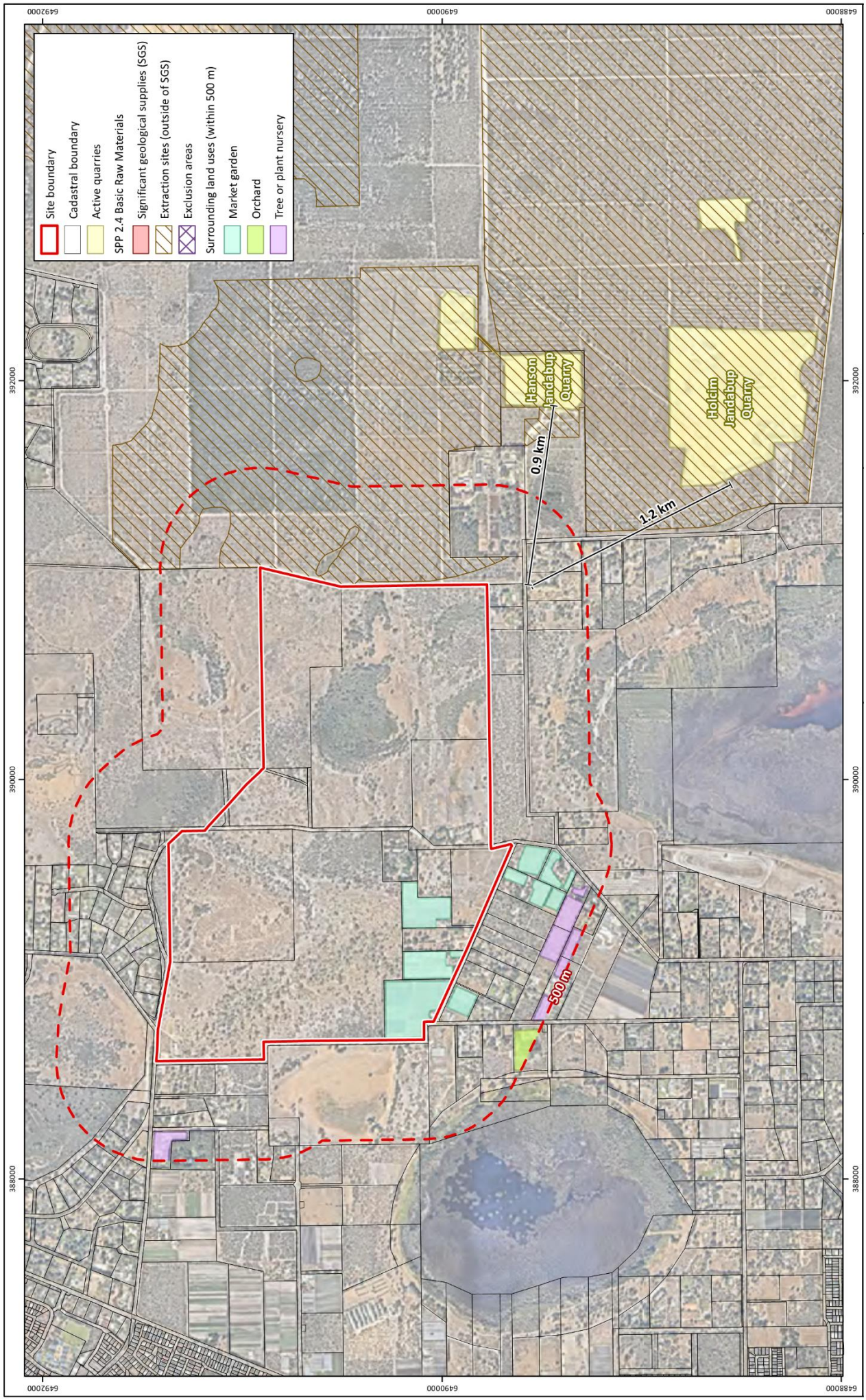


Figure 15 - Surrounding Land Uses (Source: Emerge)

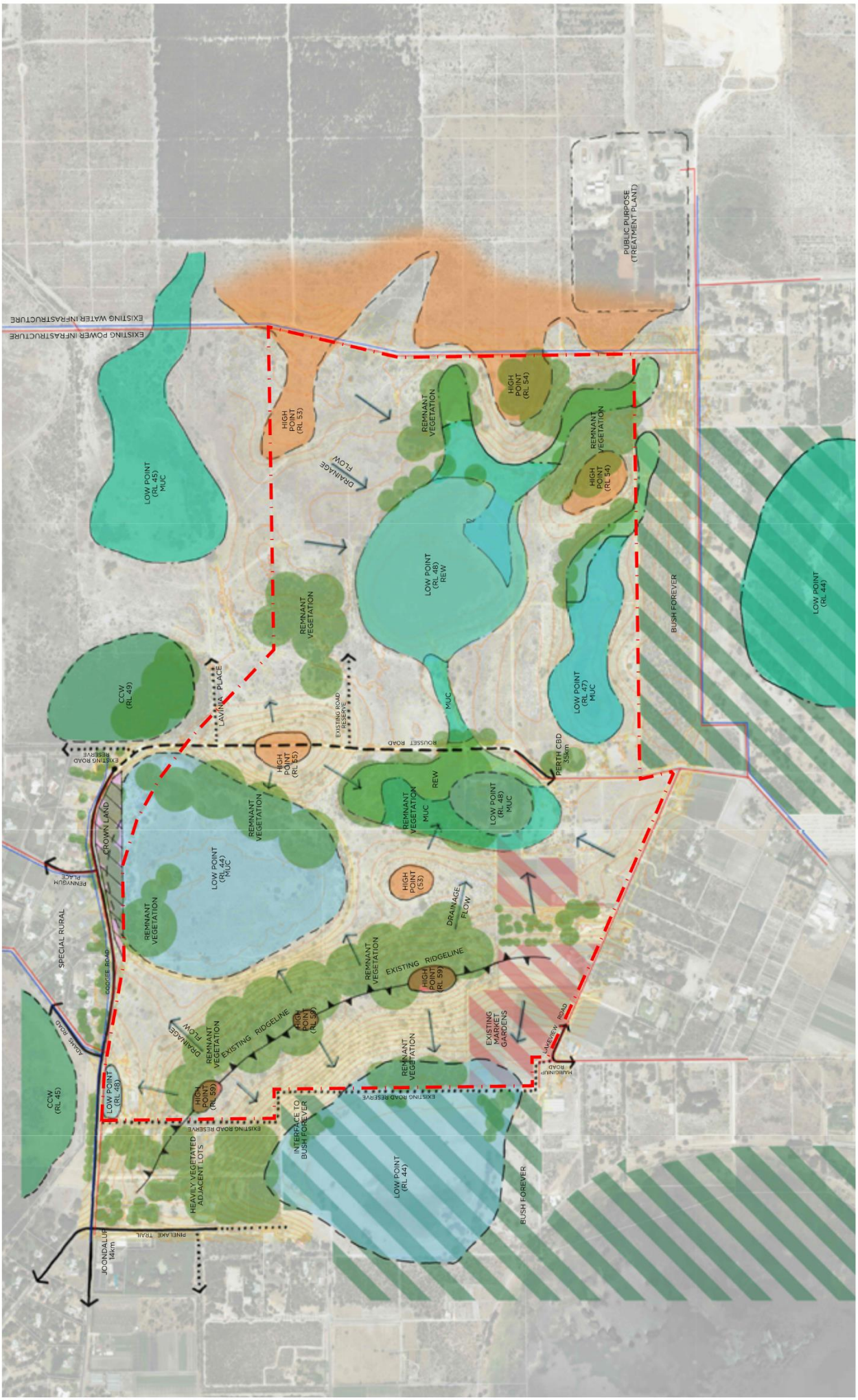


Figure 16 - Site Analysis Plan

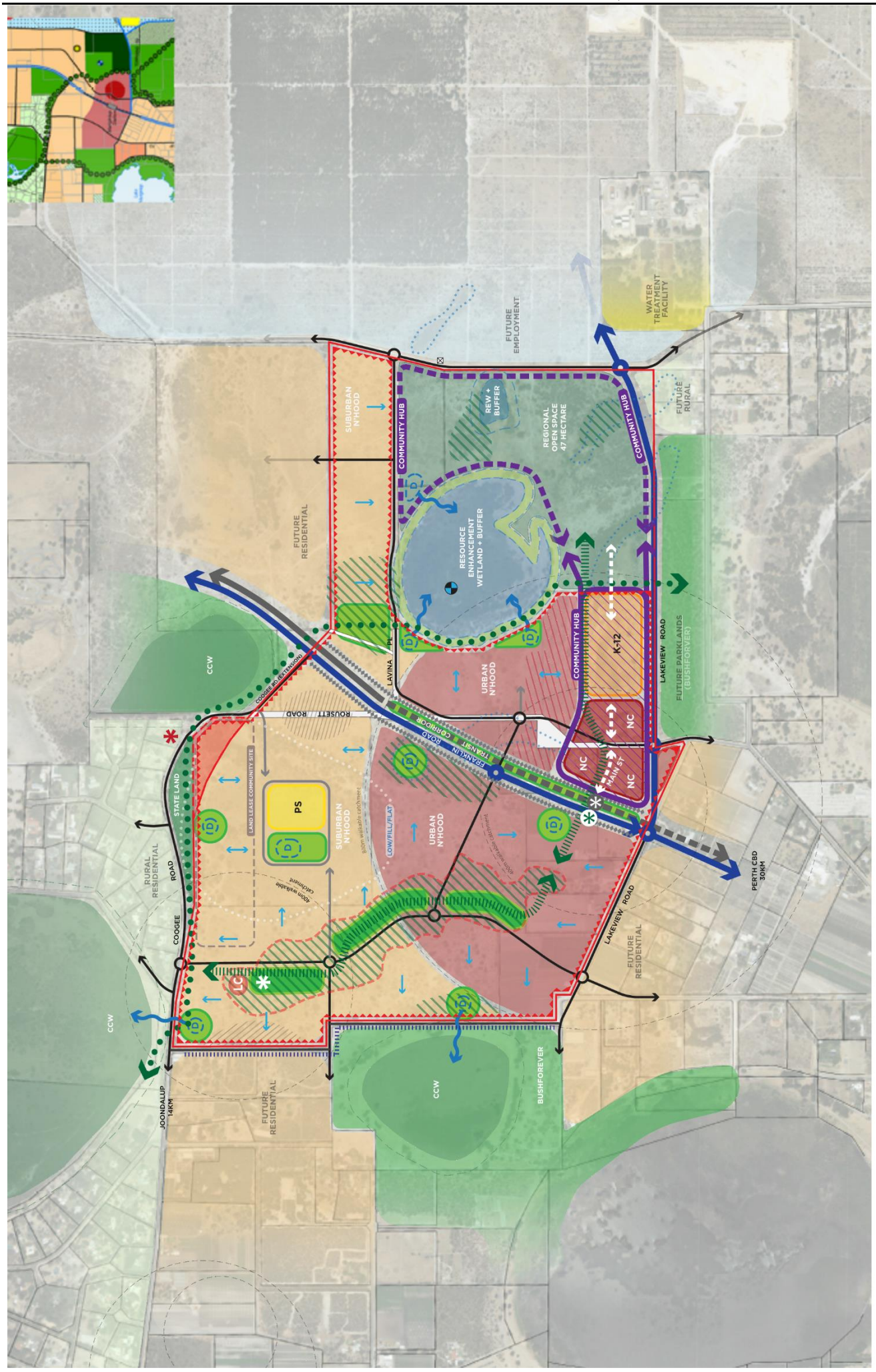


Figure 17 - Opportunities and Constraints Plan

2.10 OPPORTUNITIES AND CONSTRAINTS

An Opportunities and Constraints Plan has been prepared to inform the planning and design of the Structure Plan (refer **Figure 16 & 17**). The identified opportunities and constraints are listed in **Table 4** below:

Table 4 - Opportunities and Constraints

OPEN SPACE & DRAINAGE		
Plan Reference	**Opportunity/ Constraint**	**Comment**
1.	Opportunity	Major opportunity to retain the natural topography (north-south ridgeline) and protect significant existing jarrah trees within key open space linkages and road reserves – **Creating a strong sense of place which builds upon the natural features of the are**a.
2.	Opportunity	Opportunity to provide a strong pedestrian/cycle pathway along the retained ridgeline through to the transit station/ neighbourhood centre and connecting up with the 'parkland linkage', ultimately creating a pedestrian/cycle circuit throughout the entire structure plan area – **Creating a strong sense of place which builds upon the natural features of the area**.
3.	Opportunity	The retained ridgeline will offer long views and vantage points towards the natural REW and surrounding lakes – **Creating a strong sense of place which builds upon the natural features of the area**.
4.	Opportunity	The eastern side of the development is characterized by a large REW, and smaller REW further east, that will be enhanced through revegetation while retaining a number of significant Flooded Gum and Melaleuca trees – **Creating a strong sense of place which builds upon the natural features of the area**.
5.	Opportunity	Opportunities to locate Public Open Spaces at natural low points to assist with co-locating drainage whilst retaining existing vegetation.
6.	Opportunity	Opportunity to co-locate open space/drainage (at natural low point) with 3.5-hectare primary school.
7.	Opportunity	General drainage direction informing location of POS/Drainage areas and orientation of street blocks.
8.	Opportunity	Opportunity to outflow larger storm-event drainage into adjacent CCW/REW areas.
9.	Opportunity	Opportunity to strengthen the (DSP) Parkland Linkage within open spaces, REW buffers and regional open space.
10.	Constraint	Retention of existing MUC and REW areas at risk due to containing degraded vegetation, whilst being compromised by planned DSP infrastructure.
11.	Constraints	CCW buffers encroaching into existing road reserves to be considered.
12.	Opportunity	Fauna/Pedestrian overpass/underpass to be considered: • Size, location and functionality of public open space areas to be considered.

LANDUSE		
Plan Reference	**Opportunity/ Constraint**	**Comment**
13.	Opportunity	Opportunity to create a mixed-use Neighbourhood Centre adjacent to the Transit station, creating a vibrant shopping and community core that services the daily needs of the local residents. Considerations include: • Retail core to be approximately 5 hectares in area with around 6,000m² (net) of commercial floor area including community facilities. • Highly activated main street, extending into the transit station, to support a mix of uses and small-scale businesses at street level. • Highway commercial land uses located along Lakeview Road benefiting from high exposure, being essential for commercial success. • Park and Ride site to be carefully integrated within the Neighbourhood centre, to minimise effect on walkable catchment. • Transit orientated development supports medium-high density residential/mixed-use development on the periphery of the centre.
14.	Opportunity	Opportunity to co-locate second Primary School with High School into one consolidated K-12 site, leveraging off the amenity of the adjacent neighbourhood centre and regional sporting facilities, with the aim of sharing facilities with both.
15.	Opportunity	Regional scale sporting fields, providing the community with signification facilities, offering a unique setting and opportunity for interaction and education – **Creating a strong sense of place which builds upon the natural features of the area**.
16.	Opportunity	Opportunity to ultimately create an extensive and vibrant 'Community Hub' by co-locating, consolidating and optimising synergies between the following land uses - retail, education services, civic/community uses and regional sporting facilities/ recreation nodes. A strong east-west pedestrian connection to be promoted from the transit station through to the recreational facilities further in the east, supported by the main street and retail core, civic and community uses and educational services (K-12).
17.	Opportunity	Opportunity to locate Primary School on flat land and central to the western school catchment, whilst optimising connectivity & walkability to the surrounding area.
18.	Opportunity	Linear strip of State Land providing a parkland 'buffer' between Coogee Road and proposed 'Suburban neighbourhood' development, whilst providing an opportunity to strengthen the parkland linkage.
19.	Opportunity	Opportunity to create a local activity node (off Coogee Road) by co-locating a local commercial use (e.g. café, sales office or other) with a landmark entry parkland, exploiting synergies between the two land uses, ultimately fostering the local community and creating a sense of place.
20.	Opportunity	Potential provision of Land Lease Community site, providing opportunity for additional housing affordability and diversity, whilst boosting the precincts population.

MOVEMENT		
Plan Reference	**Opportunity/ Constraint**	**Comment**
21.	Opportunity	'Transport Corridor' alignment (as per EWDSP) with Transit Corridor located on southern side to enable transit station to be adjacent to Neighbourhood Centre.
22.	Opportunity	Existing roads (Coogee, Lakeview and Rousett) providing legal road frontage access to site.
23.	Opportunity	Opportunity to realign DSP Coogee Road along existing alignment and extend through to integrator, diverting higher traffic volumes around low-key suburban neighbourhood.
24.	Opportunity	Opportunity to realign DSP Neighbourhood Connector along 'jarrah ridge' optimising driver/pedestrian experience.
25.	Opportunity	Opportunity to realign DSP Neighbourhood Connector to prioritise connection to eastern site boundary, maximising alignment within existing road reserves (Rousett and Lavina), regularise residential development and optimise exposure to regional open space.
26.	Opportunity	Opportunity to landscape over sunken Rail line/reserve improved green amenity and pedestrian/cycle movement.
27.	Opportunity	Opportunity for DSP Neighbourhood Connector to provide good connectivity to/from Primary School.
28.	Opportunity	Opportunity to introduce Neighbourhood Connector to provide improved accessibility across Franklin Road (Integrator) to amenity east of transport corridor.
29	Constraint	Roundabouts to be generally located at intersections of integrator and neighbourhood connectors, whilst being mindful of impeding pedestrian/cycle permeability.
30.	Constraint	Interface to Transport Corridor to be considered in relation to both acoustics and lot/road access
31.	Constraint	Access and circulation to Primary and K-12 to be provided/ considered.
32.	Opportunity	Opportunity for a strong pedestrian connection from transit station and pedestrian focused main street, past K-12 to the regional sporting fields to the east.
33.	Opportunity	Opportunity to utilise existing road reserves (Rousett and Lavina) to avoid lengthy and costly road closure processes. Road closure of (portion of) Rousett Road inevitable to achieve a regular urban structure. • The development will be connected through a network of pedestrian and dual-use paths, promoting an active lifestyle and integrating the development across both sides of the railway reserve.

BUILT FORM

Plan Reference	Opportunity/ Constraint	Comment
34.	Opportunity	DSP 'Suburban Neighbourhood' generally located outside 800m of Transit Station/Neighbourhood Centre, to provide low to medium density housing. DSP states minimum target of 15 dwellings per gross hectare.
35.	Opportunity	'Urban Neighbourhoods' generally located within 800m of Transit Station/Neighbourhood Centre, to provide medium to high density housing. DSP states minimum target of 20 dwellings per gross hectare, providing opportunity to deliver housing affordability and diversity.
36.	Opportunity	Opportunity to provide additional medium to high density housing adjacent to Neighbourhood Centre. DSP states minimum target of 25 dwellings per gross hectare, providing further opportunity to deliver housing affordability and diversity.
	Opportunity	Opportunity to realign DSP Neighbourhood Connector along 'jarrah ridge' optimising driver/pedestrian experience.

GENERAL

Plan Reference	Opportunity/ Constraint	Comment
37.	Opportunity	Opportunity for minor amendment to Precinct 15 boundary, to align with boundary of Parent Lot 1673.
38.	Constraint	Wellhead and associated WHPZ (300m buffer) to sensitive uses to be considered.
39.	Opportunity	Opportunity for road interface to periphery of site, wetland buffer, retained vegetation, etc to mitigate against bushfire threat.
40.	Opportunity	Proposed water main infrastructure within existing road reserve along western edge of site, to be considered.
41.	Constraint	Natural high points subject to earthworks.

3. LOCAL SENSE OF PLACE STATEMENT

A Local Sense of Place Statement has been developed for Precinct 15 and reflects the vision and the District Sense of Place Statement for East Wanneroo that has been developed by the City of Wanneroo. The Local Sense of Place Statement outlines how protection of the environmental, cultural and historical elements of Precinct 15 will be balanced with future development to establish a sense of place.

3.1 PRECINCT 15 CHARACTERISTICS

Precinct 15 is characterised by connections to bush and green spaces and a rural history of agriculture, cattle grazing and cultivating the land. The area has a village, small country town feel underpinned by a laid back lifestyle. The existing natural environment will be critical to create the sense of place, significant existing trees will be protected, topography will be retained and connections to wetlands will be strengthened.

The land has a gentle undulating landform with a predominant north-south ridgeline located on the western portion of the site. On the eastern portion of the site, the land is characterised by two low lying areas.

An existing ridgeline in the western area of Precinct 15, populated with large Jarrah trees, will be largely retained as public open space. The topography and significant existing trees (some in excess of 20m tall) will make this a prominent aspect of the development and will offer views and vantage points to the eastern wetland and Mariginiup Lake. Amongst the ridge line it is proposed to develop multiple shelters and picnic opportunities for community gatherings as well as playgrounds targeted at all age groups. The ridge line will be a feature of the development, offering opportunities for various user groups within a natural setting. The development will be connected through a network of pedestrian and dual-use paths, promoting an active lifestyle and integrating the development across both sides of the railway reserve.

The eastern side of the development is characterized by a large wetland that will be enhanced through revegetation while retaining a number of significant Flooded Gum and Melaleuca trees. Surrounding the wetland will be a regional scale sporting complex, offering a unique setting and opportunity for interaction and education The connection to the wetland will be celebrated, with boardwalks, loose gravel trails and interpretive signage explaining the history of the site from an Indigenous and colonial perspective as well as educational signage regarding native flora and fauna. This ensures the development has a strong connection with the surrounding existing environment both visually and culturally.

Sustainability will be a major component of the design over Precinct 15. This will be visually evident in the development through water management and conservation of the natural assets. As the new development introduces a range of modern materials these will be underpinned with a palette of earthy tones and the use of materials that reference the natural environment. Material choices will strongly reflect the existing Mariginiup character, use of crushed limestone, recycled timber and rural materials salvaged from site throughout the public realm shall compliment existing trees and landforms being retained.

The planting palette will contain predominately native and endemic species, the species will be selected in the context of the existing environment. The site also contains thousands of Grass Trees, which will be retained where possible and if not possible will be transplanted within public open space. This will create a sense of character within the development, reflective of the natural landscape.

The Structure Plan responds to the relevant place outcomes identified by EWDSP including:

- Parkland link,
- Regional playing fields,
- Large wetland feature,
- Neighbourhood centre,
- Railway and rail station, and
- High school.

The Parkland Link is part of a network that is of critical importance to East Wanneroo to ensure the wetlands, native vegetation and land forms are retained, and tell the story of the place. The Parkland Link in Precinct 15 will connect Lake Adams to the north with Lake Jandabup to the south. To maximise sense of place, the parkland links is proposed to be separate from on-road networks and connected to the open space network, however they may be adjacent to the road where this supports vegetation retention alongside road reserves.

The Structure Plan proposes the co-location of many community facilities – rail station, neighbourhood centre, high school and regional playing fields. Co-located community facilities tell the story of the local place through its design and surrounding public realm. These facilities and places will be focal points for the community and will deliver the sense of place for the area.

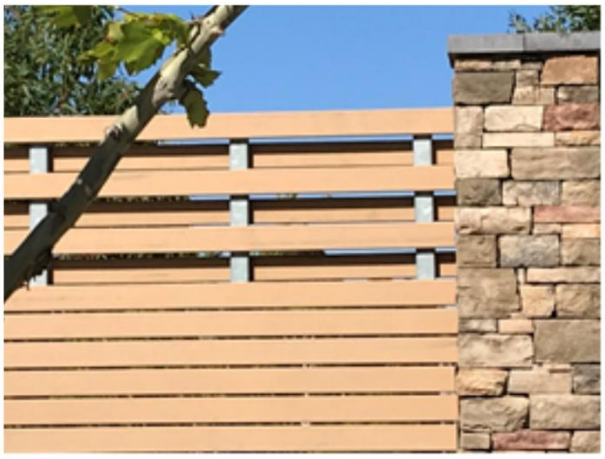
The Structure Plan incorporates the following elements that will contribute to the creation of a strong sense of place:

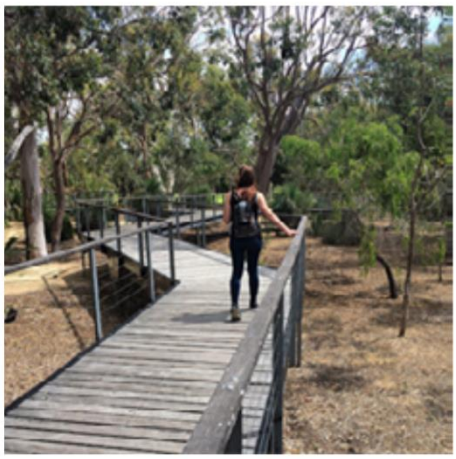
- Integrating POS with legibility, recreation, movement networks, tree and habitat conservation and WSUD
- Providing a range of recreational experiences through a hierarchy of POS and integrated with green links.
- Responding to key environmental and topographical features of the site,
- Design to create distinctive neighbourhoods/ villages defined by:
    - Clear edges and boundaries;
    - Distribution of POS provision;
    - Landscaping and tree retention; and
    - Built form and density.

























4. LAND USE AND SUBDIVISION REQUIREMENTS

4.1 LAND USE

The Structure Plan provides the framework for urban development at a level of detail that builds upon and refines the principles of the EWDSP whilst also remaining flexible in recognition of more detailed stages of planning as part of subdivision design.

The Local Structure Plan is included at **Figure 18**. It proposes the following land uses:

- Residential ranging from R25 to R80 in density
- Neighbourhood Centre
- Parks & Recreation Reserve (Regional Playing Fields / Regional Open Space)
- K-12 High school
- Primary School & co-located public open space
- Parkland Link
- Transit corridor - future railway line and regional road
- Railway station
- Additional Use – Local Centre
- Rural land with Tourism Opportunities
- Major road networks

An Illustrative Master Plan has been prepared to demonstrate how development could occur based on the principles and requirements of the LSP (refer **Figure 19**). It is important to note that the Master Plan represents only one way future development could occur. The design and lot layout will likely be refined at the time of subdivision.

Table 5: Land Use Summary

Land Use	Area (ha)
Residential	185
Neighbourhood Centre	6.5
Parks & Recreation Reserve	74.5
K-12 School	8
Primary School	3.5
Transit Corridor	8.87
Rural – Tourism Opps	1.15

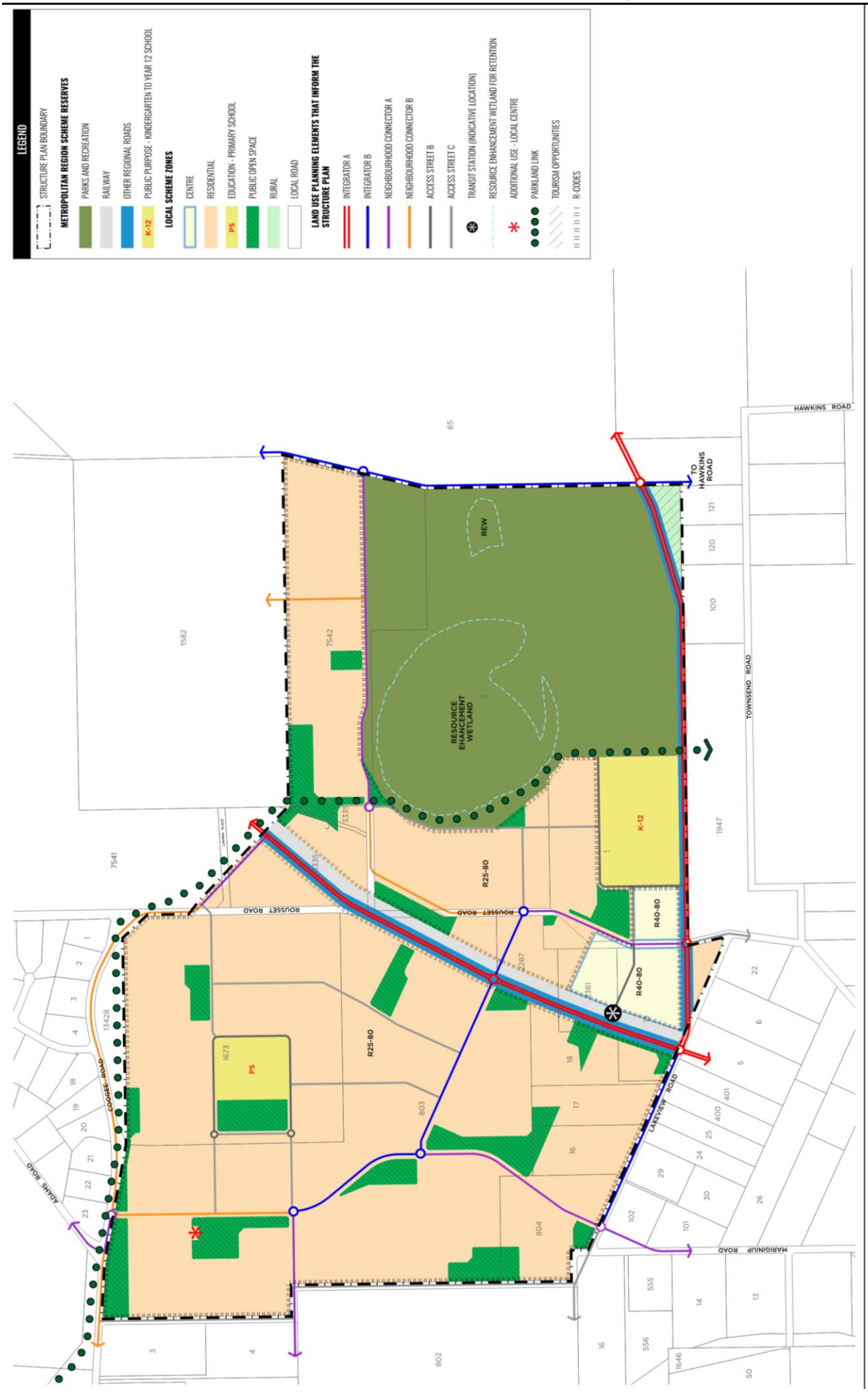


Figure 18 - Local Structure Plan Map

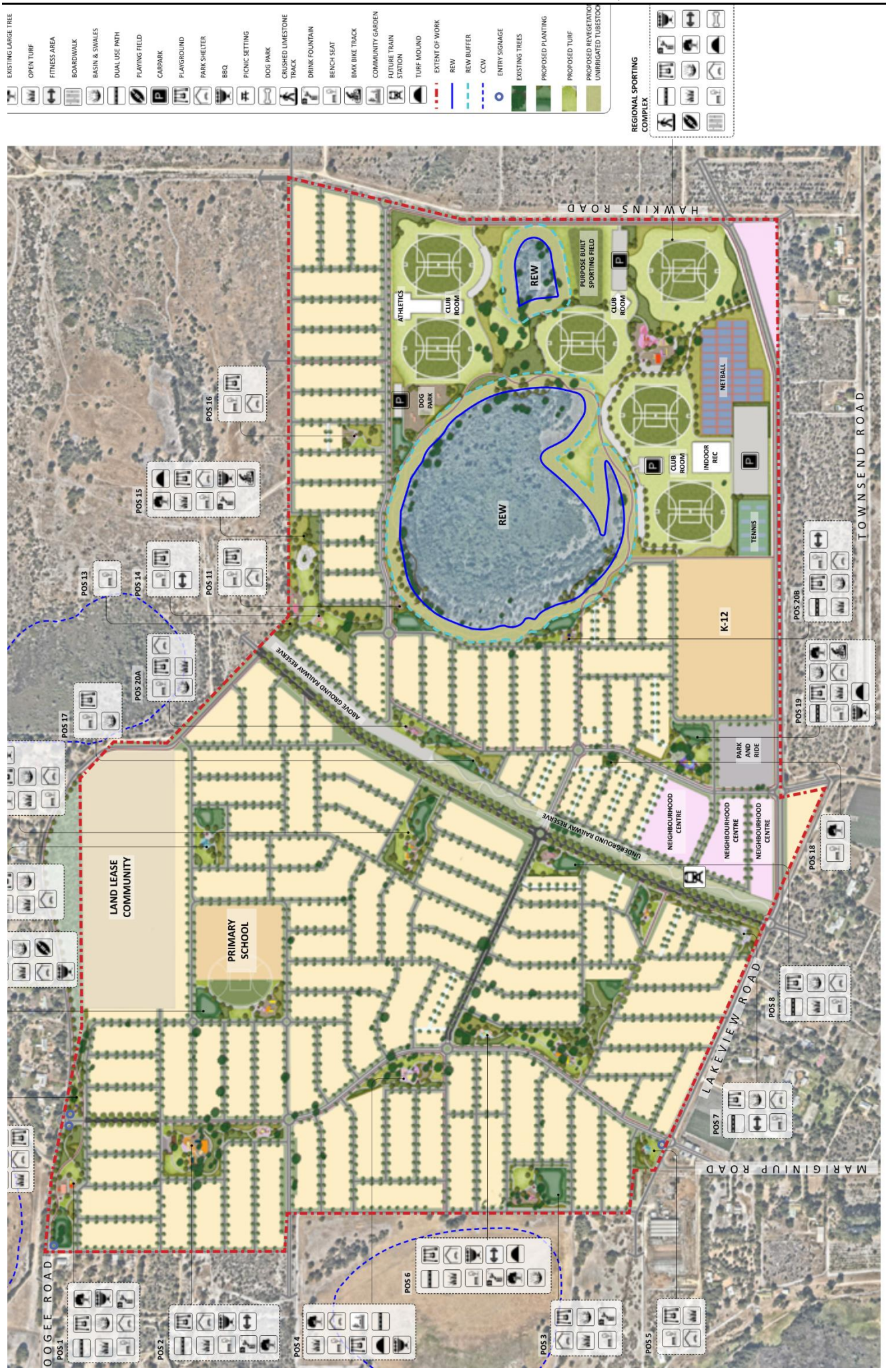


Figure 19 - Illustrative Master Plan (Source: Emerge)

4.2 RESIDENTIAL

A residential density range of R25 – R80 is proposed across the Structure Plan, with the exception of the Neighbourhood Centre which has a R40-R80 density range allocated. It is intended that the highest densities are located in proximity to the future train station, proposed neighbourhood activity centre and the regional open space. This is proposed to be controlled via location criteria included in Part 1.

A broad R Code range over the majority of the Structure Plan area is proposed in order to provide the necessary flexibility for subdivision design to respond to market demand and other issues as they arise over a development period that will likely be more lengthy than other structure planning areas. Comprehensive locational criteria are included in Part 1 of this Structure Plan that will guide how the higher densities can be applied over the site during the subdivision process. Part 1 of this Structure Plan also outlines the requirement for a Residential Code Plan to accompany a subdivision application. The Residential Code Plan will nominate the R Code for all proposed lots, and the Residential Code Plan is approved by the WAPC as part of the subdivision.

The EWDSP provides for a large area of 'Urban neighbourhood' in the southern area of Precinct 15 surrounding the activity centre and the future train station. The balance of the residential areas are nominated as 'Suburban neighbourhood' by the EWDSP. The EWDSP nominates the 'Urban neighbourhood' as medium to high density with R codes ranging from R25 – R-AC4, whilst 'Suburban neighbourhood' is nominated as low to medium density with R Codes ranging from R5 – R60. The R Codes proposed by the Structure Plan generally align with that provided for by the EWDSP in regard to 'Urban neighbourhood' and 'Suburban neighbourhood'.

This Local Structure Plan facilitates both higher density and lower densities, with the location of higher density to be guided by locational criteria. It is proposed that the higher density areas are provided for in areas surrounding the train station, neighbourhood centre and regional open space / playing fields.

4.2.1 DWELLING YIELDS AND DENSITY TARGETS

The Structure Plan provides for an estimated dwelling yield of 3,200 – 3,500 dwellings. The broad district level of planning undertaken as part of the EWDSP identified a dwelling yield of 3,800 dwellings within Precinct 15. More detailed land use planning undertaken as part of this Structure Plan has resulted in a slightly reduced dwelling yield due to greater certainty in land areas required for specific non-residential land uses. Based on an average of 2.9 persons per dwelling, the Structure Plan is likely to accommodate a future population of between 9,000 – 10,000 people.

Consistent with the EWDSP, the Structure Plan nominates a density target of 15 dwelling / gross urban hectare across the Structure Plan area, and targets higher densities of 20 -25 dwellings/ gross urban hectare in areas within 200m of the future train station and neighbourhood centre.

4.3 LAND LEASE COMMUNITY

The Illustrative Master Plan shows a potential Land Lease Community at the northern boundary of Precinct 15, This is an over-50's lifestyle community concept that differs from traditional models of retirement housing. These lifestyle communities are exclusively for owner-occupiers aged over 50. Residents purchase a stand-alone home and sign a lease (site agreement) to pay rent (site fees) on the freehold land on which the home sits. The land remains the property of Stockland. Owners hold their land lease in perpetuity, meaning the lease agreements lasts as long as their ownership. The site agreement provides a contractual right to occupy the land and gives residents non-exclusive use of the community's common areas and communal facilities.

Land lease communities are very popular overseas and in other Australian states, with more than 900 such communities already successfully operating in Australia. The community is designed to look very similar to a regular suburban development.

4.4 NEIGHBOURHOOD CENTRE

Consistent with the EWDSP, a Neighbourhood Centre is proposed to be located immediately east of the future train station. The location of the Neighbourhood Centre will provide it with good exposure and accessibility for residents within the East Wanneroo area. The location at the corner of Lakeview and Franklin Roads (both integrator arterial roads) maximises passing trade opportunities.

The Neighbourhood Centre encompasses an area of approximately 6.5 hectares. The EWDSP identifies this neighbourhood centre as accommodating in the order of 6,000m^2 of

total commercial floorspace. This encompassing approximately 4,200m² shop/retail floorspace, with the balance 1,800m² accommodated by office uses. It is anticipated that the neighbourhood centre will deliver community, education and health services as well as a residential component. It is estimated that a 6,000m² neighbourhood centre will be viable by 2030 based on expected population growth and spending in the catchment.

The layout of the neighbourhood centre shown on the Illustrative Master Plan was largely based on the six principles of economic activation:

- Purpose of place,
- Access – arrival points,
- Origins – car parking and transport nodes,
- Exposure – pedestrian movement,
- Destinations - major attractions, and
- Control – strategic sites.

The key element is the location of the neighbourhood centre between the future railway station and the Park & Ride facility and High School and the definition of a strong "main street" through the neighbourhood centre connecting these land uses. This will bring people through the neighbourhood centre to access the train station and maximise the potential vibrancy of the centre and supports walkability for multi-purpose trips. Further detail regarding the six principles of economic activation is included in the Precinct 15 East Wanneroo Economic Development and Employment Report prepared by Pracsys (refer **Appendix 5**).

Prior to subdivision or development of the Neighbourhood Centre, a Precinct Plan is to be prepared for the Neighbourhood Centre (land shown in the Centre Zone on **Plan 1 – Structure Plan Map**) and endorsed by the WAPC. This is required to provide built form and public realm design guidance.

4.5 LOCAL CENTRE

The Structure Plan provides for an 'Additional Use – Local Centre' at the north western area of the site. The intent is to allow for local centre land uses to be developed within the initial stages of residential development to service the emerging residential community. Land uses envisaged would include convenience store, office, restaurant/café and shop. This area is likely to be the first stage of subdivision and development and therefore such uses could be integrated as part of a sales centre development that will service the land release programme within Precinct 15.

4.6 EDUCATION FACILITIES

Based on the estimated dwelling yield of 3,200 – 3,500 dwellings, the Structure Plan area is required to provide 2 primary schools and 1 high school.

The Structure Plan proposes one primary school and one co-located primary school and high school site (K-12), this achieving one high school and 2 primary schools. It is noted that the EWDSP indicates that three (3) primary schools may be required within Precinct 15. However, consultation with the Department of Education during the preparation of the Structure Plan has confirmed that the provision of 2 primary schools is adequate based on the estimated dwelling yield.

4.6.1 K-12 SCHOOL

The EWDSP requires a high school to be provided within Precinct 15 with an indicative site located north west of the future railway station and neighbourhood centre. An alternative location for the high school is proposed in order to encapsulate the opportunity to co-locate the high school with the regional playing fields and provide for sharing of facilities and infrastructure across these two land uses.

The high school is proposed as an 8 hectare co-located primary and high school site (K-12). The K-12 school is to be located abutting the Regional Playing Fields at the southern boundary of Precinct 15, adjacent to Lakeview Road.

It is noted co-located primary and high school sites are expected to be provided at 10 – 12 hectares in area. However, the location of this K-12 school site immediately adjacent to the regional playing fields enables the school site area to be reduced as the school can use the Regional Open Space as its oval space during school hours when the space is not utilised by the public.

It is noted that the location of schools adjacent to retail activity center is not preferred by the Department of Education. Accordingly, the proposed high school site will be separated and buffered from the proposed Neighbourhood Centre with the medium density residential or a Park & Ride area should the rail proceed (refer **Figures 18 and 19**).

It is noted that the EWDSP shows the indicative location of the high school with Suburban Neighbourhood whilst the Local Structure Plan proposes the high school within an EWDSP Urban Neighbourhood area. However, the Structure Plan provides for higher densities in the Neighbourhood Centre and immediate surrounds and also provides for higher densities, up to R80, in all other areas which can be designed into subdivisions based on the locational criteria included in Part 1 of this Structure Plan. Therefore, it is submitted that the proposed location of the high school will not prejudice the ultimate provision of 'Urban neighbourhood' densities within the Local Structure Plan area in the appropriate spaces based on locational criteria that espouse orderly and proper planning.

Consultation has occurred with the Department of Education and the Department of Planning, Lands and Heritage regarding the proposed location of the high school. In principle support has been received from both stakeholders to co-location of the high school adjacent to the regional playing fields in the interests of achieving efficient land use synergies and providing logical opportunities to share facilitates and infrastructure. Preliminary consultation has also been undertaken with the Department of Education in regard to the proposed K-12 school format and this will continue during the advertising and assessment stages of this Local Structure Plan.

4.6.2 PRIMARY SCHOOL

A second primary school is proposed in the north western portion of the Structure Plan area. The site is proposed at 3.5 hectares and is shown to be co-located with an adjacent area of public open space. The primary school is central to the residential area and will be provided with road frontage on all sides.

4.7 TREE RETENTION

Tree retention along the natural ridgeline has been the key focus during the Structure Plan design. The Structure Plan design allows for the retention of the natural ridgeline and protection of these trees within public open space(s) and appropriate road reserves. The intention is to retain and protect these significant trees to the extent that is practical and feasible at subdivision design. These trees will make a most significant contribution to the local sense of place at Precinct 15, as discussed at Section 3.1.

4.8 REGIONAL PLAYING FIELDS/ OPEN SPACE

As required by the EWDSP, the Structure Plan provides 74.5 ha of Regional Playing Fields and Open Space at the south eastern corner of Precinct 15. This includes approximately 47 hectares of space for Regional Playing Fields and the balance of space for Regional Open Space and the protection of the large resource enhancement wetland. This land will ultimately be reserved under the MRS for Parks & Recreation as part of a MRS Amendment for public lands, following approval to this Structure Plan.

This space contains a large Resource Enhancement Wetland (REW) in the north western corner which is to be retained. The smaller REW in the eastern area can also be retained as part of the space, subject to detailed design and the priority need for this space to function as regional playing fields.

The Illustrative Masterplan (**Figure 16**) provides an indicative layout. The sporting facilities shown are consistent with those listed within the City of Wanneroo's East Wanneroo Community Facilities Plan.

4.9 PUBLIC OPEN SPACE

The Structure Plan (**Figure 18**) establishes a framework for the delivery of 10% public open space (POS) that can serve a variety of functions balancing active and passive recreational pursuits and delivering key drainage functions. POS areas are well distributed and designed to create local amenity and identity. The location and form of the POS areas have also be determined taking into consideration retention of mature trees.

Variations to the location, size and function of POS areas can be considered as part of subdivision applications and in response to detailed design processes.

4.9.1 PUBLIC OPEN SPACE SCHEDULE

Based on the Illustrative Masterplan, a POS Plan has been prepared order to demonstrate the delivery of 10% POS across the Structure Plan area (refer **Figure 19**). A POS Schedule has been prepared incorporating drainage requirements embedded in the Local Water Management Strategy (refer **Figure 20 - POS Schedule**). The Schedule demonstrates compliance with the 10% creditable POS requirement in accordance with Liveable Neighbourhoods guidance and

WAPC's Development Control (DC) *Policy 2.3 Public Open Space in Residential Areas*.

The POS Schedule will be continually reviewed during more detailed subdivision and engineering design stages, as drainage provision, earthworks and nett residential development cells are further adjusted.

4.9.2 PARKLAND LINK

Consistent with the EWDSP, a Parkland Link has been provided generally aligning with the northern boundary of the Structure Plan area, then running southwards along the western boundary of the retained wetland and proposed regional playing fields. It links the conservation category wetlands to the north of the site with the wetland and regional playing fields within the Structure Plan area. The link will take the form of landscaped boulevard style roads and linear pedestrian and cyclist movement networks within public open spaces to enhance the amenity and connectivity through the Structure Plan area.

4.9.3 FORESHORE STRATEGY

A Foreshore Strategy has been prepared as part of the Environmental Assessment Report prepared by Emerge (refer **Appendix 1**). The foreshore areas include:

- Wetland core areas;
- Wetland buffer areas; and
- Public open space areas adjacent to wetland buffers.

The Foreshore Strategy describes the proposed function, intended land uses and infrastructure, conservation areas and management approach for the foreshore areas.

4.9.4 POS MASTERPLAN

A POS Masterplan has been prepared by Emerge to provide a conceptual landscape layout and spatial activity plan for the Regional Playing Fields and all POS areas (refer **Appendix 6**).

The POS Masterplan rationalises the POS land areas, POS hierarchy, required drainage provision and suggested landscape form and intended long term development. An indicative layout is shown across the regional playing fields, all local POS areas and the underground train corridor.

PUBLIC OPEN SPACE SCHEDULE (Ha.) MARIGINIUP - PRECINCT 15 (based on Plan STOMA-1-010M)		
Precinct 15 Gross Area		
TOTAL Tranch 1 (Stockland Landholding)		121.294
TOTAL Tranch 2 (Balance)		186.698
Total Precinct 15 Gross Area		307.992
ADD Area outside of Precinct 15 - Lot 1673 (part of)		2.545
Gross Site Area		310.537
Minus Deductions		
Neighbourhood Centre		4.761
Sales/Café Site		0.080
Park and Ride		1.784
Land Lease		12.468
Employment Area		0.000
Regional Sporting Fields (RSF) Area - excludes small and large REWs + buffers		44.764
REW Core (larger REW)		20.203
REW Core (smaller REW)		1.207
Transport Corridor (29.5m Rail Reserve)		3.816
Transport Corridor (40.5m Integrator Arterial Road - Franklin Road Extention)		5.052
Other Regional Road (Lakeview Road)		3.709
One (1) Primary School		3.500
One (1) K-12		8.000
Rural		1.154
(part) Lot 44 (reserve through POS 14)		0.151
Lavinia Road Reserve		0.000
Rousset Road Reserve (minus road closure)		2.940
First 15mm Bioretention Basin Area (Pentium 1m/day infiltration - 7 June 2023)		1.590
Surplus Restricted Open Space		
20% AEP exclusive of first 15mm Bioretention Basin Area (Pentium 1m/day infiltration - 7 June 2023)	2.173	
REW Buffer (larger REW)	6.7010	
REW Buffer (smaller REW)	1.6200	
Total Surplus Restricted Open Space		10.494
	Total Deductions	125.673
	Gross Subdivisible Area	184.865
Maximum 2% Restricted POS Permitted		3.697
Minimum 8% Unrestricted POS Required		14.789
	10% POS Requirement	18.486

RESTRICTED POS Provided	
REW Buffer	0
20% AEP exclusive of First 15mm Bioretention Basin Area (Pentium 1m/day infiltration - 7 June 2023) (maximum 2% Restricted POS)	3.697
Creditable Restricted POS Provided	**3.697**
Surplus 20% AEP exclusive of first 15mm Bioretention Basin Area (Pentium 1m/day infiltration - 7 June 2023)	**2.173**

TOTAL POS Provided

POS Area	Gross POS Area	Pentium Drainage (7 June 2023)			Creditable Restricted POS (20% AEP)	Creditable Unrestricted POS	TOTAL CREDITABLE POS
		First 15mm Bioretention Basin Area	20% AEP Drainage (incl.Bio)	20% AEP Drainage (excl. Bio) [1]			
POS 1	1.431	0.175	0.175	0.000	0.000	1.256	1.256
POS 2	2.022					2.022	2.022
POS 3	1.322	0.268	0.268	0.000	0.000	1.053	1.053
POS 4	1.134					1.134	1.134
POS 5	0.366					0.366	0.366
POS 6	2.945	0.035	0.463	0.428	0.269	2.482	2.751
POS 7	1.173	0.108	0.580	0.472	0.298	0.593	0.891
POS 8	0.660	0.114	0.552	0.438	0.276	0.108	0.384
POS 9	1.819	0.167	1.600	1.434	0.903	0.219	1.122
POS 10	0.423	0.000	0.000	0.000	0.000	0.423	0.423
POS 11	0.446	0.121	0.121	0.000	0.000	0.325	0.325
POS 12	1.401	0.167	1.230	1.064	0.670	0.171	0.841
POS 13	0.149					0.149	0.149
POS 14	0.600					0.600	0.600
POS 15	1.921					1.921	1.921
POS 16	0.494					0.494	0.494
POS 17	0.448	0.067	0.423	0.356	0.224	0.025	0.249
POS 18	0.102					0.102	0.102
POS 19	1.281	0.121	1.041	0.920	0.579	0.240	0.819
POS 20A	0.633	0.035	0.246	0.211	0.133	0.387	0.520
POS 20B	0.827	0.135	0.135	0.000	0.000	0.692	0.692
POS 21	0.900	0.077	0.626	0.549	0.346	0.274	0.620
TOTALS	**22.496**	**1.590**	**7.461**	**5.871**	**3.697**	**15.035**	18.732
						PERCENTAGE POS PROVIDED	10.13%
						POS Surplus	**0.2458**

[1] >First 15mm Bioretention from POS catchment 1, 3, 11, 16 & 20B to overflow into adjacent REW/CCW/13428.

Figure 20 - POS Schedule



Figure 21 - Public Open Space Provision Plan

4.10 MOVEMENT NETWORK

A Transport Impact Assessment has been prepared by Transcore, refer **Appendix 7**. The Transport Impact Assessment demonstrates that Precinct 15 can be supported by the movement and traffic network depicted on the Structure Plan. This section provides a summary of the key elements of the Transport Impact Assessment including details of the existing and proposed road networks, the road hierarchy and traffic generation. Further consideration is also given to public transport, cyclist and pedestrian network provision.

4.10.1 *EXISTING ROAD NETWORK*

The existing road network within and abutting the Precinct 15 comprises the following:

Coogee Road is an east-west road that abuts the northern boundary. It is constructed as a two-lane rural road with sealed width of approximately 6m and unsealed shoulders. It terminates as a cul-de-sac near the Rousett Road reserve.

Rousset Road is a north south road that traverse through the centre of Precinct 15. It extends northwards from the Franklin Rd / Caporn St intersection as a two-lane rural road with sealed width of approximately 6m and unsealed shoulders. The sealed section of Rousset Road ends approximately 500m north of the Lakeview Road intersection. The remainder of Rousset Road is an unsealed road.

Lakeview Street abuts the southern boundary. It is constructed as a two-lane rural road with sealed width of approximately 5.5 to 6m and unsealed shoulders.

4.10.2 *DISTRICT STRUCTURE PLAN ROAD NETWORK*

The EWDSP provides an overall plan to ensure coordination of future development of the subject site and the surrounding area. This structure plan respects the principles and external connections of the EWDSP to ensure that good connectivity and integration with the surrounding area are achieved.

The future arterial road network within the EWDSP area embodies the following key features that are of particular relevance to Precinct 15:

- Lenore/Franklin Road (integrator arterial) – north south arterial road running through the centre of Precinct 15;
- Lakeview Road (integrator arterial) – east west arterial road along the southern boundary of Precinct 15 from Lenore/Franklin Road to Whiteman Yanchep Highway;
- Hawkins Road (integrator arterial) – north south arterial south of Lakeview Road; and
- Boundary Road (neighbourhood connector) – eastern boundary of Precinct 15.

4.10.3 *RAILWAY*

The EWDSP shows a future underground / above ground railway corridor along the Lenore/ Franklin Road alignment within Precinct 15. However, it should be noted that the EWDSP also identifies an alternative alignment for this future railway line within a 22-metre median along the Whiteman Yanchep Highway located outside of and east of Precinct 15. This local structure plan provides for the Lenore/Franklin transit corridor alignment to accommodate this option pending a final decision on this future rail alignment.

4.10.4 *PROPOSED ROAD NETWORK*

The proposed hierarchy of roads in and around Precinct 15 is illustrated in **Figure 22**. The classification of roads is based on preliminary analysis of future traffic flows provided within the TIA (refer **Appendix 7**).

Proposed road cross-sections for the Integrator A roads are provided in the East Wanneroo District Structure Plan Road Planning Study report (11 Sept 2019). Two cross-sections for this section of Franklin Road are included at Appendix B of the TIA. Option 1 (outside of neighbourhood and district centres) has 6m median, 3.5m traffic lanes and 2m cycle lanes in a 35m road reserve. Option 5 (through the neighbourhood centre) adds two 3m parking lanes and increases the road reserve to 40.5m.

Standard cross-sections from the WAPC Liveable Neighbourhoods policy for the Integrator B, Neighbourhood Connectors and Access Streets are shown in Appendix B of the TIA.

4.10.5 *TRAFFIC IMPACT AND VOLUMES*

Daily traffic flows generated by the local structure plan and through traffic generated by the rest of the EWDSP area have been assigned on the proposed road network to determine future, full development, daily traffic flows. The traffic flows generated will result in approximately 32,000vpd of internal-to-external

trips or external-to-internal trips across the Precinct 15 boundary, as well as internal traffic flows between land uses within Precinct 15.

The resultant total daily traffic flows on the proposed road network are shown in **Figure 23**. The component of these total traffic flows that has an origin or destination within the structure plan area is shown in brackets.

4.10.6 INTERSECTIONS

The East Wanneroo District Structure Plan Road Planning Study report (2019) identifies the Franklin Road / Lakeview Road 4-way intersection and the Lakeview Road / Hawkins Road / Boundary Road 4-way intersection as future signalised intersections. The EWDSP indicates the Franklin Road / Lakeview Road 4-way intersection and the Lakeview Road / neighbourhood connector 4-way intersection as future signalised intersections but does not indicate a signalised intersection at the Lakeview Road / Hawkins Road / Boundary Road intersection. Accordingly, those two major 4-way intersections on Lakeview Road at the neighbourhood centre should be planned as signalised intersections, which will also facilitate pedestrian and cyclist movements across Lakeview Road to this activity centre.

Other major intersections on the arterial roads would either require traffic signals or a roundabout to provide sufficient capacity for right turn movements. There is generally a preference for roundabouts at these intersections unless it can be demonstrated that traffic signals would operate at a better level of service than signals. Accordingly, those other intersections will generally be indicated as roundabouts in the LSP.

Other minor 4-way intersections at intermediate locations can be treated with threshold treatments such as raised plateaus or brick-paved sections on the minor road legs to reduce speed and raise driver awareness of the intersection and the need to give way on those minor road approaches.

The location and type of intersection treatment of key intersections are shown in **Figure 24**. The results of the SIDRA analysis are summarised in Appendix C of the TIA and satisfactory intersection performance is shown for each of the intersections assessed.

4.10.7 DIRECT ACCESS

The WAPC Liveable Neighbourhoods policy requires that *"Development along integrator B and neighbourhood connector streets with ultimate vehicle volumes over 5,000 vehicles per day should be designed either so vehicles entering the street can do so travelling forward, or are provided with alternative forms of vehicle access."*

There is to be no direct driveway access to residential development from the Integrator A roads – Franklin Road and Lakeview Road. Driveway access to car parks for the K-12 school and regional sporting facilities would be appropriate subject to detailed design of access arrangements as part of those future development applications.

Other roads carrying more than 5,000vpd include each of the Integrator B roads and some of the Neighbourhood Connector A roads, particularly around the neighbourhood centre. Residential subdivisions along those roads would typically involve lot access via side roads or rear laneways. Another alternative suggested in Liveable Neighbourhoods involves wider lots with paired driveways and protected reversing areas in the parking lane but this would need to be coordinated by local development plans for those local areas.

All of the other roads are expected to carry less than 5,000vpd, so no restriction on vehicular access is required.

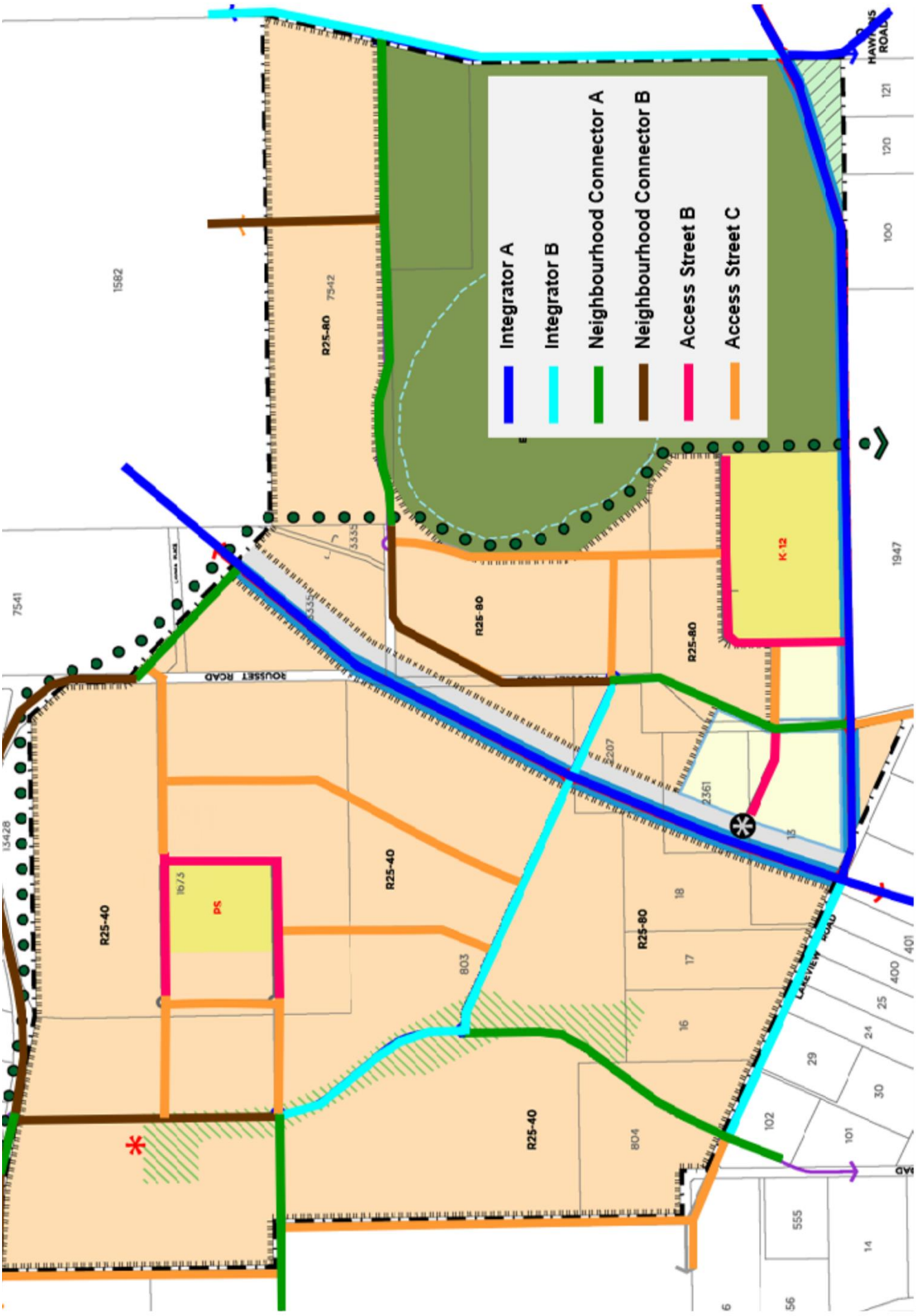


Figure 22 - Road Hierarchy (Source: Transcore)

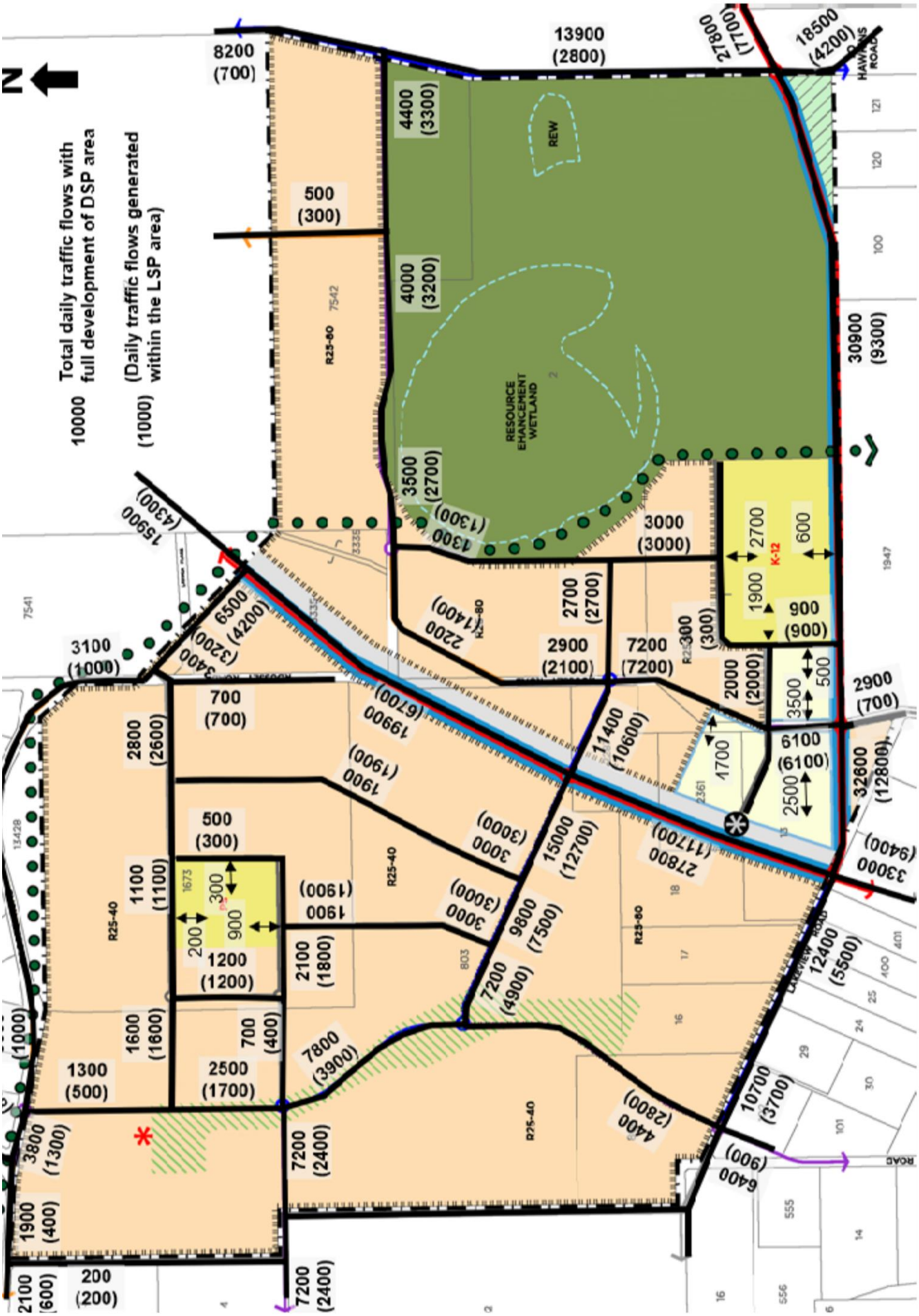


Figure 23 - Traffic Volumes (Source: Transcore)

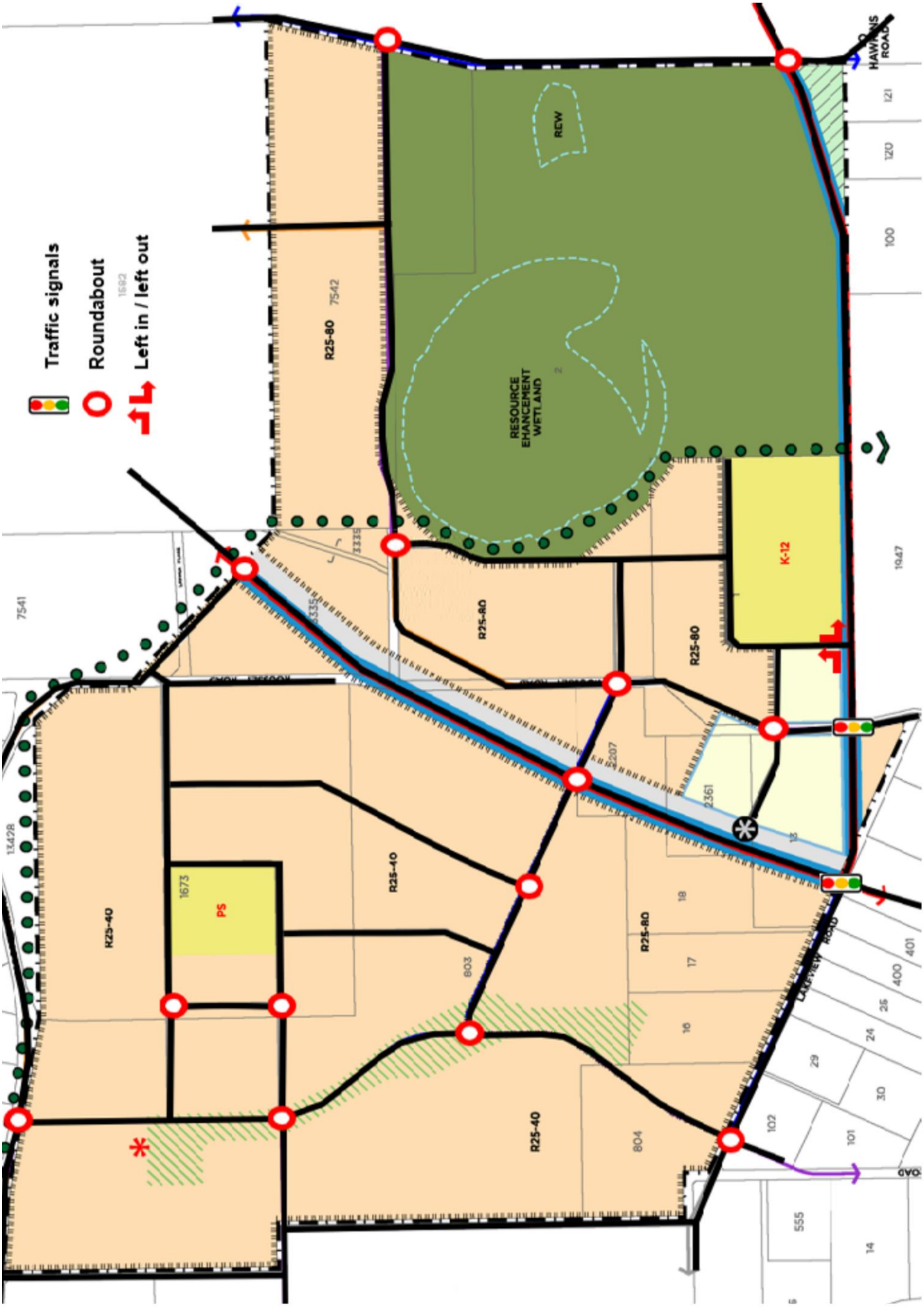


Figure 24 - Intersection Treatments (Source: Transcore)

4.10.8 PUBLIC TRANSPORT

The closest existing bus routes to the subject site include:

- Route 389: Perth – Wanneroo (closest stop Steven St before Dundebar Rd, Wanneroo)
- Route 390: (Joondalup Station – Banksia Grove (closest stop Joondalup Dr before Pinjar Rd, Banksia Grove)
- Route 467: Whitfords Station – Joondalup Station (closest stop Elizabeth Rd before Dundebar Rd, Wanneroo)

The closest bus stop for route 390 is approximately 2.5km west of the LSP area and the closest bus stops for routes 389 and 467 are approximately 4km southwest of the LSP area.

All of the proposed neighbourhood connectors and integrator arterial roads would have paths on both sides in accordance with Liveable Neighbourhoods guidelines, including a shared path on one side. Paths would be required on at least one side of all roads in accordance with Liveable Neighbourhoods guidelines.

The structure plan accommodates the underground / above ground railway corridor indicated in the EWDSP running north south through the middle of this precinct with a future Mariginiup Station and associated park & ride facility located adjacent to the neighbourhood centre site. This transit corridor runs along the Lenore/ Franklin Road alignment and will be the main public transport spine. The Park & Ride car park has been sized to accommodate 2,000 car bays.

All of the proposed neighbourhood connectors and integrator arterial roads would be of suitable standard to accommodate bus services through this area, providing suitable options for future feeder bus routes to the station and neighbourhood centre to service this area. This allows suitable flexibility for the Public Transport Authority to plan future bus routes within this area.

4.10.9 PEDESTRIANS AND CYCLISTS

High-level future planning for cycling facilities is now set out in Western Australia's Long Term Cycle Network (LTCN). The LTCN in the East Wanneroo area shows future primary routes, secondary routes and local routes. A primary route is planned on the north south arterial / transit corridor through the LSP area. A north south secondary route is planned on Boundary Road – Hawkins Road (eastern boundary) and an east west secondary route is planned on Townsend Road – Lakeview Road and diagonally northwest across the corner of Precinct 15 to Coogee Road. A number of local routes are also shown within the LSP area.

On-street cycle lanes are normally included only on Neighbourhood Connector A roads and above, due to traffic flows above 3000vpd on these categories of roads.

The resultant path network associated with the road network is indicated in **Figure 25**. This does not include paths outside of the road network, such as within public open space.

The proposed network of footpaths and shared paths for pedestrians and cyclists will provide an excellent level of accessibility and permeability for pedestrians and cyclists, and connections to neighbouring precincts at strategic locations.

The WAPC *Transport Impact Assessment Guidelines (2016)* provides guidance on the levels of traffic volumes that are likely to affect the ability for pedestrians to cross various types of road. Based on that guidance an undivided two-lane road should be acceptable for pedestrians crossing traffic volumes of up to approximately 11,000 vpd and this threshold can be increased to around 28,000 vpd by adding a central median or pedestrian refuge islands. On a four-lane road, because of its greater carriageway width, this threshold is lower; even with a median island the threshold is only around 16,000 vpd.

Only Franklin Road and Lakeview Road are expected to carry future traffic flows above these levels. The future K-12 school site north of Lakeview Rd, the railway station east of Franklin Road, the neighbourhood centre and the regional sporting facility will all be significant generators of pedestrian and cyclist movements across Franklin Road and Lakeview Road.

The signalised intersections at Franklin Rd / Lakeview Rd and at the north south neighbourhood connector intersection on Lakeview Road will include appropriate pedestrian facilities to assist pedestrians and cyclists crossing those roads at those locations. An additional pedestrian crossing facility should be provided on Franklin Road at the future rail station location to assist pedestrian and cyclist movements from residential areas west of Franklin Road to access the station, neighbourhood centre main street, K-12 school

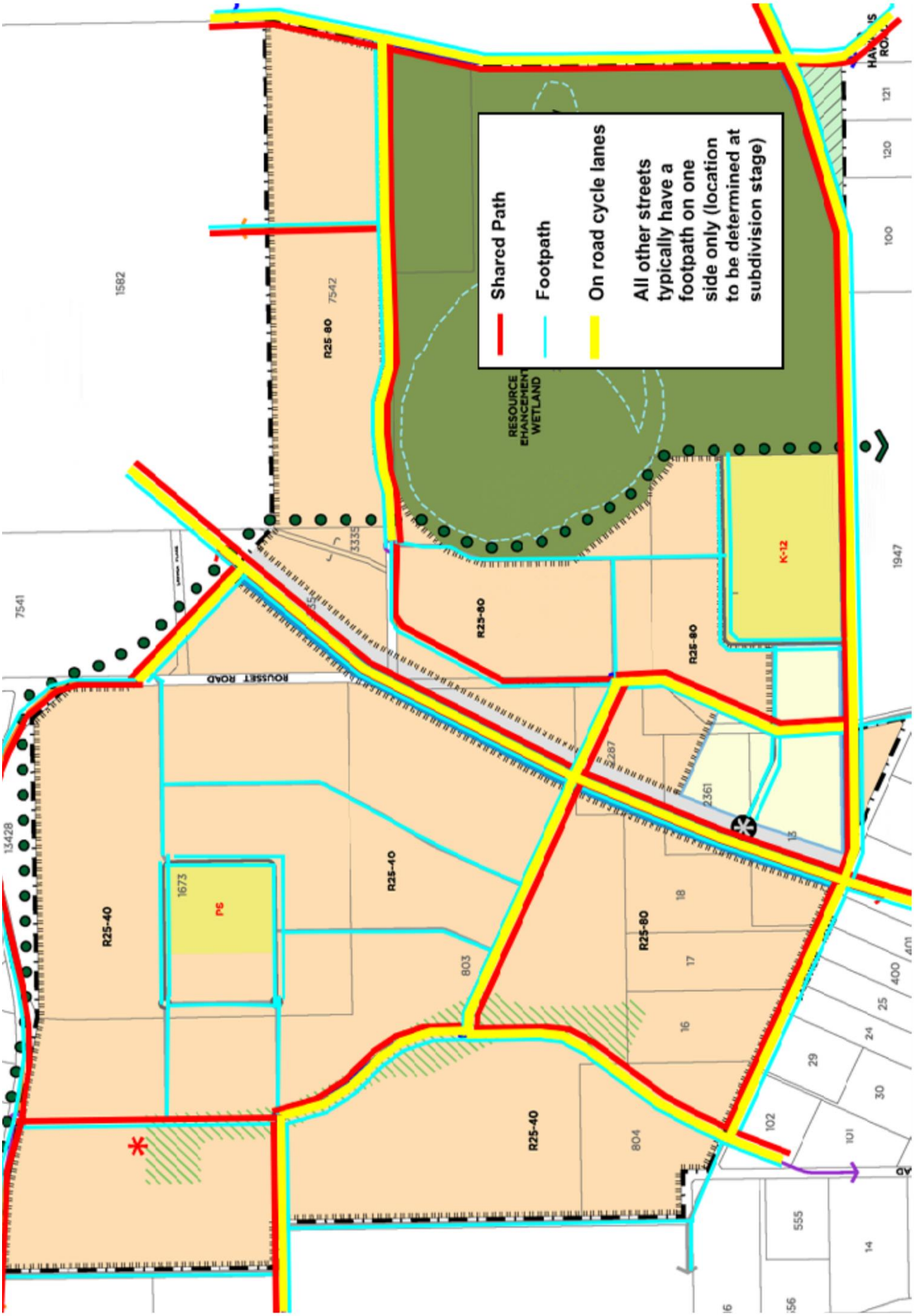


Figure 25 - Path Network (Source: Transcore)

and regional sporting facilities. This could be in the form of a signalised pedestrian crossing when traffic and pedestrian numbers warrants for that type of facility, or potentially a pedestrian underpass as part of a future underground rail line project.

4.11 NOISE MANAGEMENT

Pursuant to the EWDSP, a future passenger rail line is proposed to be underground with the exception of the section located in the northern area. Herring Storer prepared an acoustical assessment to review the compliance with *State Planning Policy 5.4 Road and Rail Noise (SPP 5.4)* (refer **Appendix 4**). The acoustic assessment was conducted over that portion of the railway that will not be underground pursuant to the EWDSP. Noting that the railway does not yet exist, predictive noise modelling software was utilised for the purpose of assessing future noise levels.

The results of the acoustic assessment indicate that noise received at residences located adjacent to the passenger rail line would exceed the "Noise Targets" as outlined in SPP 5.4. To address this the possible noise amelioration options that are can be considered at subdivision stages are setbacks or buffer areas, noise bunds and / or barriers (noise walls) and "Quiet House" design.

The acoustic assessment is provided as overall guidance for the Structure Plan. Once detailed information is available at subdivision stage, such as final levels, lot placements etc, more detailed acoustic assessment should be undertaken to account for noise emanating from the transit corridor comprising the railway and the Other Regional Road.

4.12 WATER MANAGEMENT

A District Water Management Strategy (DWMS) was prepared on behalf of DPLH to support the EWDSP in 2021. The DWMS provides a summary of the existing water resources and environmental conditions within the EWDSP area to demonstrate that the land is capable of development. The DWMS highlights the need for a more detailed investigation for individual precincts including the preparation of a local water management strategy (LWMS) and urban water management plans at later planning stages.

This DWMS confirmed that groundwater across the EWDSP is likely to rise approximately 4-5 metres post development. The DWMS anticipates that groundwater rise should be managed by "Controlled Groundwater Levels" and dealt with through a network of subsoil pipes gravitating to strategically located tanks and pumps that controls future groundwater levels to the pre-development levels (or existing levels).

4.12.1 *LOCAL WATER MANAGEMENT STRATEGY*

A LWMS has been prepared for the site by Pentium Water and provides a comprehensive assessment of the existing hydrological settings within the site. Refer **Appendix 8**.

The LWMS demonstrates that the land has the capacity to support the proposed land use change with best practice water management outcomes in terms of water supply, stormwater, surface water and groundwater management. The LWMS will recognise the principles, objectives, and requirements of total water cycle management as outlined in the *State Planning Policy 2.9 Water Resources (Government of WA, 2006)*, *Liveable Neighbourhoods (WAPC, 2007)* and the *Stormwater Management Manual for WA (DWER, 2004 – 2007)*, including the *Decision process for stormwater for stormwater management in WA (DWER, 2017)*.

The LWMS also broadly states the water quantity and quality management objectives to be achieved.

The proposed development will include total water cycle management principles and objectives guided by the *Better Urban Water Management Framework (WAPC 2008)*. The LWMS also provides a synthesis of the project methodology and provides a detailed strategy to address all key issues associated with the project delivery.

4.12.2 *GROUNDWATER MANAGEMENT*

A district groundwater management scheme will control post-development groundwater level rise through subsoil drainage in areas that are likely to either become inundated or have shallow depth to groundwater if no groundwater control measures are implemented. The groundwater management scheme is to be informed by a detailed groundwater model that is currently under development. In the absence of the groundwater model results and the groundwater management scheme design, planning must follow requirements stipulated in the *DWMS (Urbaqua, 2021)*. The structure plan will accommodate the outcomes of the future engineering design and has allowed for

additional land area and infrastructure within road reserves to manage additional pipelines used to convey groundwater.

4.12.3 GROUNDWATER CONTROL

The DWMS proposed the controlled groundwater level (CGL) be represented by the 1986 to 1995 AAMGL, but notes:

- The impacts of using an AAMGL rather than MGL (maximum groundwater level) as the CGL near wetlands and important environmental values will require further consideration when detailed modelling is undertaken for the preparation of the local water management strategy for each precinct.

The DWMS also states:

- Where local structure planning is proceeding in advance of the detailed local groundwater modelling being available, the local structure plan must:
    - Install groundwater management systems (subsoil drains) at invert levels based on the determined controlled groundwater level (CGL) in areas where the predicted future groundwater level is within 2m of the future design surface.

The CGL, clearance of the drainage basins to CGL, and subsoil drainage extent have been assessed in accordance with the requirements specified in the DWMS.

4.12.4 GROUNDWATER MANAGEMENT RESPONSES

Subsoil drains will be located beneath road reserves and POS areas to aid infiltration. The detailed design of the subsoil drainage network has not yet been undertaken.

The subsoil drainage design response will also consider the subsoil drainage pipe sizing in response to an appropriate infiltration rate at each POS area. Currently, the flood storage basins have been sized based on an assumed infiltration rate (continuing loss) of 1 m/d.

The DWMS describes a groundwater management scheme that will be controlled by subsoil drainage. Precinct 15 is an undulating area with several post-development surface water catchments draining internal to the precinct and not draining to major lakes or wetlands. The project team understands that these internally draining catchments will be governed by the groundwater management scheme and subsoil drainage abstraction during rainfall events will be critical.

The current earthworks design and subsoil drainage design allows for catchments to drain surface water and subsoil drainage to low points in the landscape where it is anticipated a pumping system will abstract or transfer subsoil drainage to a disposal or final use location. The engineering drawings appended to the LWMS illustrate the preliminary design as it relates to the subsoil drainage networks and its likely abstraction and transfer locations.

The current urban design and engineering drainage design supports flexibility to respond to the future groundwater management scheme and is consistent with the known design principles. The urban design responds to the likely infrastructure demands and land take of the groundwater management scheme.

4.13 BUSHFIRE MANAGEMENT

The majority of the Structure Plan area is identified within a 'bushfire prone area'. State Planning Policy 3.7 (SPP 3.7) requires structure plans to include a bushfire hazard level assessment. A Bushfire Management Plan (BMP) has been prepared by Emerge providing an assessment of how future development within the site can satisfy the policy measures of SPP 3.7 (refer **Appendix 2**). The BMP identified a variety of bushfire hazards within and surrounding the site, including different patches of forest, woodland, scrub and grassland hazards.

This BMP has followed the requirements of SPP 3.7 to identify bushfire risk and the bushfire protection measures that will make the land suitable for its intended purpose. As part of this, a Bushfire Attack Level (BAL) assessment involving the classification and condition of vegetation within 150 m of the site has been undertaken. The outcomes of this BMP demonstrate that as development progresses, it will be possible for an acceptable solution to be adopted for each of the applicable bushfire protection criteria outlined in the SPP. The management/mitigation measures to be implemented through the proposed development of the site have been outlined as part of this BMP.

4.14 ECONOMIC DEVELOPMENT AND EMPLOYMENT

An Economic and Employment Development Report has been prepared by Pracsys (refer **Appendix 5**) to consider the economic and employment impacts associated with the development of the Structure Plan area. During construction, a total of 9,544 total jobs (direct and indirect) are forecast to be created by the development of Precinct 15. Operational employment generated by the development of Precinct 15 is predicted to be 728 total jobs in the broader region.

In addition, Pracsys has prepared an Economic Analysis to support the concurrent proposed lifting of urban deferment for the first stage of Precinct 15 (refer **Appendix 1**). This includes an employment self-sufficiency (ESS) assessment for this area based on the employment within a 5km catchment radius of Precinct 15. The employment offered in the catchment achieves an ESS of 555% when compared to the additional labour force at the site. While the surrounding areas may develop as urban, the identified employment areas within the catchment area can support an increase labour force of approximately 20,000 working persons and still meet the sub-regional ESS target of 60% by 2050. In summary, Precinct 15 is located with high levels of access to employment including a mix of population driven and potentially strategic industries. The area will be able to achieve high levels of employment self-sufficiency, even with significant population growth.

4.15 INFRASTRUCTURE CO-ORDINATION, SERVICING AND STAGING

An Engineering Report has been prepared by Cossill & Webley (refer **Appendix 9**).

4.15.1 EARTHWORKS

The earthworks across Precinct 15 have been designed in accordance with the following objectives:

- To allow for the retention of existing vegetation and topography within the designated open space, chiefly along the elevated ridge line in the western parts of the precinct and within the large central wetland of the eastern precinct
- To allow for roads and development sites to be graded to best follow the existing topography and to best reflect the existing landscape.

A preliminary earthworks design generally allows for the retention of vegetation along the elevated ridge line in the western parts of the Precinct and within the large wetland. The design also maintains a cut-fill balance west of the rail line site to make best use of Basic Raw Materials (BRM) and to minimise the need to import fill to the site east of the rail line.

4.15.2 BASIC RAW MATERIALS

It is preferable to minimise the importation of clean fill sand to the site, not only to reduce costs (imported fill can typically equate to around 30% - 40% of development costs), but also to ensure the most appropriate use of basic raw materials. Considerations that have been investigated to minimise the need to import clean fill sand include the following:

- Establishing a subsoil network and creating a controlled groundwater level, this has the net effect of reducing the volume of imported material brought to a development to maintain clearance from groundwater, and also has the potential of assisting with irrigation.;
- Adopting a planning layout which is sympathetic to existing natural contours, to ensure that stormwater drainage design is optimised such that required development levels do not require excessive filling over the existing topography.
- Optimising the location of any critical sewer infrastructure (such as Waste Water Pumping Stations), to ensure that sewer controls minimise the need to fill areas of the development.

The above controls will be reviewed in further detail as part of the design process to ensure that the volume of imported fill necessary for development is minimised.

4.15.3 SEWER

The Water Corporation planning indicates that the site falls within the catchment of five proposed future Waste Water Pumping Stations (WWPS).

- The north-west corner of the site is proposed to be serviced by the future Jandabup WWPS X, located north-west of the Site across Coogee Road and adjacent Lake Adams;
- A small portion of the site along the western boundary is proposed to gravitate west to

the future Jandabup WWPS Z located west of the Site at the eastern end of Ranch Road adjacent Little Mariginiup Lake;

- Western edge of the site is proposed to gravitate south via Collector Sewer to the future Jandabup WWPS A located south of the site at the southern end of Mariginiup Lake;

- The majority of the western portion of the site and a portion of the north-eastern part of the site, which captures wastewater flows within the site to gravitate to the proposed Jandabup WWPS D. Jandabup WWPS D would then pump flows west to the future collector sewer w described above for Jandabup WWPS A; and

- The majority of the eastern portion of the site, which captures wastewater flows within the site to gravitate to the proposed Jandabup WWPS Q. Jandabup WWPS Q would then pump flows west to the future collector sewer described above for Jandabup WWPS A.

Cossill & Webley have prepared a preliminary sewer design and catchment plan. Based upon the preliminary design levels completed, the majority of the western portion of the Site will be serviced by the Jandabup WWPS D, largely in line with the Water Corporation's Wastewater Planning. All of the eastern portion of the site and a portion of the west will be serviced by Jandabup WWPS Q. Along the western extremities of the Site, a portion of the NW corner of the site will likely fall into the catchment of future Jandabup WWPS X. The majority of land on the western periphery of the Site will ultimately grade out to Jandabup WWPS A.

Development of the site in an ultimate sense requires the delivery of a number of higher order infrastructure items, which are not currently available, so it is likely an interim solution will be required to service the site. It has been confirmed that there is capacity within the existing wastewater network nearby. An interim connection to the existing network is physically possible from Precinct 15, and would allow progression of the development in the area whilst the necessary planning and implementation of upgrades required to the existing network for additional capacity is undertaken concurrently by the Water Corporation to ensure that the balance of the EWDSP area can be delivered unimpeded as it progresses.

4.15.4 WATER SUPPLY

Precinct 15 is proposed to be serviced with water from the Wanneroo Reservoir tank site located on Steven Street in Wanneroo. This tank is currently fed from the existing Wanneroo Groundwater Treatment Plant (GWTP) located to the east of the Precinct 15.

Ultimately, an additional bore main from the GWTP to the Wanneroo Reservoir is proposed, which will be augmented via a new supply from the proposed Alkimos Desalination plant. From discussions with the Water Corporation the route of the proposed desalination trunk main is still at a planning stage, and a route external to the EWDSP area is under consideration.

As part of the consideration of future development of the EWDSP area, the Water Corporation has completed high level planning over the EWDSP which has determined that a series of large volume trunk mains connecting the Wanneroo Reservoir to other regional water storage facilities within the Integrated Water Supply Scheme will be required as development progresses. The construction of these mains will be deferred until such time as water supply demand requires the Water Corporation to construct the mains. The optimal route for the construction of these mains will be assessed by the Water Corporation ahead of delivery of the mains, and will consider development within the EWDSP at that point in time. Within the Precinct 15 area, should distribution mains be required they will likely follow routes of higher order roads where there is a greater reserve width which more readily accommodates retrofit of infrastructure.

There is existing water infrastructure west of Precinct 15 area at the intersection of Coogee Road and Mornington Drive that includes both larger reticulation mains as well as a distribution main. Connection to the existing network should provide adequate water supply to allow initiation of development in the area.

4.15.5 POWER

There is an existing high voltage underground power cable in Coogee Road which extends power from the existing "Wanneroo Zone Substation" located at the intersection of Wanneroo Road and Clarkson Ave west of Precinct 15. There is 25 to 30MVA projected to be available from this sub-station, which will be sufficient to service future development of Precinct 15.

It is anticipated that the local network will be incrementally extended from the existing HV feeder located in Coogee Road. A series of HV feeds, switch stations and transformers will be required throughout Precinct 15 to meet individual site requirements.

4.15.6 TELECOMMUNICATIONS

The Site is within NBN's fixed line footprint, and hence can be serviced with optic fibre under their roll-out scheme for greenfield developments. The current design practice for road reserves, pavement and verge provisions will make adequate allowance for services including broadband in accordance with the agreed Utilities Service Providers handbook. There will be some local land requirements for equipment sites, similar to current provisions which will be accommodated at detailed subdivision stage.

4.15.7 DEVELOPMENT STAGING

Initial stages of subdivision and development are likely to be located within the north western areas of the Precinct, accessed via Coogee Road. Subdivision and development will then move southwards and eastwards in line with market demand.

4.16 DEVELOPER CONTRIBUTION ARRANGEMENTS

The East Wanneroo District Developer Contribution Plan is being prepared for the entire EWDSP area. This will require contributions from all development in the EWDSP to district infrastructure items.

Given the predominately large land holdings in Precinct 15 and the limited ownership, it is not anticipated that formal developer contributions will be required towards local infrastructure items. Rather, any cost sharing required for other local infrastructure items can be arranged through land owner legal agreements without the need for a formal local DCP.

4.17 IMPLEMENTATION

4.17.1 LIFTING OF URBAN DEFERMENT

Implementation of the Structure Plan requires the Lifting of Urban Deferment across the site. A request to Lift Urban Deferment across a portion of the site has been lodged concurrently with this Structure Plan.

4.17.2 MRS AMENDMENTS – PUBLIC LANDS

The MRS is required to be amended to reserve public lands within the Structure Plan area for regional roads, railways, parks and recreation reserves and high school. These public lands are defined by the proposed Structure Plan and it is submitted as logical that an MRS Amendment for public lands is pursued subsequent to this Local Structure Plan process. The WAPC is the responsible authority for preparing and initiating amendments to the MRS for public lands.

4.17.3 DPS2 AMENDMENT

Pursuant to Section 126(3) of the Planning and Development Act 2005, it is proposed that the site is rezoned under City of Wanneroo District Planning Scheme No.2 to 'Urban Development' concurrent with the Lifting of Urban Deferment.

4.17.4 FURTHER MANAGEMENT PLANS

As part of the future subdivision and development process, the following management plans may be necessary, the implementation of which would further minimise potential environmental impacts that have the potential to arise through implementation of the LSP:

- Acid Sulfate Soil and Dewatering Management Plan
- Construction Environmental Management Plan
- Urban Water Management Plan/s
- Foreshore Management Plan
- Aboriginal Heritage Management Plan
- Bushfire Management Plan.
- Acoustic Assessment

CITY OF WANNEROO
PRECINCT 15 – CENTRAL MARIGINIUP
SCHEDULE OF SUBMISSIONS FOLLOWING ADVERTISING
(Advertising Closed 8 March 2024)

No.	Summary of Submission	Applicant Comment	Administration Comment	Modifications?
1.	**Submitter 1 (ATCO Gas) – Refer to Schedule of External Agency Submissions**			
2.	**Submitter 2**			
2.1	Existing infrastructure is too limited and wont handle such an increase volume of traffic. Perhaps provide plans demonstrating how this will be resolved first.	Area is zoned for urban expansion. Proposal is supported by technical documentation regarding infrastructure and road upgrades necessary to support the development.	The LSP provides details in Part 2 regarding the infrastructure upgrades required to service the development. As discussed in the body of the report, interim servicing measures may be required to service the development prior to higher order infrastructure being developed. Notwithstanding this, prior to the titling of land, the proponent will be required to adequately service each of the lots titled.	It is recommended that Part 2 of the LSP and servicing report be amended to discuss what interim servicing measures may be required facilitate the development and servicing of the LSP area.
3.	**Submitter 3**			
3.1	Please stop destroying the natural environment out of pure greed.	The subject land is zoned for urban development. Environmental protection is a key consideration within all stages of planning, design and development and this will be carefully assessed and scrutinised by the environmental government agencies. The	As foreshadowed in the North West Sub-Regional Planning Framework (2018), the land has always been earmarked for urban expansion and as a result the natural environment and urban development must be adequately balanced. The approval of the East Wanneroo District Structure Plan (EWDSP) in August 2021	No modification required.

No.	Summary of Submission	Applicant Comment	Administration Comment	Modifications?
		project has been referred under Federal legislation for assessment of environmental protection.	has provided a framework for the City and the WAPC to consider the lodged Local Structure Plan. In accordance with Liveable Neighbourhoods 10% Public Open Space is required to be provided with the LSP area which has been provided based upon the POS Schedule included in Figure 20.	
4.	**Submitter 4**			
4.1	The area will need another high school as Wanneroo Secondary College is already at capacity.	A high school is proposed.	The application incorporates an eight hectare combined primary and high school site to the west of the Regional Sporting Complex. The provision of a single high school in this precinct is consistent with the EWDSP.	No modification required.
4.2	Surrounding Primary Schools in the locality still have capacity for increases to the number of students accommodated.	Noted. Future population growth requires additional primary schools.	Noted. The EWDSP requires three primary schools to be established in Precinct 15 based upon its forecasted population and residential catchment. The LSP area incorporates two primary schools which is supported by the Department of Education.	No modification required.
5.	**Submitter 5**			
5.1	Supports the proposal	Noted.	Noted.	No modification required.
6.	**Submitter 6**			

No.	Summary of Submission	Applicant Comment	Administration Comment	Modifications?
6.1	Raises concern that the resultant development of the structure plan will result in no wildlife corridors, wildlife or green links. With no character in the streets or buildings and multiple hot glaring hard surfaces being incorporated into the design of the area.	The subject land is zoned for urban development. Environmental protection is a key consideration within all stages of planning, design and development and this will be carefully assessed and scrutinised by the environmental government agencies. The project has been referred under Federal legislation for assessment of environmental protection. Streetscape and built form character are very important. The LSP is supported by a Local Sense of Place Statement. These matters and will be addressed and implemented through more detailed planning and design phases of the development project.	Noted. The Applicant in support of the proposal has provided an Environmental Assessment Report which discusses the environmental issues pertaining to the development. In accordance with the EWDSP, a parkland link has been provided connecting a variety of open space both within the Precinct and to the wider EWDSP area. As noted by the Applicant, a Local Sense of Place Statement has been provided within Part 2 of the LSP which provides detail regarding the character of the locality. However, there are no specific measures detailed in Part 1 which are required to be implemented. As such, Administration recommends that provisions are incorporated into Part 1 which contribute towards the sense of place of the locality.	It is recommended that provisions are incorporated in Part 1 to retain native vegetation within the LSP area and develop public realm design guidelines for the neighbourhood centre.
6.2	Wetland buffer of 30m is not sufficient buffer does not provide sufficient habitat for fauna which will increase risk of vehicle and animal collisions.	Refer applicant response to City and external agency comments on the wetland buffer.	A 50m wetland buffer is required in accordance with Environmental Guidance for Planning and Development Guidance 33, EPA 2008. The Proponent has contended a reduced wetland buffer is appropriate given the minor difference in risk to the	It is recommended that the LSP Map is updated to demonstrate the location of the 50m wetland buffer. Additionally, that a vegetation and fauna

No.	Summary of Submission	Applicant Comment	Administration Comment	Modifications?
			wetland as a result of either a 30m or 50m buffer being implemented. Administration does not concur with the findings of this assessment and recommends that a 50 metre wetland buffer be implemented. In addition to the above, retained wetlands will be rehabilitated and at which time subdivision and development occur. Further a Vegetation and Fauna Management Plan (VFMP) will be required to ensure best practice management practices are implemented.	management plan be required upon the lodgement of a subdivision application.
6.3	If the lake provides habitat for SW Snake neck turtles these can travel up to 500m – 1km from the wetland to find a suitable nesting site. Therefore the 30m wetland buffer is not sufficient to accommodate for this. Additionally, if roads are panned nearby, there is a risk turtles will fall into drains.	Refer applicant response to City and external agency comments on the wetland buffer.	Noted. See Administration's response in 6.2.	No modification required.
6.4	The development needs to include more wildlife corridors and bushland reserves connecting safe spaces for all wildlife species (especially to follow ecological linkages). These would also help to form natural linkages for people. These corridors should retain and revegetate native bushland.	The subject area is zoned for urban development and is the subject of an approved District Structure Plan which provides for urban development. Environmental protection is a key consideration within all stages of planning, design and	As detailed within the EWDSP, the Precinct is intended to be largely developed for residential purposes. As part of the development, the proponent has retained a Resource Enhancement Wetland which will be rehabilitated. Additionally, the Proponent will seek to incorporate	No modification required.

No.	Summary of Submission	Applicant Comment	Administration Comment	Modifications?
		development. Environmental impacts will be carefully assessed and scrutinised by the environmental government agencies. The project has been referred under Federal legislation for assessment of environmental protection. The structure plan proposes a Parkland Link, tree retention, wetland protection and green spaces. Green links, tree and vegetation protection are important and will be addressed through all planning and design phases of the development project.	retained native vegetation within POS which is proposed within the Local Structure Plan area this will be required to be demonstrated as part of a VFMP.	
6.5	What do the green linkages look like? Have they been planned in collaboration with Murdoch University's Keep Carnarby's Flying: Ngoolarks Forever Project to ensure they and other wildlife are safe?	Details of green spaces and parkland linkages to be part of more detailed planning. In regard to Carnarby's, the project has been referred under Federal legislation for assessment of environmental protection.	The Applicant has not provided any specific detail regarding the proposed parkland link. A Public Open Space Masterplan (POS Masterplan) has been provided which incorporates some level of detail regarding the development of the Parkland Link. It is recommended that the POS Masterplan is revised to demonstrate how the Parkland Links satisfy the objectives of the	It is recommended that the POS Masterplan is amended to demonstrate that the Parkland Link design satisfies the objectives of the EWDSP.

No.	Summary of Submission	Applicant Comment	Administration Comment	Modifications?
			EWDSP which are to deliver district wide pedestrian and cycling movement and nature based education. Additionally, in relation to the Carnaby's Black Cockatoo, the proposal has been referred for assessment and the project will be reviewed under Federal Legislation.	
6.6	How many mature trees will be retained? Where are their locations? We need as many as possible to be retained throughout the development including in suburban areas that are to be subdivided to avoid decrease in tree canopy. Additionally, canopy should be retained in order to prevent the effects of urban heat island effect in the suburbs. It is not enough to plant small verge trees as they take along time to reach a height that will provide canopy and wildlife habitat.	The LSP identified the ridgeline as a strategic location for tree retention. Noted and agreed that as many existing trees as possible should be retained within the ridgeline and within the site. Actual tree retention is addressed at subdivision levels of planning and design.	Th Public Open Space Masterplan indicates a number of trees which are intended to be retained within the LSP Area. Additionally, it is acknowledged that mature trees not only provide environmental benefits from an urban heat perspective but also provide habitat and contribute to an areas sense of place. As such, Administration recommends the LSP map is modified to reflect the locations of retained vegetation within the LSP Area in accordance with the WAPC WA Planning Manual: Guidance for Structure Plans.	It is recommended that the LSP Map is updated to reflect the locations of retained vegetation within the LSP Area.
6.7	Will the development aim to follow the 3-30-300 rule?	The concept of this rule will be a design consideration.	See response from the Applicant.	No modification required.
6.8	Street trees – will these be native and provide ample shade? Planting a variety of trees would be ideal rather	This is a detailed matter for subdivision and development stages of the project. Street trees	Administration recommends that where native trees are unable to be retained within road reserves,	No modification required.

No.	Summary of Submission	Applicant Comment	Administration Comment	Modifications?
	than a single species along individual streets to protect against pests and disease. Will a list of tree species being used and mapping of tree planting locations be made available?	will be provided in collaboration with the City.	that trees are planted in accordance with the City's LPP 5.3: East Wanneroo which includes a list of recommended species for each type of road reserve. Notwithstanding this, the planting palette will be determined at detailed design stage.	
6.9	Will verges be prioritised to be vegetated with native plants be incentivised? This will prevent the installation of hardstand and artificial turf. Will pale roof colours form part of the design codes or any other green infrastructure?	This is a detailed matter for subdivision and development stages of the project. Street trees will be provided in collaboration with the City.	At the time of consideration of the LSP, the City doesn't have any incentives for the planting of verges with natives plants. Further, any detail regarding roof design or colours may be imposed by the proponent of the estate as a design guideline if they consider it appropriate.	No modification required.
6.10	Will the building aims to minimise footprint to allow for the retention of more space for vegetation and trees. Promote building up rather than out.	This is not an LSP matter.	To be considered at subdivision/detailed design stage. Development of residential dwellings is regulated by the Residential Design Codes (Planning Codes) which impose open space requirements for dwellings facilitating an outcome where trees may be capable of being retained.	No modification required.
7.	**Submitter 7**			
7.1	It is not a bad layout.	Noted.	Noted.	No modification required.
7.2	The recreation space is great and in a good location.	Noted.	Noted.	No modification required.

No.	Summary of Submission	Applicant Comment	Administration Comment	Modifications?
7.3	I would like to see a limit on how small blocks can be and consideration for the width of streets and increased street parking.	This is controlled by planning policy and regulations.	The size of residential lots is regulated by the Residential Design Codes and the number of lots created is subject to subdivision and detailed design. The width of streets and provision of on street parking will be established as a part of the subject local structure plan. It is recommended that road reserves are provided in accordance with its Local Planning Policy 5.3: East Wanneroo.	It is recommended that road reserves are provided in accordance with Local Planning Polic 5.3: East Wanneroo.
7.4	Please make native shady street trees mandatory and continue to keep as many established trees as possible.	This is a detailed matter for subdivision and development stages of the project. Street trees will be provided in collaboration with the City.	Refer to Administration's response in 6.8. In addition, the R-Codes prescribes the requirement for the planting of additional trees within residential lots. Retention of established trees will be subject to detailed design.	No modification required.
7.5	Consider moving the big K-12 school at least a street away from a main road as it causes too many dangerous situations for motorists.	Disagree. High schools must be accessible.	In accordance with Operational Policy 2.4 Planning for School Sites, school sites should be in accessible locations and have safe access. Whilst it is acknowledged that the combined Primary School and High school site (combined site) abuts an Integrator A road, crossing points will be established as part of the ongoing design and development of the road as part of the District	It is recommended that permitter roads are provided on all boundaries of the high school site.

No.	Summary of Submission	Applicant Comment	Administration Comment	Modifications?
			Development Contributions Plan (DDCP). Further, Administration recommend that the combined site is bounded by a road to provide increased physical separation to Lakeview Road and to facilitate access to the Regional Open Space.	
8.	**Submitter 8**			
8.1	Although regional and local linkages are not located immediately within the development area, a significant number of native flora and fauna can be found to live within and pass through the structure plan area.	The subject area is zoned for urban development and is the subject of an approved District Structure Plan which provides for urban development. Environmental protection is a key consideration within all stages of planning, design and development. Environmental impacts will be carefully assessed and scrutinised by the environmental government agencies. The project has been referred under Federal legislation for assessment of environmental protection.	Noted. In support of the Local Structure Plan, the proponent has submitted an Environmental Assessment Report (EAR) which provides an assessment of the flora and fauna within the site. As part of any proposed subdivision, a Vegetation and Fauna Management Plan (VFMP) will need to be submitted as part of the assessment of the application to consider the management of flora and fauna within the LSP area.	No modification required.
8.2	Public open spaces and green areas identified across the site are located within proximity to significant human	Refer 8.1	Noted. Open Spaces have been located with regard to the East Wanneroo District Structure Plan	It is recommended that the POS Masterplan is modified

No.	Summary of Submission	Applicant Comment	Administration Comment	Modifications?
	activity including roads and sporting fields.		(EWDSP) and in consideration of environmental, hydrological and bushfire constraints. Public Open space is required to be provided in accordance with Liveable Neighbourhoods in proximity to residential areas and should maximise amenity to future residents. Notwithstanding the above, it is recommended that the POS Masterplan is modified and the Local Water Management Strategy amended in accordance with the City's recommended modifications,	and the Local Water Management Strategy amended in accordance with the City's recommended modifications.
8.3	As many of these public open space and green areas are proposed to include multiple types of human activities, the proposal will have a huge negative impact on fauna habitat in the area. Additionally, these green areas are too small/narrow and therefore ineffective for the existing local fauna to use as linkages. Therefore, these spaces are useless to all but people.	Refer 8.1	Refer to Administration's comment in 3.1. In addition, Administration agrees that the Public Open Spaces are largely irregular in shape. It is recommended that the POS schedule is reviewed given that some of the POS locations afford very little amenity to the community.	It is recommended that POS 18 is removed from the POS Schedule given it is a pedestrian access way.
8.4	The development of the EWDSP will result in the displacement of existing fauna and further fragmentation of habitat and feeding grounds as such resulting in a biodiversity decrease.	Refer 8.1	Noted. Refer to Administration's comment in 3.1.	No modification required.
8.5	Local governments play important roles in the protection and	Refer 8.1	Noted.	No modification required.

No.	Summary of Submission	Applicant Comment	Administration Comment	Modifications?
	conservation of biodiversity. As such, City of Wanneroo should be doing everything in its power to better the design and layout of these proposed developments to cater to the globally recognised biodiversity hotspot.			
8.6	Although the significantly mapped ecological linkages occur outside of Precinct 15, further developments are seen to be drafted and planned throughout these supposed linkages. The proposed linkages detailed in the East Wanneroo District Structure Plan (EWDSP) and the environmental benefit of these is grossly overstated. It is recommended that the design of both this Precinct and the EWDSP is amended to increase their size.	Refer 8.1	Noted. Administration has recommended a number of modifications to the proposed LSP in its schedule of modifications.	No modification required.
8.7	Recommends retention of larger or rewilded areas greater than what is currently proposed.	Refer 8.1	Refer to Administration's comment in 3.1. The Applicant's POS Masterplan indicates that vegetation will be retained where possible within POS. In addition, the Proponent has generally provided Public Open Space in accordance with Liveable Neighbourhoods. Further, a rehabilitation plan will be required for the Resource Enhancement Wetland as a Condition of Subdivision approval.	No modification required.

No.	Summary of Submission	Applicant Comment	Administration Comment	Modifications?
8.8	Reducing the amount of facilities within and immediately surrounding the POS/ green areas that are intended or human use would reduce the amount of fragmentation that occurs as a result of road, playing fields and monoculture turf areas.	Refer 8.1	Noted, refer to Administration's response in 3.1.	No modification required.
8.9	Reduce reliance on the surrounding bush and wetlands to be the primary linkages for developments when they have either already been developed or already planned to be developed.	Refer 8.1	Noted, refer to Administration's response in 8.3 and 8.7.	No modification required.
8.10	Removal of 2 playing fields will allow for better fauna movement between resource enhancement wetland and the existing regional ecological link.	The community requires Regional Sporting Fields. A balanced outcome is required for an area that is zoned for urban development.	The EWDSP requires the provision of a 50 hectare Regional Playing Field. Additionally, Administration's East Wanneroo Community Facility Plan requires the provision of five community facilities within Precinct 15.	It is recommended that Part 1 and the LSP Map be updated to include the five required community facilities within Precinct 15.
8.11	Amend the proposed planting species along streets, road and parks to all Western Australian native species as follows: Remove: *Melaleuca viridiflora* *Brachychiton populneus* *Hibiscus tiliaceus rubra* *Magnolia grandiflora* *Jacaranda mimosifolia* *Callistemon 'Kings Park Special'*	Plant species to be finalised at subdivision and development stages of the project in collaboration with the City.	Noted. Plant species within road reserves should generally be in accordance with the City's Local Planning Policy 5.3: East Wanneroo. Notwithstanding this, the planting palette is subject to approval at detailed design stage.	No modification required.

No.	Summary of Submission	Applicant Comment	Administration Comment	Modifications?
	Alternative species could include: *Corymbia calophylla* *Eucalyptus macrandra* *Eucalyptus rudis* *Eucalyptus todtiana* *Eucalyptus torquate* *Eucalyptus vitrix* *Hakea laurina*			
8.12	The Environmental Assessment Report details that a large number of the conservation significant species may only opportunistically use the area if flying over or migrating over. Therefore, it is argued that additional land should be retained.	Refer 8.1	Noted. Refer to Administration's response in 3.1.	No modification required.
8.13	To state that given a species was not recorded during the survey period, that there is less of a need to consider or retain as much vegetation is why so many of our species are now facing the possibility of extinction.	Refer 8.1	Noted. Refer to Administration's response in 3.1. In addition, the proposed LSP is being considered by multiple Government agencies at both State and Federal levels to ensure compliance with legislation for these jurisdictions.	No modification required.
8.14	As for priority species within the development area, although not afforded statutory protection, should be afforded significant consideration by the City of Wanneroo to protect biodiversity.	Refer 8.1	Refer to Administration's response in 3.1. In addition, should the LSP be approved by the WAPC, It is recommended within Administration's schedule of modifications that a VFMP is submitted upon lodgement of a	No modification required.

No.	Summary of Submission	Applicant Comment	Administration Comment	Modifications?
			subdivision or development application to ensure best practice flora and fauna management is implemented.	
8.15	Recommends modification to the proposed Local Structure Plan to ensure an improved balance between biodiversity protection and urban development is achieved.	Refer 8.1	Refer to Administration's comment in 3.1.	No modification required.
9.	**Submitter 9**			
9.1	Objects to the proposal on the basis that it will result in a loss of wildlife habitat, loss of indigenous historic site and lack of infrastructure to support the influx of people into the area.	Refer 8.1 The protection of indigenous heritage is, and will continue to be, addressed through all stages of planning. The proposal is supported by technical documentation and district structure planning that will provide for the infrastructure required to support the urban growth.	Refer to Administration's comment in 3.1. In addition, in accordance with the Aboriginal Cultural Heritage Assessment Report, it is recommended that an Aboriginal Cultural Heritage Management Plan is prepared in consultation with local Knowledge Holders and the Whadjuk Aboriginal Corporation.	It is recommended that an Aboriginal Cultural Heritage Management Plan is prepared and approved in consultation with local Knowledge Holders prior to the subdivision and development of the LSP area.
10.	**Submitter 10**			
10.1	Supports the proposal and the urban expansion afforded by the proposed structure plan.	Noted	Noted.	No modification required.
11.	**Submitter 11**			
11.1	Objects to the proposal given the significant bushfire hazards identified within the technical reporting. The technical reporting has identified the	Refer to applicants response to external agency and City comments on bushfire.	The Bushfire Hazard Levels indicated in the Bushfire Management Plan (BMP) generally appear to be acceptable	It is recommended that the BMP be amended to address the concerns raised by

No.	Summary of Submission	Applicant Comment	Administration Comment	Modifications?
	inherent risks of developing within the area. Additionally, the environmental report emphasises the permanent bushfire hazard to the development site.		and in some cases are intended to reduce at which time the surrounding Precincts within the EWDSP area are developed. It is noted that some lots on the periphery of the LSP area and surrounding the REW achieve an excessive level of risk and modifications are recommended to ensure these lots achieve an acceptable level of bushfire risk. Notwithstanding this, the Department of Fire and Emergency Services (DFES) have identified a range of items which are recommended to be addressed prior to the approval of the LSP.	DFES prior to the adoption of the LSP.
	It is evident that proceeding with the proposal could endanger both residents and the environment. Without robust measures to mitigate these risks and ensure the safety of future inhabitants, the proposal raises serious concerns about the welfare and sustainability of our community.	Refer to applicants response to external agency and City comments on bushfire.	Refer to Administration's response to 11.1.	No modification required.
12.	**Submitter 12**			

No.	Summary of Submission	Applicant Comment	Administration Comment	Modifications?
12.1	Submitter vehemently object to the suggestion that Precinct 15 warrants prioritisation at the expense of Precinct 8 of any other 'first stage' precinct. Further we respectfully remind the City that there is an approved sequence for development in East Wanneroo.	Staging of urban development is dependent on many factors and is not "approved". This LSP does not prevent an LSP for any other Precinct also being pursued.	The staging established within the EWDSP is recognised. Irrespective of this, as discussed in the EWDSP, it was always contemplated that Precinct's with more consolidate landholdings could progress ahead of the development front. Additionally, the engineering report stipulates that LSP area will be capable of being serviced by the existing capacity of utilities in the locality. However, development of the site to its ultimate capacity will require the delivery of a number of higher order infrastructure items which are not currently available. With this in mind, interim solutions will be required to service the site. The engineering report does not stipulate what may be required and it is recommended that the report is amended to discuss this in more detail.	It is recommended that the Engineering Report is amended to detail what engineering solutions are available to resolve interim capacity issues in existing utility.
12.2	The majority of Precinct 8 falls within the existing gravity sewer catchment of the Pinjar Road Waste Water Pump Station meaning that sewer flows from development in this precinct can simply be gravity fed to this existing pump station. This is a stark contrast to Precinct 15 which	Servicing this Precinct is addressed by technical reporting attached to the LSP.	As discussed in Administration's response in 12.1 above, the Engineering Report details that interim solutions may be required to address utility capacity issues. The absence of coordination between the land levels of	It is recommended that Part 2 and the Engineering Report is amended to discuss interim servicing arrangements.

No.	Summary of Submission	Applicant Comment	Administration Comment	Modifications?
	identifies the potential need for up to 4 pump stations to service the precinct. Further, the design levels along the western boundary of Precinct 15 have not been discussed with Precinct 8 parties, introducing a level of uncertainty in this regard.		Precincts 8 and 15 is noted.	
12.3	Notes that Precinct 7 and 8 are identified to be developed as Part of Stage 1 with an indicative development timeframe of 2021 to 2031. Precinct 15 falls within Stage 2 which is identified in the EWDSP to be developed In 2031 to 2051.	Staging of urban development is dependent on many factors and is not "locked" by the staging shown within the EWDSP.	Refer to Administration's response in 12.1.	No modification required.
12.4	The LSP details that it is appropriate for the subject precinct to be developed prior to its nominated stage on the basis that stage 1 precincts such as 6 and 8 have a high degree of land fragmentation. The submitter has identified that the Structure Plan also identifies the various land holdings within it which also demonstrates that the land holdings within this Precinct also equally fragmented.	Staging of urban development is dependent on many factors and is not "locked" by the staging shown within the EWDSP. This LSP does not prevent an LSP for any other Precinct also being pursued.	Noted. Notwithstanding this, Administration is of the understanding that the Proponent of the Precinct has 85% of lots under option enabling the timely development of the Precinct.	No modification required.
12.5	The submitter identifies that the findings of the LWMS detail that groundwater levels are expected to rise approximately 4 – 5 metres post development as a result of urbanisation. The submitter then goes on to state that this will result in	This matter is addressed by LWMS and Engineering reporting prepared to support the LSP.	Noted. At the time of Administration's consideration of the LSP, groundwater management both at the District and Local levels are yet to be resolved. Notwithstanding this, given that the District Ground	It is recommended that the LWMS is amended and approved in consultation with Administration and the Department of Water

No.	Summary of Submission	Applicant Comment	Administration Comment	Modifications?
	the need for significant importation of fill which is both an unsustainable and costly exercise.		Water Management Scheme (DGWMS) is yet to be finalised, it is appropriate for the water management issues within the Precinct to be resolved in consultation with the Department of Planning, Lands and Heritage (DPLH) prior to the approval of the LSP by the WAPC.	and Environmental Regulation.
12.6	Details that the EWDSP timeline has not been effectively managed or upheld should the Structure Plan be supported.	Staging of urban development is dependent on many factors and is not "locked" by the staging shown within the EWDSP	Refer to Administration's response in 12.1.	
13.	**Submitter 13**			
13.1	Identifies the Kindergarten to Year 12 high school and the Park and Ride site as the key items to be addressed.	Addressing these issues with PTA, DoE, DPLH and the City.	Noted. Educational Facilities are discussed in the body of the report. Further, the parking requirements for the transit station is to be further developed at detailed design stage in consultation with the Public Transport Authority.	No modification required.
13.2	The high school site occupies land within the 'Centre' as depicted in the EWDSP map. It relocation would encourage additional higher density residential in close proximity to the Mariginiup Station.	Noted. High school land use in close proximity to a transit station is also beneficial for student travel.	The EWDSP identifies that the high school should be located to the north west of the transit corridor in Precinct 15. As discussed in the body of the report, there are a number of benefits to relocating the high school closer the neighbourhood centre, including proximity to the Regional Playing Field, Community Facilities and the	No modification required.

No.	Summary of Submission	Applicant Comment	Administration Comment	Modifications?
			transit station. Additionally, given that catchments to high schools, are significantly greater than primary schools, this outcome is considered appropriate.	
13.3	The K – 12 school is site is approximately 8.5 hectares which is less than the required 10 – 12 hectares required under Operational Policy 2.4 – Planning for school sites (OP 2.4). The detailed plans do not show any sharing of recreational facilities with the adjoining regional open space, even though the report suggests that the regional park facilities could be shared.	Details of the sharing of the use of the facilities between the high school and the regional playing fields will be the subject of future more detailed stage of planning and implementation. The 'sharing' is not in terms of land area, but rather 'sharing' the use of the facilities located wholly within the regional playing fields.	Following the initial plan advertised for public comment, a revised plan has been provided to Administration for consideration. As discussed in the body of the report, the high school size is still less than the requirements of OP 2.4. Notwithstanding this, it is recommended that once Administration has made its recommendation to the WAPC, that consultation is undertaken with the Department of Education (DoE) to ensure the adequacy of the number, size and location of educational facilities within the Precinct.	It is recommended that as part of Council's resolution that the LSP be readvertised to the relevant external agencies for comment.
13.4	The K-12 school site is located next to a 'Park and Ride' facility to the west, a district sporting facility to west and an extensive Bush Forever site to the south, all of which do not generate a student population.	High school catchments are very broad (ie. 4 primary school catchments) and the location of high schools should be considered beyond the immediately adjacent land uses. The high school has been located adjacent to the sporting facility intentionally to allow for shared use of the facilities.	Refer to Administration's response in 13.3. In addition, DoE has also raised concerns regarding the location of the high school site to the east of the neighbourhood centre. Notwithstanding this, the location of the high school is supported due to its proximity to the transit station, community facilities and	No modification required.

No.	Summary of Submission	Applicant Comment	Administration Comment	Modifications?
			co-location with the regional open space.	
13.5	Similarly the primary school site is shown to be 3.5 hectares in lieu of the 4 hectares required under OP 2.4	3.5 hectares is allowed as the primary school directly abuts a POS area.	In accordance with OP 2.4 a primary school site can be reduced in area where co-located with a public open space. As discussed in the body of the report, the primary school is required to be increased by 2,500m^2 to 3.75 hectares in order to accommodate Childcare Facilities consistent with the advice from DoE.	It is recommended that the north western primary school be increased to 3.75 hectares in accordance with DoE advice.
13.6	The report acknowledges that the K-12 school site is located adjacent to a retail activity centre and its location is not preferred by the Department of Education. Further, OP2.4 states that secondary school sites should be located on the edge of a walkable catchment of an activity centre. In this instance the secondary school is located within the centre itself.	Addressing this issue with DoE, DPLH and the City.	Refer to Administration's response in 13.4 above.	No modification required.
13.7	The cost to the community for acquiring land within the Centre will be significantly greater than an alternative location outside of the centre and on the edge of the urban neighbourhood.	Not a relevant planning matter.	Noted. Not a relevant planning consideration.	No modification required.
13.8	The LSP Map identifies a portion of land as 'Centre' and then subsequently identifies a portion of this land as 'Park and Ride' in Part 2	A Park & Ride facility is required to service the proposed rail station. It is indicatively shown on the Master Plan within the eastern	As discussed in the report, Administration recommends that the 'Centre' zone is modified to Commercial to remove the need	It is recommended that all 'Centre' zoned land is amended to 'Commercial'. It is also

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	of the LSP. These two portions of the LSP appear to conflict with one another.	extent of the Centre Zone. It has been located as such to draw people through the neighbourhood centre to enhance the economic activity, vibrancy and transit experience. The Centre Zone land will be the subject of more detailed planning (Precinct Plan) to address the final land use structure and interactions within the Neighbourhood Centre.	for a separate Precinct Plan to be developed. Administration also recommended a LDP and Public Realm Design Guidelines be approved prior to the subdivision and development of the neighbourhood centre. Additionally, the Applicant has indicated parking for the transit station on the POS Masterplan. Notwithstanding this, the parking requirements of the transit station are subject to consultation with the Public Transport Authority (PTA) and will be subject to detailed design.	recommend that the neighbourhood centre be subject to a LDP, a parking strategy and Public Realm Design Guidelines. The two latter items of which are required by the EWDSP.
13.9	The Park and Ride is 220m from the station which is greater than the 100m generally provided to other stations. Furthermore, the 200 – 400m walk from the Park and Ride to the station from the car park is an unattractive proposition on many days of the year.	Refer above.	The Applicant has indicated parking for the transit station on the POS Masterplan. Notwithstanding this, the parking requirements of the transit station are subject to consultation with the Public Transport Authority (PTA) and will be subject to detailed design.	No modification required.
13.10	The park and ride facility would be better located on the western side of the railway. This would leave the eastern side for the creation of a neighbourhood centre with a mix of higher densities and associated retail and service activities. This would	Refer above.	Noted. Refer to Administration's response in 13.9.	No modification required.

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	also leave the vacant land over the sunken railway for neighbourhood parkland for direct use of centre users.			
13.11	It is unusual for a Structure Plan to determine zones or densities as this is commonly a decision made (ultimately) by the Minister.	LSP's do determine zones and residential densities.	The LSP provides further refinement of the overall spatial arrangement of land uses contemplated within the EWDSP. The LSP approval process requires that it is approved by the WAPC.	No modification required.
13.12	The BMP shows the primary school site as a K-12 on the Landscape Circulation Plan (page 54) and the landscape street tree masterplan (page 55).Page 54 legend shows two Neighbhourhood Connector 'A' roads	Comment unclear.	It is noted that some of the plans contained within the LSP are not consistent with one another. It is recommended that these plans and the technical appendices are updated to be consistent with one another prior to the approval of the LSP by the WAPC.	It is recommended that the LSP and technical appendices are updated to be consistent with one another prior to the approval of the LSP by the WAPC
13.13	Who will be responsible from preparing a 'Residential Code Plan', and why is this necessary if the LSP assigns densities	Refer to Part 1 of the LSP. Subdividers prepare R Code Plans and they are required as the LSP only provides R Code density ranges.	It is a standard requirement of a subdivision application that a R-Code plan be submitted. Further, given that the LSP assigns an R-Code range, a R-Code plan will need to be approved by the Commission to designate the applicable R-Code to a lot.	No modification required.
13.14	Table 4 of LSP 15 refers to a number of opportunities and constraints on Figures 16 and 17. The first column in Table 4 – 'Plan reference' has no corresponding number on 'Figures 16 and 17'	Can be edited as required.	Administration recommends that Table 4, Figure 16 and Figure 17 be updated accordingly.	It is recommended that Table 4, Figure 16 and 17 are updated to address the errors identified.

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13.15	Is there a need for Figure 18 given that Plan 1 already depicts the LSP?	For ease of reference only at this section of the report.	Refer to Applicant's response.	No modification required.
14.	**Submitter 14**			
14.1	Why is so much space allocated for sporting complexes and fields and so little or passive recreation.	Regional sporting field are required by the EWDSP. The LSP provides for the required 10% public open space (passive recreation) in addition to the regional sporting fields.	Refer to Applicant's response.	No modification required.
14.2	Sporting fields should only be placed adjacent to schools to ensure that they will be used	Noted. Colocation is proposed by the LSP.	The high school is proposed to be co-located with the regional playing field.	No modification required.
14.3	The structure plan does not make any mention of the local turtle population affected in the environmental reports.	Environmental protection is a key consideration within all stages of planning, design and development and this will be carefully assessed and scrutinised by the environmental government agencies. The project has been referred under Federal legislation for assessment of environmental protection.	The Environmental Assessment Report identifies a range of species of turtles within 10km of the LSP area. The reporting prepared to support the LSP will be reviewed by all relevant state and federal government agencies for consideration. Should the LSP be approved a VFMP will be required as a condition of subdivision approval to ensure best practice management of flora and fauna is implemented.	No modification required.
15.	**Submitter 15**			
15.1	There needs to be more passive recreation and less are dedicated to sporting fields.	The sporting fields are required by the EWDSP and are a specific community need.	Noted. A Public Open Space Masterplan has been provided demonstrating the range of active and passive open spaces which are anticipated to be developed within the LSP area.	No modification required.

No.	Summary of Submission	Applicant Comment	Administration Comment	Modifications?
16.	**Submitter 16**			
16.1	Submitter has reviewed the local structure plan and the technical appendices made available for public review. The submitter notes that they have observed the following animals within the Precinct 15 Local Structure Plans. Western Grey Kangaroos *Western Blue Tongue Lizard *Burton's Legless Lizard *Gould Monitor Bobtail (tiliqua Rugosa) *Black Kite *Tawny Frogmouth *Nankeen Kestrel *Ranbow Honeyeater *Welcome Swallow Emus Wedge Tailed Eagle Common Bronzewing Caranby Black Cockatoo Forest Red-tail Black Cockatoo Magpir Crow Rabbit Fox The animals identified with an asterisk were not ones observed as	Environmental protection is a key consideration within all stages of planning, design and development and this will be carefully assessed and scrutinised by the environmental government agencies. The project has been referred under Federal legislation for assessment of environmental protection.	Noted. The reporting prepared to support the LSP will be reviewed by all relevant state and federal government agencies for consideration. Should the LSP be approved a VFMP will be required to be submitted as part of a subdivision application to ensure best practice management of flora and fauna is implemented.	No modification required.

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	part of the study undertaken as part of the Environmental Assessment Report.			
17.	**Submitter 17**			
17.1	The Environmental Assessment (ENA) Report for Precinct 15 does not list snake neck turtles among the development site's fauna. This is despite DWER on its website stating that '*Chelodina colliei'* is currently listed as 'near threatened' by the IUCN, although this has not been assessed for 20 years".	Environmental protection is a key consideration within all stages of planning, design and development and this will be carefully assessed and scrutinised by the environmental government agencies. The project has been referred under Federal legislation for assessment of environmental protection.	See Administration's response to 16.1.	No modification required.
17.2	The ENA also identifies that the linkage will inhibit regional playing field functionality. However the LSP does not mention this constraint.	The location of the regional playing fields is determined by the EWDSP.	Refer to Administration's response to 3.1. In addition, as detailed in the EWDSP, a 50 hectare regional sporting field is required to be delivered as part of Precinct 15.	No modification required.
17.3	The land area of 47.5 ha to be set aside for six playing fields as part of a regional sporting complex is disproportionate to the small areas of POS for informal recreation. According to the WA Government's Classification framework for public open space regional-level sporting facilities are 20 hectares or larger in area. Therefore the decision to	The location and extent of the regional playing fields is determined by the EWDSP.	Refer to Administration's response to 17.2.	No modification required.

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	building a facility of such immense proportions on an environmentally sensitive site ignores the trends of declines in adult participation in organsied sporting events.			
17.4	The submitter notes that many studies have concluded that activities such as walking, including hiking and bush walking are the most popular adult physical activity.	Noted	Noted.	No modification required.
17.5	Building a sporting facility would be expensive to build and maintain and as such would be a poor use of public funds.	The regional sporting facility is required by the EWDSP and the future community.	The construction of the Regional Playing Fields and the Indoor Recreation Centre are subject to funding by the District Development Contributions Plan (DDCP). Notwithstanding this, the delivery of these community facilities is consistent with the City's Community Facilities Plan endorsed in July 2023.	No modification required.
17.6	This regional sporting facility land would be more appropriately designated as Regional Nature Open Space, be regenerated and provide habitat and food for native wildlife which could be reintroduce din the area. The site could then incorporate walking trails and cycle paths for locals and visitors. These changes would create a much greater Sense of Place than an under utilised sporting complex and would help meet the State's Urban Forest	The regional sporting facility is required by the EWDSP and the future community.	Refer to Administration's response in 17.2.	No modification required.

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	Strategy and benefit the physical and mental well-being of the wider community.			
18.	**Submitter 18**			
18.1	Disappointed to hear that the area would be developed. Submitter recognises the environmental significance of the area and the range of species which inhabit the area. Notes that the banksia woodlands around Wanneroo are classified as a threatened ecological community by the WA Government and they must be better protected from development.	The subject area is zoned for urban development. Environmental protection is a key consideration within all stages of planning, design and development and this will be carefully assessed and scrutinised by the environmental government agencies. The project has been referred under Federal legislation for assessment of environmental protection.	Refer to Administration's response in 3.1 and 16.1.	No modification required.
19.	**Submitter 19**			
19.1	The local biodiversity, natural environment and bushland is more important than a new housing and road development. The native fauna which is known to use these locations for deeding, foraging , roosting/nesting will be impacted.	The subject area is zoned for urban development. Environmental protection is a key consideration within all stages of planning, design and development and this will be carefully assessed and scrutinised by the environmental government agencies. The project has been referred under Federal legislation for assessment of environmental	Refer to Administration's response in 18.1	No modification required.

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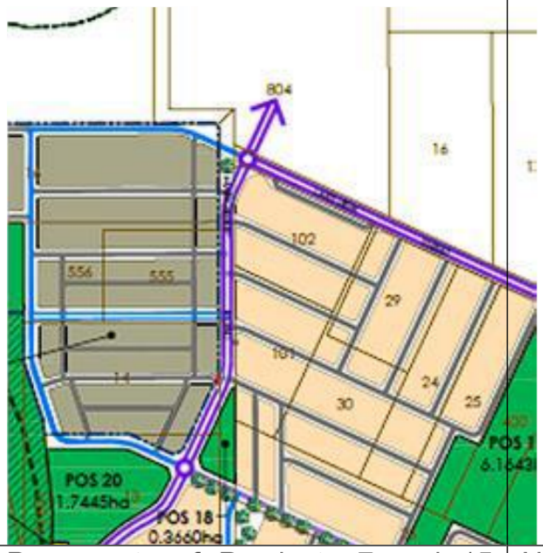
		protection.		
20.	**Submitter 20 (Main Road Western Australia) – Refer to Schedule of External Agency Submissions**			
21.	**Submitter 21**			
21.1	Please consider the impact of development on the snake neck turtle to ensure green corridors are continuous on the ground to ensure safe passage.	Environmental protection is a key consideration within all stages of planning, design and development and this will be carefully assessed and scrutinised by the environmental government agencies. The project has been referred under Federal legislation for assessment of environmental protection.	Refer to Administration's response in 18.1.	No modification required.
22.	**Submitter 22**			
22.1	The submitter notes that the proposed transit corridor's design requirements are yet to be finalised. The submitter is of the understanding that the transit corridor is proposing to modify the alignment as depicted on the EWDSP, by shifting it further to the east as it extends northwards and curving it westward to connect with Coogee Road.	Noted. The LSP reflects the approved EWDSP alignment, however this matter continues to be discussed with PTA, DPLH, and the developers leading Local Structure Planning for the precincts adjacent to Precinct 15.	Noted. The amended LSP Map considered in the report is based upon the latest alignment of the transit corridor. Should this alignment change, it is anticipated that this will be amended prior to the WAPC approving the LSP.	No modification required.
22.2	The proposed alignment of the transit corridor is consistent between precincts 7 and 15, the alignment as currently proposed results in Lot 102 being segregated in such a way that	Noted. The alignment of key roads and the transit corridor in the LSP reflects the approved EWDSP. This matter continues to be discussed with PTA, DPLH,	The proponent has submitted a revised LSP Map to ensure that the alignment of the transit corridor is consistent between Precincts 7 and 15. The revised	No modification required.

No.	Summary of Submission	Applicant Comment	Administration Comment	Modifications?
	it results in a small triangular lot, undermining orderly and proper planning. It is recommended that the alignment shift slightly westwards to support a more regular development outcome for Lot 102, as depicted below: 	and the developers leading Local Structure Planning for the precincts adjacent to Precinct 15.	alignment is based upon the latest advice from the PTA and DPLH.	
22.3	Proponents of Precincts 7 and 15 have both accurately depicted the Lakeview Road reserve in their LSPs. However there are discrepancies with its classification and intended width and composition (ie. Neighbourhood Connector A (25m) versus Integrator B (29.2). Furthermore, the way in which the	Noted. Any discrepancies in regard to road alignment, hierarchy and classification can be reviewed and rectified as required in coordination with the developers leading Local Structure Planning for Precinct 7.	Road reserves are required to be provided in accordance with Local Planning Policy 5.3: East Wanneroo, delivery of roads in accordance with the reserve requirements of this Policy will ensure consistency between Precincts.	It is recommended that road reserves are provided in accordance with the reserves included within Local Planning Policy 5.3: East Wanneroo.

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	existing Lakeview Street reservation, east of the Transit Corridor is intended to operate and intersect wit the future Integrator Arterial Road, once constructed, is unclear under the Precinct 15 LSP.			
22.4	The Parkland link provided is consistent with the EWDSP. The Landscape Master Plan prepared by Emerge does not clearly demonstrate how the Parkland Link will connect southwards, given the indicative positioning of future tennis courts.	Noted. The Master Plan provided is illustrative only, however this can be reviewed.	Noted. Administration recommends that the POS Masterplan is amended to demonstrate how the intent of the Parkland Links as detailed within the EWDSP will be achieved.	It is recommended that a revised POS Masterplan is required to demonstrate how the intent of the Parkland Links as detailed within the EWDSP will be achieved.
22.5	Positioning of the Neighbourhood centre to the west results in the centre's location straddling three separate lots resulting in concern that the fragmented landholdings would pose a challenge to the delivery of the activity centre. In particular the coordination of supporting infrastructure within the activity centre and the management of retail floorspace allocation amongst competing landowners. It is recommended that the Neighbourhood centre be designated mostly or entirely within the primary landowner's landholdings. This would potentially negate the need to prepare a separate Precinct	The neighbourhood centre is appropriately located adjacent to the transit station, transit corridor and at the junction of integrator arterial roads. This is a primary consideration in regard to accessibility and economic sustainability of the centre. Land ownership is not the primary consideration.	Noted. The neighbourhood centre was always envisaged in the EWDSP to be located to the east of the transit corridor. The location of the neighbourhood centre maximises connectivity with the transit station, community facilities, the combined primary and high school site and the regional open space.	No modification required.

No.	Summary of Submission	Applicant Comment	Administration Comment	Modifications?
	Structure Plan.			
22.6	The proposed density allocation of R40 – R80 for the Neighbourhood Centre is lower than envisaged under the EWDSP, with potential to increase up to the 'R-AC44' coding. Increasing the maximum allowable density in this location can provide greater flexibility, assist with delivering housing diversity, and further bolster the sustainability of this centre.	Such high densities were investigated however are not considered feasible. It is considered that up to R80 zoning will support delivery of a diverse housing mix across Precinct 15.	Administration agrees that a density code of R80 will deliver a comparable built form outcome to R-AC4. Notwithstanding this, built form within the centre will be considered at which time a LDP is submitted. In addition, rezoning of the neighbourhood centre from 'Centre' to Commercial will enable further flexibility to the development of the site.	No modification is required.
22.7	The EWDSP identifies that utilisation of existing servicing capacity will be on a 'first come, first-serve basis' until exhausted. Service providers will then bring additional capacity online pending market demand. Whilst the servicing report acknowledges that both Precinct 6 and 7 are quite fragmented, in the case of Precinct 7, Hesperia have acquired or have under option significant portions of the precinct immediately to the south of Precinct 15 and have also progressed an LSP. Similarly, Precinct 8 will be soon submitted. With this in mind, it is apparent that the timing of development, and the first come, first serve approach to wastewater	Ongoing discussions are being held with adjoining developers and key agencies, including Water Corporation, regarding servicing of the area.	See Administration's response in 12.1. In addition, it is understood that all Precincts are in discussions with the relevant servicing authorities to ensure that their developments are adequately serviced.	No modification is required.

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	provision, will be problematic if not appropriately managed. As such, there is evidently a need for ongoing collaboration between the key development groups in these precincts, as well as State Government agencies, with a view of securing key strategic sites that enable the delivery of critical servicing infrastructure to unlock development in these precincts in a manner that is fair and equitable.			
22.8	It is recommended that the cost of widening and upgrading/constructing Lakeview Road, which straddles the boundaries between Precincts 7 and 15, be incorporated into the District DCP as a shared cost item.	Noted. There will be an opportunity for the developers within East Wanneroo to comment on the District DCP when it is advertised in mid-2024.	Lakeview Road is partially included within the DDCP. The portion that is outside the scope of the DDCP will need to be upgraded by the proponents of Precinct 15 to an urban standard in order to facilitate the development of the Precinct	It is recommended that the LSP Map is amended so that Lakeview Road is entirely contained within Precinct 15.
22.9	Consideration should be given to the interface and integration between Precincts 7 and 15 to ensure alignment and consistency under each LSP.	Noted. Any inconsistencies will be reviewed as required, in coordination with the developers leading Local Structure Planning for Precinct 7.	Noted. Administration as part of its assessment of the proposal, has considered potential interface issues between the LSPs submitted to date.	No modification is required.
23.	**Submitter 23**			
23.1	It is requested that the western portion of Lot 13 be rezoned to 'Neighbourhood Centre' to allow for the development of 'Service Commercial' land uses to match the eastern Commercial portion of the Lot. The POS from Lot 13 is also to	Noted. The Neighbourhood Centre has been located in accordance with the EWDSP. However, discussions are ongoing with DPLH and PTA around the proposed mode and alignment of the transit corridor,	Administration notes the Applicant's response in relation to this comment. At the time of consideration, no changes to the location of the Neighbourhood Centre are proposed. Administration's resolution will	No modification is required.

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	be removed. It is detailed that this zoning is requested in order to provide for an additional range of uses which would be complementary to the traditional retail commercial development which is planned for the eastern portion of Lot 13. As 'Shop' is a prohibited use within the Service Commercial 'zone' this modification will not compromise the intended and traditional Neighbourhood Centre. With this modification in mind, there is no base residential zoning and therefore no requirement for public open space within this portion of Lot 13. Noting that there is no drainage proposed in this POS, this modification will have no impact on the drainage functionality. The submitter notes that as the railway is to be set underground, there is no major physical barrier or divide between the eastern and western portions of Lot 13, promoting a good environment for Neighbourhood Centre' and the requested 'Service Commercial' land uses which users can travel between.	which has the ability to affect the final location of the Neighbourhood Centre. Any relocation of POS would require a review of equitable POS distribution across the LSP, in addition to drainage requirements. Currently, POS has been equitably allocated across all landholdings within Precinct 15.	recommend that should any changes to the LSP be made, that targeted consultation or readvertising of the LSP to the affected landowners is required.	
23.2	Removal of POS on Lot 17, as the subject property poses no conservation or environmental value.	Any relocation of POS would require a review of equitable POS distribution across the LSP, and a	Noted. The Applicant has not made any changes to the LSP Map in response to the comment	No modification required.

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	The rationale around the placement of POS was heavily attached to the co-location of drainage catchments and the functionality of drainage within the Structure Plan area. The methodology has been to co-locate POS and drainage at natural low points which appears to have heavily impacted the location of POS on Lot 17. The drainage basin offers little amenity to residents. The drainage basin should instead be located on the abutting, eastern area where the land forms a depression highlighted in Figure 7 (Lot 2287 and Lot 2361). The submitter also identifies that these lots form part of a multiple use geomorphic wetland consistent with the pre-development drainage flow in the area as detailed in the LWMS prepared by Pentium.	complete review of preliminary earthworks and stormwater management. This can be reviewed following resolution of alignment of the transit corridor with DPLH and PTA.	made by the Submitter. Administration recommends that should any changes to the LSP Map be made following Council making a recommendation to the WAPC that target consultation to the affected landowners is required.	

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	 Rather than using the existing topography of the locality which naturally drains into this location, the post development drainage results in a shift in drainage logic despite ground levels being unchanged. It is recommended that POS Concept 8 is extended and relocate the drainage and POS out of Lot 17 as follows:			

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23.3	Lots 13 and 17 are located well within 400m of the Neighbourhood Centre and therefore should be able to reach an R80 density coding based upon the locational criteria prescribed in Part 1. However it is noted that the necessity to meet each criteria in order to access the stated density is vague and further clarity is required. The proposed modification would result in a high density residential hub within walkable distance to Service and Retail Commercial opportunities which provides for a high amenity Neighbourhood Centre as a whole. The R80 density code is identified as a maximum not a minimum density code requirement	Text within the LSP can be refined to provide clarity on locational criteria.	As discussed in the body of the report, it is recommended modifications to the locational criteria given the significant development flexibility that the criteria currently affords to the Precinct. In addition, the current R-Code range could facilitate a dwelling yield well in excess of the forecasted dwelling yield envisages as part of the Precinct 15 Local Structure Plan.	It is recommended that modifications to the locational criteria are implemented in accordance with Administration's locational criteria.

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	imposing a minimum further density requirement would unnecessarily ignored market and economic trends and potentially sterilise land from being developed.			
24.	**Submitter 24**			
24.1	Supportive of the proposal.	Noted	Noted.	No modification required.
25.	**Submitter 25**			
25.1	Will subdivision ensure there is room for 30% tree canopy?	Percentage unknown at this stage of planning. Tree canopy is important and will continue to be addressed at all stages of future planning and development.	It is uncertain whether 30% tree canopy is achieved across the LSP. Notwithstanding this, it is recommended that provisions are incorporated in Part 1 and vegetation to be retained is identified on the LSP Map. In addition, see Administration's response in 6.6.	It is recommended that provisions are incorporated in Part 1 of the LSP and vegetation for retention is identified on the LSP Map.
26.	**Submitter 26**			
26.1	Before handover of a new build a verge tree should be planted on every lot.	Agreed.	Noted.	No modification required.
26.2	The boulevards should be wide enough for a median strip that includes sufficient space for trees to be planted that would (as research shows) calm traffic as well as create a wonderful visual impact, an enhanced Sense of Place, and advance the City's Urban Forest Strategy.	Agreed that trees within road reserves should be pursued. This is a detailed design matter and will continue to be addressed at all stages of future planning and development.	Noted. See Administration's response in 7.3	No modification required.

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27.	**Submitter 27**			
27.1	Our dwindling and endangered black cockatoos rely on this area of bushland for habitat, food and foraging. This area should be maintained and protected, not flattened or destroyed.	The subject area is zoned for urban development. Environmental protection is a key consideration within all stages of planning, design and development and this will be carefully assessed and scrutinised by the environmental government agencies. The project has been referred under Federal legislation for assessment of environmental protection.	See Administration's response in 18.1.	No modification required.
27.2	The trees in these areas are hundreds of years old and should not be touched. It is senseless to destroy our native vegetation and scrubland, its killing many of our endangered and threatened species. This would be devastating and I urge you to reconsider.	The subject area is zoned for urban development. Environmental protection is a key consideration within all stages of planning, design and development and this will be carefully assessed and scrutinised by the environmental government agencies. The project has been referred under Federal legislation for assessment of environmental protection.	See Administration's response in 18.1.	No modification required.
28.	**Submitter 28**			
28.1	Recommends the retention of	Noted. The project will	Noted. In accordance with the	See Administration's

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	culturally and spiritually significant trees that occur within the locality which have a dramatic impact on the Noongar Aboriginal cultural continuity. Specifically, *Nuytsia fllorabunda* (Christmas Trees) and the *Melaleuca persiana* (Also other paperbark species present in the area in and around past and present wetlands)	endeavour to retain as many trees as possible. The project has been referred under Federal legislation for assessment of environmental protection.	recommendation of the Aboriginal Heritage Assessment Report, prior to subdivision and development occurring within the Precinct, an Aboriginal Cultural Heritage Management Plan prepared in consultation with the Whadjuk People is required to be prepared. This is recommended within Administration's schedule of modifications.	recommended modifications in 9.1.
28.2	The Kanyra or Moodjar tree (Christmas Tree) is the tree in which those who have passed would rest before leaving for the afterlife. Noted Wanneroo Elder Ken Colbung called it the Spirit Tree. The absence of these trees from the landscape would break thousands of years of continuous significant spiritual values. Additionally, the flowering of these trees have been used for a millennia as a clock timing the meeting times for clans between the northern most borders of Noohar Country by the Moore River to the edges of the Australian Bight. These areas are most impacted by settlement, farming and urbanisation. Further destruction would lead to a break down in the continuity of	Noted. The project will endeavour to protect these trees as much as possible. The project has been referred under Federal legislation for assessment of environmental protection.	Noted. Refer to Administration's response in 28.1.	No modification required.

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	cultural practices. At Lake Gnangara the clans and family groups would meet, walking from their various custodial lands as the tree flowered, earlier in the warmer Eastern and Northern parts, to come together for cultural events like ceremony, reunions and marriages. These trees are the world's largest form of Mistletoe and one of the world's most florescent trees. They need the roots of other trees and large plants to survive as their roots attach to them for food and water. Maintaining them in the landscape requires careful biological considerations. Leaving a single tree here and there will not maintain them for future generations.			
28.3	The Bibbool or Moonah (Paperbark Tree) is considered the Booka (cloak) of the Warkarl (Waugal - Rainbow Snake) showing where the Warkarl has created water places, and sometimes where he/she is still sleeping. The EWDSP area has many wetlands and swamps with paperbarks that indicate the Warkarl's work and presence.2. The bark of this tree is used as a blanket in the Bibbulmun Pit Healing Ceremony, as experienced by City of Wanneroo councillors and officers	Noted. The project will endeavour to protect these trees as much as possible. The project has been referred under Federal legislation for assessment of environmental protection.	Noted. Refer to Administration's response in 28.1.	No modification required.

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	more than a decade ago in Mariginiup at the invitation of Cultural Custodians there. Maintaining healthy stands of these paperbarks within an easily walking radius (perhaps 2 kilometres) of this Healing Site represent a sustainable way to ensure the paperbark is available for the healing practices there for the future. The flowers of this tree are also one of many used in the Pit Healing Ceremony and once again, to be sustainable for this cultural practice, there needs to be a sustainable amount of well protected trees within easy walking distance of this site. One paperbark near the site is around 300 years old and has seen continual Healing and other ceremonies since before colonisation.			
28.4	There may be other considerations that the members of Ni Kadadjiny Koort would like the City of Wanneroo to express in their response to the EWDSP, perhaps they can add to the information here and be part of the City's response	Noted	Noted.	No modification required.
29.	**Submitter 29**			
29.1	Duplicate of Submission 6	Refer to comments in Submission 6.		
30.	**Submitter 30 (Department of Fire and Emergency Services) – Refer to Schedule of External Agency Submissions**			

No.	Summary of Submission	Applicant Comment	Administration Comment	Modifications?
31.	Submitter 31 (Department of Education) – Refer to Schedule of External Agency Submissions			
32.	Submitter 32 (Department of Water and Environmental Regulation) and the Environmental Protection Authority– Refer to Schedule of External Agency Submissions			
33.	Submitter 33 (Water Corporation) – Refer to Schedule of External Agency Submissions			
34.	Submitter 34 (Department of Transport) – Refer to Schedule of External Agency Submissions			
35.	Submitter 35 (Department of Biodiversity, Conservation and Attractions) – Refer to Schedule of External Agency Submissions			

CITY OF WANNEROO
PRECINCT 15 – CENTRAL MARIGINIUP
SCHEDULE OF EXTERNAL AGENCY SUBMISSIONS FOLLOWING ADVERTISING
(Advertising Closed 8 March 2024)

Department of Planning, Lands and Heritage				
Item No.	**Comment**	**Proponent Comment**	**Administration Comment**	**Modification Required?**
1.1	Comment not provided at time of consultation.			
Main Roads Western Australia (Information Request)				
Item No.	**Comment**	**Proponent Comment**	**Administration Comment**	**Modification Required?**
2.1	Based upon the information presented in the TIA, it is uncertain how the traffic generated from the proposed Structure Plan area will impact the State Road Network. As such the following needs to be addressed: • The trip distribution information presented should be revised to consider a wider area, including key distributor roads. The traffic generated from the structure plan to access employment and other commercial opportunities will likely impact distributor roads such as Ocean Reef Road, Wanneroo Road, Neaves Road as there is limited road	The East Wanneroo DSP Road Planning Study (2019) provides 2051 total traffic volumes on roads within the DSP area but not on the surrounding Primary Distributor network (Wanneroo Rd, Ocean Reef Rd, Gnangara Rd, Whiteman-Yanchep Hwy, etc.). It is not appropriate to expect the LSP TIA to provide traffic projections outside the area reported in the DSP Road Planning Study. The LSP TIA can be updated to show LSP traffic generation on key roads in the overall DSP area.	In accordance with the Proponent's comments, the TIA will be updated to show LSP traffic generation on key roads within the DSP and is contained within Administration's schedule of modifications.	It is recommended that the TIA is to be modified in accordance with Main Roads Western Australia's comments.

	network surrounding the structure plan area; and • The trip distribution should consider future roads such as the Whiteman-Yanchep highway. The land for this highway is currently reserved under Planning Control Area 173. This corridor will be less than 800m from the Structure Plan area.			
Department of Water and Environmental Regulation (Not Support)				
Item No.	**Comment**	**Proponent Comment**	**Administration Comment**	**Modification Required?**
3.1	Does not support the progression of the proposed Precinct 15 Local Structure Plan.	It is understood that DWER does not support the LSP on the basis of district scale planning matters still being resolved (district groundwater solution via the District DCP). Pentium is still working with DPLH on the overall groundwater management solution as well as the Stage 1 area expansion (staging).	It is understood that DPLH, its hydrology consultant Pentium Water and DWER have made progress in determining an agreed approach to groundwater management in East Wanneroo. At the time of Administration's consideration of the LSP, the District Ground Water Management Scheme (DGWMS) has not been finalised. The design of the DGWMS will not be known until late this year. Once the design is finalised, it is recommended that the LWMS be referred to DWER and the City for review.	It is recommended that prior to the LSP being approved that the design of the DGWMS be approved and the LWMS amended to demonstrate adequate management of water in the LSP area. In addition, Administration's resolution recommends that targeted consultation or full readvertising of the LSP be undertaken to relevant external agencies prior to the approval of the LSP.

3.2	Pentium Water has developed a model and provided a draft of its report to DWER for review. The modelling report demonstrates substantial progress towards meeting the requirements of the District Water Management Strategy however further documentation is required for us to consider changes to the development schedule beyond the extent identified as Stage 1 as detailed in the EWDSP.	DPLH and Pentium Water are progressing the Groundwater Management Scheme Concept Design and Costing as part of the Part B District DCP including updates to the groundwater modelling report. DPLH and Pentium Water are also advancing a technical assessment and justification for the revision of the originally conceived Stage 1 area as illustrated in Figure 1.16 of the DSP based on an updated assessment of groundwater level and lake water level changes as development progress through multiple future climate scenarios. The timing of this supporting information is likely to be in the coming months (estimated Q1 FY24-25) and DPLH anticipates their endorsement will be required before LSPs are approved by SPC or WAPC. However, it should not preclude CoW from endorsing the LSP on its merits, knowing the broader water management issues are outside the control of LSP proponents. The advancement of the LSP (irrespective of the	Noted. See Administration's response in 3.1.	No modification required.

		approval status of the LWMS with DWER) needs to occur.		
3.3	The Department's endorsement of the District Water Management Strategy was conditional on a district groundwater management model and implementation strategy being developed by the Western Australian Planning Commission (WAPC).	Noted. This is underway by DPLH as outlined above.	Noted. See Administration's response in 3.1.	No modification required.
3.4	The Department also advised that if local structure planning proceeds before the development of the district groundwater management scheme, the Department may consider that Stage 1 in Figure 1.16 in the district structure plan could progress if appropriate land is set aside for flood management and there is provision for future connection to a district scale groundwater management scheme. Consideration of LWMS for stages 2 and 3 would be made once the district scale solution was resolved.	DPLH and Pentium Water are advancing a technical assessment and justification for the revision of the originally conceived Stage 1 area as illustrated in Figure 1.16 of the DSP based on an updated assessment of groundwater level and lake water level changes as development progresses through multiple future climate scenarios. The assessment will also identify proposed future connections to a district scale groundwater or lake water management scheme, as well as identify short term contingencies such as interim flood storage or drainage management areas. The timing of this supporting information is likely to be in the coming months (estimated Q1 FY24-25) and DPLH anticipates the endorsement will be	Noted. See Administration's response in 3.1.	No modification required.

		required before LSPs are approved by SPC or WAPC. However, it should not preclude the CoW from endorsing the LSP on its merits knowing the broader water management issues are outside the control of LSP proponents. The advancement of the LSP (irrespective of the approval status of the LWMS with DWER) needs to occur.		
3.5.	The LWMS does not demonstrate that the Structure Plan can adequately manage water (flooding, surface water and groundwater).	Stockland accept that not all facets of the stormwater and groundwater management elements have been resolved in the LWMS. This is simply a product of the additional information and designs being concurrently developed by DPLH to support the District DCP. Stockland accept that large portions of the LSP area (i.e. the central areas) are trapped catchments that will be reliant on a district scale groundwater management scheme. It is clear that portions of Precinct 15 can be considered in Stage 1 and portions will be in Stage 2, and that the design and finalisation of the (final) LWMS won't be feasible until such time as the	Administration concurs with the comments from the Department of Water and Environment Regulation (DWER) that the LWMS fails to demonstrate that water can be adequately managed within the Precinct. Notwithstanding this, see Administration's response in 3.1.	No modification required.

		district scale groundwater management scheme is resolved. Stockland is advocating for a sensible assessment of the LWMS and LSP to allow for development to progress in areas of Precinct 15 that are considered not reliant of the district scale scheme.		
3.6	The LWMS has not addressed the requirements specified in the DWMS.	Stockland understand that DPLH has appointed Urbaqua to work with DWER to provide updated guidance to proponents on some of the specific elements of the water management (that are unique to East Wanneroo) that need to be included in the LWMS. It is anticipated that this guidance to Stockland will allow the LWMS to be updated to the agreed standard.	Noted. See Administration's response in 3.1.	No modification required.
3.7	<u>Contamination (s2.3.2)</u> A number of sites within the structure plan area pose contamination risk due to their former land use. This is to be investigated – a Preliminary Site Investigation is recommended at Local Structure Plan stage. Precinct 15 has had several land uses considered to be potential sources of contamination that may pose risks to	Preliminary Site Investigation is appropriate at subdivision stages of development. The site is not listed as a contaminated site on DWER register. An Environmental Site Assessment was conducted at Stockland's acquisition of Call Option land by JBS&G which identified areas and sources of	Administration concurs with the comments from DWER.	It is recommended that the LWMS be modified to address contamination issues prior to the approval of the LSP.

	water quality to the onsite water resources	potential contamination. Report identified potential contamination types as 'low risk'. Further investigations to be completed prior to settlement and/or as part of subdivision processes.		
3.8	<u>Wetland retention and management requirements (s2.4.6 and s5.1.3)</u> Several of the wetlands and their associated 50 metre buffers identified for retention In DWMS Figure 9, have not been retained. For example UFI 15022 is identified as a wetland for retention as an integrated part of the drainage system however this is not retained as part of the LSP and no alternative location has been provided to accommodate the modelled storage.	The LWMS identifies the stormwater management strategy for each drainage catchment determined through a preliminary earthworks design of Precinct 15. The appropriate modelling storage has been provided based on a more detailed assessment. The DMWS nominal drainage location and volumes are now outdated. Wetland UFI 15022 (Pennygum Place) is classified as a Multiple Use wetland. It was considered for retention, however the design preference is to infill this area as presented in the LWMS and LSP. Post development runoff that drained into that wetland will be managed within Basins 9, 12 and 21, and the LLC (Figure 15).	Noted. Refer to the Proponent's response in 3.8. In addition, it is noted that UFI 15022 is located in an area designated for suburban neighbourhood in the EWDSP. Notwithstanding this, as per Administration's previous recommendation, the LWMS is to be amended to ensure consistency with the DGWMS when approved, at which time the sufficiency of water management within the Precinct will be reconsidered.	No modification required.
3.9	There is no evidence of consultation with the Department of Biodiversity, Conservation and Attractions	DBCA have been referred the draft LSP and have provided a	DBCA have been consulted regarding the proposed LSP. The EWDSP required that a foreshore	It is recommended that upon lodgement of a subdivision application,

	(DBCA) on wetland buffer requirements. The DWMS required that wetland management plans should be prepared for wetlands to be protected to ensure ongoing maintenance and/or enhancement of wetland values and mitigation of impacts from changes in adjacent land uses. Wetland management plans have not been provided. Furthermore, the LWMS has not provided investigations into impacts to wetland hydrology.	submission, which includes consideration of wetland buffers. The wetland areas (extent of buffer and surrounding Regional Open Space (ROS)/Public Open Space) have not yet been approved - this is the purpose of the LSP. The detailed layout of spaces around the wetlands has not yet been determined – this is the purpose of subdivision applications. It is not appropriate to prepare a detailed WMP at LSP stage. A Foreshore Strategy has been submitted with the LSP that will inform more detailed Wetland Management Plans for retained wetlands which will be prepared to support the subdivision stage (when the abutting land is to be subdivided and developed). The WMP will also need to be informed by ongoing groundwater investigation and management strategies being developed for East Wanneroo. Importantly, the wetlands proposed to be retained by this LSP are located within the proposed Regional Open Space which will ultimately be reserved for Parks & Recreation under	strategy and wetland buffer assessment was provided as part of the 'inputs' for Precinct 15. A wetland buffer assessment has been provided in the Environmental Assessment Report (EAR) prepared by the Proponent's environmental consultant. Administration understands that the consultant contends that a 30 metre wetland buffer is appropriate. At the time of consideration of the LSP, Administration does not concur with this finding. Notwithstanding the above, Administration recommends within its schedule of modifications that as a subdivision application requirement that a wetland management plan is prepared and submitted to support development located within 50 metres of an existing wetland or a smaller buffer as agreed with the Department of Water and Environmental Regulation.	that a wetland management plan is prepared and submitted to support development located within 50 metres of an existing wetland or a smaller buffer as agreed with the Department of Water and Environmental Regulation.

		the MRS. The preparation of detailed WMP ahead of certainty regarding the exact form and function of this ROS is not appropriate. It is most appropriate that a WMP is developed concurrently with detailed plans for the ROS/Parks and Recreation reserve.		
3.10	Protection of important environmental assets and water resources (s5.1) Insufficient information to determine the impact of the proposed water management strategies to water resources and other significant environments. As such development of the LSP may pose significant impacts to terrestrial fauna and flora.	The LWMS is not a document that covers environmental impact as it relates to terrestrial fauna and flora. The Environmental Assessment Report that supports the LSP addresses these issues.	Noted. Administration has reviewed the EAR provided by the Proponent and agrees that the information contained within section 3.1.2.1 does not adequately addresses the comments raised by DWER.	It is recommended that this section is modified to further discuss the LSPs impact upon terrestrial fauna.
3.11	Public Drinking Water Source Protection Areas and Wellhead Protection Zones (s5.1.1) The LSP assumes that the area will be reclassified from P2 to P3, however this process has not occurred.	The P2 area only affects the very eastern section the LSP area that is still zoned Rural – Water Protection under MRS. Section 2.5 of LSP reports addresses this matter. Reclassification from P2 to P3* happens when this land is rezoned under future MRS Amendments as provided for by the DSP, as per DWER's WQPN38. This is a separate stand-alone process. Importantly, the LSP is consistent with the DSP.	Noted. A subsequent amendment to the MRS is required to zone the site from Rual – Water Protection to Urban. It is noted that at the time of consideration of the LSP, a request for the lifting of deferment and concurrent amendment to DPS 2 has been lodged, this only pertains to approximately 30% of the LSP Area. The EWDSP requires that the lifting of the urban deferment occurs on a Precinct wide basis.	It is recommended that prior to the approval of the LSP, that the underlying zoning issues are resolved and the zoning under both the MRS and DPS 2 are amended to be 'Urban' and 'Urban Development' respectively.

3.12	The PDWSA and WHPZs are not appropriately marked on the LSP or identified for inclusion in a special control area as required by the DWMS. The LSP has not addressed the local water management plan aspects provided in Table 3 in *Water Quality Protection Note No. 38 – Priority 3* (P3*) Areas* (DWER, Oct 2018).	The LWMS will be updated to specifically address these gaps. However, updates to the LWMS to address this issue does not change the proposed LSP.	Refer to Proponent's response in 3.12. Notwithstanding this, issues pertaining to the Public Drinking Water Supply Area and the Wellhead Protection Zone areas are to be addressed through a further MRS Amendment.	Refer to Administration's recommended modifications in 3.11.
3.13	The Department's policy on development in PDWSAs is a presumption against the intensification of land uses. This is because more intense land uses increase the risk that the drinking water will become contaminated.	DWER's position is understood. However, the WAPC has approved the DSP with the knowledge of the presence of the PDWSAs. The LSP simply adopts the DSP design outcomes across the PDWSAs and anticipates WAPC approval.	Noted. See Administration's response in 3.11.	No modification required.
3.14	<u>Management of groundwater and stormwater (s5.3)</u> No information on groundwater management or integration with the district scale system is provided in the LWMS. No local groundwater modelling is provided to quantify the potential range of groundwater volumes that could be captured by subsoil drainage and where these volumes will be treated and stored. The LSP layout and groundwater management strategy is inconsistent with the DWMS.	The LWMS has been prepared with the benefit of the information that is being development by the DPLH/Pentium Water team. Proponents of LSPs have not yet been provided with the necessary information to articulate or demonstrate how local design will integrate with the district scale system. Stockland is committed to updating the LWMS once this information is available.	See Administration's response in 3.1.	No modification required.

		It is understood that the LSP is consistent with the DSP and supporting DWMS.		
3.15	The LWMS identified that groundwater nutrient levels exceeded the ANZECC guideline in all bores. Insufficient information has been provided to demonstrate where and how groundwater collected in subsoil drains will be treated.	The LWMS will be updated when information is made available on the proposed concept design of the district scale groundwater management scheme. However, it is anticipated that groundwater collected via subsoil drainage will need to be treated via conveyance to a biofiltration basin or through treatment in a swale or dedicated vegetated system.	Administration concurs with the Proponent's comment in 3.15.	It is recommended that the LWMS be amended to discuss how groundwater nutrient levels will be managed within the Precinct.
3.16	Surface water modelling has not been provided. The LWMS proposes to integrate groundwater and stormwater management however it does not demonstrate that the integrated system can function effectively for both purposes.	Stormwater modelling results are presented in Section 5.4 of the LWMS. The LWMS will be updated to include additional information to demonstrate the functioning of the system.	Noted. See Administration's response in 3.1	No modification required.
3.17	<u>Fit for purpose water supply (s5.4)</u> No water source for public open space irrigation has been secured and sub-soil harvesting is proposed as an alternative source with no further technical justification. Almost half a gigalitre is required and not yet sourced, and cannot be fully supplied by licences within the subject site.	Non-potable water supply for irrigation was discussed with DWER in 2022 and it was agreed non-potable water supply was not a major issue to be resolved at LSP stage. The significant groundwater balance shift across East Wanneroo due to land use change will inevitably free up groundwater allocation to be	The assumption made by the Proponent does not adequately address the concern raised by DWER. Similarly, Administration concurs with the comments made by DWER. Based upon the information contained within the LWMS, the Precinct has approximately 50% of the required water licences to irrigate the proposed POS. Irrespective of this, at which time the POS is	No modification required.

		made available to the City for irrigation. Given this outcome, it is logical to allow this non-potable water supply licensing issue to be resolved at subdivision stage.	handed over to the City to manage, the required water licences will also be provided.	
Environmental Protection Authority (Not Support)				
Item No.	**Comment**	**Proponent Comment**	**Administration Comment**	**Modification Required?**
3.18	Regarding fauna surveys, the provided surveys were inadequate to determine the significance of the site for invertebrate fauna including significant species and short-range endemic invertebrates, which would not meet EPA guidance. No specific sampling for invertebrate fauna appears to have been conducted.	Short-range endemic fauna surveys are not typically undertaken (nor are they listed as being required under relevant CoW / WAPC planning policies relating to structure planning) and therefore are not proposed to be completed a part of the LSP process.	Noted.	No modification required.
3.19	Based on the information provided in the LSP and attached Environmental Assessment Report (EAR), a key concern is that the quantification of impacts to environmental values is not explicitly stated; EAR Table 16 *Summary of EPA environmental factors and objectives relevant to the proposed future land use* would be appropriate to state impacts. For example, it could be calculated that the impacts to clearing of threatened Black Cockatoo foraging habitat would add up to over 51 hectares (ha), which is also considered largely	Noted. EAR can be updated to include quantification of potential future impacts to environmental values, as a result of future subdivision and development works. It should be noted that: - At the LSP stage, the quantum of future impacts on environmental values is less certain as further impact avoidance (i.e. habitat retention) can be considered at the more	In accordance with the comments of the Proponent, the EAR will be updated to include quantification of potential future impacts to environmental values, as a result of future subdivision and development works.	It is recommended that the EAR is amended to discuss the quantification of impacts to environmental values.

	remnant Banksia woodlands Threatened Ecological Community. This would constitute a significant impact to terrestrial fauna and flora and vegetation values; in recent appeal determinations the Minister for Environment has stated that all remaining foraging habitat on the Swan Coastal Plain is critical to the survival of black cockatoo species, regardless of quality.	detailed design stages such as subdivision. Notwithstanding this, the EAR can be edited to consider the quantum of anticipated impacts based on a worst-case scenario. - The LSP design has been informed by environmental considerations that has resulted in the identification of POS areas to retain significant environmental values, to avoid future impacts in these areas. This includes strategically locating POS areas to maximise the retention of black cockatoo habitat in the most opportune areas. - The LSP is not a proposal for the purpose of the EP Act. It is a land use planning tool to inform future subdivision and development applications, that may be progressed by a variety of different proponents over different areas and		

		over different timeframes. - The proposed development of part of the LSP area (under Stockland control) has been referred under the EPBC Act (Federal) and is currently going through an environmental assessment process, which considers residual impacts to black cockatoo habitat.		
3.20	Noting the lack of information, the LSP will result in a further incremental and net loss to the remaining extent of black cockatoo habitat on the Swan Coastal Plain and should be modified to adequately secure, protect and manage the environmental values within the area; impacts should first be avoided or minimised.	Noted. The Precinct 15 LSP is consistent with the approved EWDSP, which identifies this area for urban development. The development of the EWDSP specifically considered strategic environmental retention opportunities at a district-scale, to provide protection for the most significant environmental areas. The environmental retention areas identified in the approved EWDSP are reflected in the Precinct 15 LSP. The approved EWDSP also identifies a range of land uses to be provided which have large spatial footprints (in addition to the identified future urban areas), including a 50 ha	Noted. The development of the subject Precinct for urban purposes is consistent with the EWDSP. In addition, in accordance with the EWDSP, a 50 hectare regional sporting facility has been provided in the south eastern corner of the site. Further, the Resource Enhancement Wetland (REW) has been retained both for its aesthetic and environmental value but also for groundwater management purposes. The POS Masterplan indicates that generally vegetation will be retained within POS. However, the Bushfire Management Plan provided identifies that all POS	It is recommended that Part 1 of the LSP is amended to include a provision requiring that tree and vegetation retention is maximised subject to detailed engineering design. Further, it is recommended that the BMP is amended to consider retention of tree canopy within POS.

		regional sporting fields area, a major transit corridor, a Neighbourhood Centre, and a high school site. This provides a level of restriction to the ability for the LSP to accommodate all significant environmental assets within the site. Notwithstanding this, and as outlined extensively in the EAR, an integrated multi-disciplinary design process was undertaken to develop the LSP layout, of which environmental considerations were a key component. This resulted in the strategic identification of public open space areas to further retain environmental values and avoid impacts to significant environmental values, whilst balancing the other drivers and requirements (e.g. population and density targets, planning policy requirements, roads, stormwater management, etc.). Overall, a balanced design outcome has been achieved.	will be designed to be low threat. Drainage basins within POS however are identified to be BAL-FZ. Given that BAL-LOW is not conducive to retaining vegetation, Administration recommends that the BMP is amended to consider retention of tree canopy within POS. In addition, it is recommended that Part 1 of the LSP is amended to include a provision requiring that tree and vegetation retention is maximised subject to detailed engineering design.	
3.21	The high number (68 native species) of vertebrate fauna species recorded indicates that the LSP has high potential values to fauna. Despite its degraded state, the location of the LSP may be of importance to fauna	Noted. The approved EWDSP has considered ecological linkages at a district scale and the Precinct 15 LSP is consistent with the approved EWDSP. Furthermore, the LSP	Noted.	

	for habitat connectivity between Bush Forever Sites 147 and 324, and remnant bushland within surrounding areas including State Forest.	includes a POS network that provides vegetation retention and landscape opportunities to assist further with ecological linkages. Specific landscaping opportunities to maximise ecological linkage functionality will be further considered as part of future detailed design.		
3.22	To counter balance any loss of foraging habitat, the LSP should provide for revegetation in the local area so there is no net loss.	Noted. As outlined above, the proposed development of part of the LSP area (under Stockland control) has been referred under the EPBC Act and is currently going through an environmental assessment process, which considers residual impacts to black cockatoo habitat. As part of this process, offsets are likely to be required and Stockland are currently investigating local opportunities to implementation revegetation-based offsets.	Noted. The portion of the LSP subject to development has been referred under the EPBC Act and is currently under assessment. Actions resulting from the assessment will be required to be implemented by the Proponent.	No modification required.
3.23	Noting two specific Resource Enhancement Wetlands are proposed to be retained, there are further inland water values within the LSP area (including additional wetlands) which may be worthy of retention. Further investigation is required to determine whether these wetland areas are worthy of retention for inland waters, and terrestrial environmental values,	Noted. The development of the LSP layout has been informed by the approved EWDSP layout and associated future land uses, which include a major transit corridor and regional sporting field requirements that intersect the remaining REW features, restricting the ability to provide for their future retention whilst still being consistent with the	The EWDSP provides high level guidance regarding the envisaged development of a particular precinct. Majority of the Precinct is intended to be developed for residential purposes. In this instance, the range of wetlands present within the Precinct means that not all environmental values of these wetlands can be retained. Therefore, the development outcome is	No modification required.

	noting these areas also contain good quality remnant vegetation.	approved EWDSP. This is outlined extensively in the EAR.	considered to be consistent with that of the EWDSP.	
3.24	The higher priority given for these areas being identified for sporting fields is not supported. In addition, the characteristics of several Resource Enhancement Wetlands suggest a reclassification to Conservation Category Wetlands (CCW) may be warranted.	Noted. The provision of sporting fields in these areas was determined through the State Government led East Wanneroo DSP process, not the LSP process. Regional playing fields are social infrastructure required by the future community. It is understood that EPA Services were provided opportunities to be involved in the district structure planning process. The Precinct 15 LSP is required to be consistent with the overarching approved EWDSP, and as such has reflected the provision of regional sporting fields in this area per the approved EWDSP. In addition, the LSP has sought to improve the environmental retention outcomes from the approved EWDSP, by strategically designing the regional sporting fields layout to provide the number and type of fields stipulated in the EWDSP, whilst also providing retention of an additional REW feature.	Noted. See Administration's response in 3.23. In addition, the EAR discusses the processes required to occur to change wetland boundaries and management categories of the existing geomorphic wetland dataset. The EAR does not suggest that the REW wetlands should be reclassified to Conservation Category Wetlands (CCW).	No modification required.
3.25	It is also noted that an Aboriginal heritage site 22160, associated with CCW UFI 14241, borders the LSP	Figure 2.8 of the DSP identifies an Aboriginal Heritage site (22160; Marrynginup) within	Noted. An Aboriginal Heritage Assessment Report was submitted to support the LSP. The	It is recommended that prior to the lodgement of a subdivision or

	area. The EAR documents this as a very significant and sensitive area, and proposes that consultation with the Whadjuk People (Whadjuk Aboriginal Corporation) and the site custodian should be undertaken. Consideration should be given to undertaking this as soon as possible to better inform the LSP, and modify the LSP if required. Statutory approval or consent under the *Aboriginal Heritage Act 1972* will also be required.	Precinct 15. The place has been lodged with the Registrar of Aboriginal Sites but has not yet been formally assessed. The DSP identifies the need for an Aboriginal Heritage Investigation and consultation with the Whadjuk Working Party be undertaken. An Aboriginal Heritage Desktop Assessment has been undertaken as part of the LSP, and engagement with the key Whadjuk Custodian has been undertaken to inform the significance of the place. The report and consultation findings have been incorporated into the LSP. Further consultation with the Whadjuk people and a s.18 approval under the Aboriginal Heritage Act. As the ACH boundary (as identified in the Aboriginal Heritage Desktop Assessment Report) will be required prior to subdivision and development of the land, noting the ACH boundary area is located within Stage 2 of the DSP. It is noted that DPLH 22160 site as shown on Figure 14 of the LSP affects a small area of land within Precinct 15, near the	report recommends that an Aboriginal Cultural Heritage Management Plan is prepared with direct input from the Whajuk People to satisfy the requirements of the *Aboriginal Cultural Heritage Act 2021*. Administration understands that Aboriginal Heritage site 22160 has been lodged with the Registrar of Aboriginal Sites but has not yet been formally assessed. Currently there are no provisions within Part 1 which address Heritage within the LSP. Noting this, it is recommended that an additional section is created in Part 1 of the LSP discussing how impacts to Heritage located within and surrounding the Precinct will be managed.	development application that an Aboriginal Cultural Heritage Management Plan is prepared with direct input from the Whajuk People to satisfy the requirements of the *Aboriginal Cultural Heritage Act 2021*. Additionally, it is recommended that an additional section is created in Part 1 of the LSP discussing how impacts to Heritage located within and surrounding the Precinct will be managed.

		junction of existing road reserves Rousset and Lavina. The LSP shows a neighbourhood connector and residential land here, however it is noted that this land use would be subject to further assessment, management and legislative requirements around this lodged heritage site. If required for heritage protection, the land uses and road network could be modified in this area. We also note that this area is involved in the current transit corridor re-alignment issue currently being considered by the DPLH and PTA. Given this, we suggest any redesign of the LSP is deferred until the transit corridor/rapid bus route alignment is finalised.		
Department of Fire and Emergency Services (Advice)				
Item No.	**Comment**	**Proponent Comment**	**Administration Comment**	**Modification Required?**
4.1	<u>Vegetation Classification</u> There is no photographic evidence to support the vegetation classification within Plot 2, or some of the photos for Plot 1 have been incorrectly labelled. The delineation between Plots 1 and 2 is also not clear on the vegetation classification map.	Plot 2 comprises forest (Class A) vegetation that is contiguous with vegetation in Plot 1 (photo ID 6) and synonymous in vegetation structure. The area comprising Plot 2 is subject to downslope 0-5; therefore, was assigned an individual Plot	Noted.	It is recommended that the BMP is amended to include photographic evidence to substantiate the identified vegetation classification within Plot 2.

		number. No BMP updates required.		
4.2	<u>BAL Contour Map</u> Table 3 is a copy of the separation distances as found in Table 2.5 of AS3935, it doesn't provide any value. Table 3 should be updated to state the highest BAL impact for each vegetation plot on development areas i.e. Plot 1 has an impact of BAL-40 in the post development scenario. This provides decision makers with a clear picture of how the structure plan layout is complying, or not, with the policy requirements. Furthermore, the BAL Contour does not clearly identify all POS, including areas of managed POS where the encroachment of BAL40/FZ would have no impact on compliance.	Noted – Figure 2 and 3 to be updated to differentiate between residential and public open space areas.	In accordance with the Proponent' comments BMP Figure 2 and 3 are to be updated to differentiate between residential and public open space areas.	It is recommended that Table 3 of the BMP is amended to state the highest BAL impact for each vegetation plot on development areas. Further, the BAL Contour Map is to be updated to differentiate between residential and public open spaces.
4.3	<u>A1.1 & A2.1 – not demonstrated</u> The BMP acknowledges that future lots will be impacted by BAL40/FZ however states compliance with Elements 1 and 2 is achieved as future dwellings can achieve BAL-29. The BMP has focussed on the future dwellings which is not relevant at the structure planning stage. The assessment at this level should inform the design and layout of subdivision and reduce the vulnerability of people and property form the impact	The BMP supports a strategic planning proposal (Local Structure Plan Stage) with the lot layout not known. It is noted that in accordance with the Guidelines, a BAL contour plan is not a requirement where the lot layout of the structure plan is not known. In accordance with the Guidelines a BHL was prepared to the support the LSP, whilst the BAL contour plan was provided to inform	The Bushfire Management Plan provided by the Proponent details that in some instances, the Bushfire Attack Level (BAL) achieved by some lots is in excess of BAL 29 specifically, where residential lots are located within proximity to the REW. Administration have included recommended modifications to the LSP which will provide further physical separation to the bushfire threat and it is anticipated that as a result of	It is recommended that a road reserve is located around the entire periphery of the REW and regional Sporting Fields. Further, that at which time a subdivision application is submitted, a Bushfire Management Plan is submitted demonstrating that the proposed lots achieve a Bushfire Hazard Level less of BAL 29 or lower.

	of bushfire. The BAL Contour Map identifies areas of BAL-40/BAL-FZ within developable areas (residential) of the structure plan. Strategic planning presents the best opportunity to incorporate setbacks in the form of roads and/or managed open space areas to address at planning stage and remove the need for reliance on building setbacks at a later stage. The BMP and layout should be updated to incorporate appropriate setbacks to demonstrate compliance with Elements 1 and 2 by locating development in areas with least possible risk of bushfire and achieving a maximum rating of BAL-29 for all future residential areas and not rely on construction standards, in-lot setbacks or the possible management of wetland buffer. There is an opportunity to review and redesign the LSP to achieve compliance with A1.1 and A2.1 for future stages.	future detailed planning designs and decisions. An updated BMP/s will be prepared to support future subdivision applications and development approvals within the LSP area. The future BMPs will be supported by detailed design of the proposed residential lots and civil infrastructure such as roads including detail on road surface and reserve width, and pedestrian and cycling paths that will provide separation between future buildings and classified vegetation forming part of the asset protection zones for future buildings to achieve BAL-29 or less. The future BMP/s will provide an assessment of the detailed design against the bushfire protection criteria of the Guidelines and will be required to achieve the acceptable solutions to support subdivision approvals and to support subsequent planning processes (i.e. land tiles and development approvals). It is also to be noted that the final BAL's are dependent on the	these changes a compliant BAL rating should be achieved. Notwithstanding this, upon lodgement of subdivision application a BMP will be required to be submitted to demonstrate an acceptable level of bushfire risk is achieved on the property.	

		details regarding development /maintenance and management of open space areas which is uncertain at this stage of planning.		
4.4	A3.2a and A3.3 – not demonstrated The BMP states that temporary no through roads may be required where external roads have not been constructed. This conflicts with the compliance statement in A3.2a which states that *vehicular access arrangements in the short, medium and long term duration of development will need to ensure that all occupiers and visitors are provided with at least two vehicular access routes at all times*. The Local Government should make commitments to construct any external roads prior to commencement of the structure plan to ensure multiple access routes are available at all stages of development and the BMP compliance statements should reflect this.	Noted – to be edited to clarify that as part of staged construction, multiple access routes will need to be provided and that this will require coordination with the City of Wanneroo with respect to external local road upgrades, where required.	As per Administration's previously recommended modification, at which time a subdivision application is lodged for assessment a BMP will be required to be submitted to demonstrate that the proposed lots achieve a BAL of less than BAL 29.updated to clarify that, as part of staged construction, multiple access routes will need to be provided and that this will require coordination with the City of Wanneroo with respect to external local road upgrades, where required.	No modification required.
4.5	The BMP does not adequately address the policy requirements of SPP 3.7 and the guidelines.	Response provided in above sections.	Noted. Specific discrepancies discussed in 4.1 to 4.5 above.	No modification required.
4.6	In addition to the BMP updates, DFES recommends amendments to the proposed Structure Plan (section	Response provided in above sections.	Noted. Administration concurs with comments made by DFES. Modifications made to the LSP in	It is recommended that any further changes to the LSP Map will require

	4.13 of the East Wanneroo Precinct 15 Local Structure Plan Report), consistent with any future modifications to the BMP. The proposed changes include commitments regarding the location of residential lots in areas of BAL-29 or below; and vehicular access and vegetation management to meet the requirements of SPP 3.7 and Guidelines at all stages of the development.		response to Administration's schedule of modifications will require revised technical documentation to be prepared.	subsequent amendments to Part 2 and the Technical Documentation.
Water Corporation (Not Support)				
Item No.	**Comment**	**Proponent Comment**	**Administration Comment**	**Modification Required?**
5.1	Currently not able to support the LSP being used as a basis to lift the Urban Deferment over the subject land and allow subdivision and development of this area to commence in the short term.	This feedback has already been provided as part of Stockland's Lifting of Urban Deferment request for the western portion of the site, lodged with DPLH in October 2023.	Noted.	No modification required.
5.2	There is currently a lack of clarity about the ultimate regional drainage and groundwater suppression scheme and governance arrangements, and there is currently no suitable wastewater outlet (sewer discharge point) for Precinct 15.	As outlined in reports accompanying the DSP, it is acknowledged that the ultimate outlet for Precinct 15 as proposed in the Water Corporation's Wastewater Planning for the area is currently not available. The LSP engineering report proposes that the existing capacity in the network west of Precinct 15 is made available as an interim	Noted. The DGWMS design is yet to be finalised and it is anticipated that a further amendment to DPS 2 will be lodged to incorporate the required cost of this into the District Development Contribution Scheme. Notwithstanding this, the Local Water Management Strategy fails to address flooding, surface water and groundwater management within Precinct 15 in	It is recommended that the LWMS is amended following the DGWMS being finalised and approved by DWER. Administration's resolution recommends that further targeted consultation or readvertising of the LSP is undertaken prior to the LSP being approved.

		measure and outlines likely timeframes for development. Strategic work between DPLH, DWER, and Water Corporation are continuing in relation to the timely delivery of infrastructure within East Wanneroo.	the absence of an approved DGWMS. With respect to wastewater management, the engineering report demonstrates that a portion of the Precinct falls within the Jandabup Sewer District. However, the report acknowledges that delivery of the Precinct in an ultimate sense requires the delivery of a number of higher order infrastructure items which are yet to be delivered. In order to address this issue, the servicing report needs to be amended to discuss interim solutions.	In addition, it is recommended that Part 2 of the LSP and Engineering Report be updated to discuss interim servicing requirements where capacity in utility infrastructure is exhausted.
5.3	There is currently no water or wastewater infrastructure in the area that could support servicing of the land uses and dwelling yields envisaged in the LSP.	Please refer to comment above.	Noted. See Administration's response in 5.2.	No modification required.
5.4	Water Corporation's infrastructure planning is based upon the staging plan set out in the EWDSP. As such, capital funding for headworks infrastructure to serve this area is therefore located outside the current capital program.	DPLH advised in a meeting between WC/SGP and DPLH on 10/5/23 that the staging outlined in the EWDSP is not rigid, and stages could be brought forward from those indicated in the EWDSP which was a best guess and estimated staging at the time that the EWDSP was completed.	Noted. Irrespective of the staging guidance provided by the EWDSP, the EWDSP is explicit in stating that existing utility capacity will be on a first come first serve basis until exhausted. In the absence of the development being capable of being serviced, interim solutions will be required until such time as additional capacity is brought online by service providers.	Refer to Administration's recommendation in 5.2.

		If larger tracts of land such as Precinct 15 were proposed to be developed, then WAPC could respond and bring forward stages outside of Stage 1 given the size of the landholding, with provision to fund utility extensions to bring forward into Stage 1 from Stage 2.	Noting that this precinct is outside the current capital program for Water Corporation, interim servicing requirements of the development need to be considered.	
5.5	Precinct 15 is located approximately 5km from the Wanneroo Reservoir and 2-3km from the nearest water distribution main of adequate size to serve the proposed dwelling yield. Long water main extensions will be required at the developer's cost. It is likely that larger distribution sized water main (Greater than 300mm diameter) may be required to serve Precinct 15 if this land is to be developed as a standalone development ahead of other land closer to the water network.	It is acknowledged that the ultimate demands for Precinct 15 may require water mains of a size larger than typical retic mains. Initial stages of Precinct 15 may be stand-alone, however are not likely to create significant water demand until such time that development has progressed in the area more substantially. Progressive review of water demand needs can occur, which considers other extension and growth of the network along the western front of the EWDSP. The usual approach to temporary water servicing to developments located further away from the existing network is to extend a suitably sized reticulation main (typically 250mm) from the nearest available distribution main, with the Water Corporation to plan and follow in	Noted. See Administration's response to 5.2.	No modification required.

		with larger distribution mains in future as demand necessitates.		
5.6	The LSP area forms part of the Jandabup catchment which is planned to be served by two waste water pumping stations. Current infrastructure planning, indicates these are both currently outside the Corporation's 5 year investment program.	Refer to responses to items 5.2 & 5.4	Noted. See Administration's response to 5.2.	No modification required.
5.7	The LSP layout needs to make provision within or adjoining the proposed POS area/shared oval immediately west of the primary school to accommodate one of the Jandabup waste water pumping stations.	The LSP layout accounts for this. Final design of POS9 to ensure WWPS accommodated alongside Primary School sporting facilities.	Administration acknowledges that two waste water pumping stations (WWPS) will be required to service the ultimate development of the LSP area. Notwithstanding this, Administration is not supportive of this infrastructure being located within or collocated with Public Open Space. A separate reserve should be created to accommodate this infrastructure and ceded to Water Corporation. This requirement is consistent with the WA Planning Manual: Guidance for Structure Plans.	It is recommended that a separate section is created within Part 1 which discusses public reserves for utilities. Further, Administration recommends that all necessary utility required to service the development be identified on the LSP Map.
5.8	The other waste water pumping station is required to be located somewhere within the POS playing fields to the east of the K-12 school site. The final location and local catchments of these pump stations will be dictated by the developer's finished ground levels and sit grades. The LSP and Landscape	Prelim sewer planning is attached which shows the proposed location of WWPS Q which is referred to by the WC. The indicative location, or a notation, can be included on the LSP.	See Administration's response in 5.7. In addition, with respect to the buffer to WWPS, this is required to be indicated on the LSP Map in accordance with the WAPC's WA Planning Manual: Guidance for Structure Plans.	It is recommended that any odour buffers resulting WWPS are represented on the LSP Map.

	Masterplan should be modified and annotated to show the approximate locations for the two stations, the required land for the WWPS infrastructure, direct road frontage access, and a 30 radius odour buffer.	The location of the WWPS will need to be finalised following agreement of location of the eastern Primary School and High School with DoE (locations subject to change following LSP advertising). The final location of the WWPS should also be carefully considered by relevant stakeholders in light of the Regional Playing Field function of this POS. It is not appropriate to lock this in until the design of the ROS is completed.		
5.9	There is currently no wastewater outlet/discharge point available to allow short term development of land in Precinct 15, contrary to the information contained in the accompanying Engineering Report, which suggests the use of spare capacity in other adjoining networks which has not been agreed to by Water Corporation.	See 5.2	Noted. See Administration's response to 5.2 and 5.4.	No modification required.
5.10	Existing capacity in the DN375 sewer in Joondalup Drive will be taken up by pumped flows from the Jandabup interim WWPS which is to be constructed as the southern end of Lake Mariginiup. The interim WWPS will service much of Precinct 7 and parts of Precinct 6, which are closer to the urban front. The Precinct 15 land is located outside of	See 5.2. Water Corporation's response is predicated on proximity of Precincts 6 & 7, however does not consider likely timing of development of Precinct 15, as well as rate of development within each Precinct.	Noted. See Administration's response in 5.4.	No modification required.

	the gravity catchment of the proposed Jandabup Interim WWPS.			
5.11	The groundwater table is modelled to rise by up to 5 metres in places. Left unmanage, the projected groundwater table rise will cause permanent inundation in some areas adjoining wetlands and ecological destruction of regionally significant, protected wetlands.	No comment provided.	Noted. The DGWMS is yet to be finalised, in the absence of an approved DGWMS, the Local Water Management Strategy (LWMS) fails to provide a proof of concept that flooding, ground water and surface water is adequately able to be managed within Precinct 15. Notwithstanding this, once the DGWMS has been approved by DWER, it is recommend that DWER and the City be afforded the opportunity to review the amended LWMS prior to the approval of the LSP by the WAPC.	No modification required.
5.12	A regional groundwater management scheme is being prepared. It is understood that the proposal is yet to recover the cost of regional groundwater management infrastructure through a DCP. No operating costs will be covered by the DCP.	Costs and management approach for the District DCP are still to be confirmed. This is expected to be finalised for advertising in late calendar year 2024.	Noted.	No modification required.
5.13	Precinct 15 is likely to be significantly affected by groundwater level rise, according to the modelling outcomes, the developable area is contingent on the effectiveness of the groundwater management scheme.	Noted. This will be addressed through LWMS update and District DCP.	See Administration's response in 5.11.	No modification required.

5.14	The eastern edges of Precinct 15 LSP intersect with the gazetted Wellhead Protection Zones that protect the abstraction zones around two aquifer abstraction bores (Wanneroo 'W255' and Wanneroo 'W260'). Urban development of the portion of land in the WPZ's can occur after the relevant area has been reclassified from P1 and P2 to P3*, on agreement from DWER, and arrangements have been made through Government to compensate the Water Corporation for the loss of the water source and/or replacement with other sources.	No comment provided.	Noted. As discussed in the body of the report, these areas are zoned Rural – Water Protection under the MRS and prior to the adoption of the LSP, an amendment to the MRS is required prior to the adoption of the LSP.	No modification required.
5.15	The East Wanneroo DSP area is traversed by several existing and planned water trunk mains and raw water bore mains. Existing trunk pipes in the vicinity of Precinct 15 include: - Parallel 1,000mm and 600mm bore mains running north-south generally within Boundary Road at the eastern edge of the LSP area. - Parallel 915mm and 1,220mm diameter transfer mains between the Wanneroo Groundwater Treatment Plant and Wanneroo Reservoir, running east to west within Townsend Road, and then southwest within Roussett Rd, and then south along Franklin Road.	Existing mains in Boundary Road considered in design. 915 and 1220 mains in Townsend/Rousset/Franklin not within or neighbouring LSP area and hence not affected.	Noted. Administration requires that the boundary roads abutting the LSP area are upgraded to an urban standard. At which time the required infrastructure to service the LSP area can be developed.	It is recommended that the LSP Map is amended to include Lakeview Street, Roussett Road, Mariginiup Road, Coogee Road and the easternmost perimeter road within its boundaries.

	These critical assets must be adequately protected on their current alignments as part of structure planning, subdivision, and road design.			
5.16	The Water Corporation also has long term planning to install additional water distribution mains, groundwater bore collector mains, and bulk water transfer/trunk mains through East Wanneroo to interconnect northern, southern and eastern water sources with the Wanneroo Reservoir.	Noted. Given that these items are longer term and that timing for delivery is unknown, it is understood that closer to the time of delivery that WC will undertake the necessary alignment review processes which will consider status of development in the area to determine the best routes available for these mains, which are likely to follow higher order roads.	Noted.	No modification required.
5.17	The route for a 1,600mm diameter steel water trunk main from the Alkimos Seawater Desalination Plant to Wanneroo Reservoir is currently in advanced planning and design. The 1,600mm trunk main is proposed to run along the western edge of Precinct 15, initially within the unmade portions of Mariginiup Road, and then southwards along Mariginiup Rd and Caporn Street. Any minor variations between the final trunk main route and the local road pattern depicted in the Precinct 15 LSP will need to be reflected in the final structure plan.	Noted. Cossill and Webley have received preliminary alignment information from the WC are in ongoing collaborative dialogue with the WC regarding the alignment and delivery of the main.	Noted. At the time of Administration's review of the proposal, it is understood that the road alignment is consistent with the final trunk main route. Prior to the approval of the LSP, it is recommended that DPLH liaise with Water Corporation to ensure that the alignment and road reserve width is unchanged prior to the approval of the LSP.	No modification required.

ATCO Gas Australia (Support)				
Item No.	**Comment**	**Proponent Comment**	**Administration Comment**	**Modification Required?**
6.1	No objection	Noted.	Noted.	No modification required.
6.2	Anyone proposing to carry out construction or excavation works must contact 'Before You Dig Australia' (www.byda.com.au) to determine the location of buried gas infrastructure. Refer to ATCO document AGA-O&M-PR24-Additional Information for Working Around Gas Infrastructure https://www.atco.com/en-au/for-home/natural-gas/wa-gas-network/working-around-gas.html	Noted.	Noted.	No modification required.
6.3	Proposed construction and excavation works need to be managed in accordance with the ATCO document Additional Information for Working Around Gas Infrastructure - AGA-O&M-PR24 https://www.atco.com/en-au/for-home/natural-gas/wa-gas-network/working-around-gas.html	Noted.	Noted.	No modification required.
Department of Education (Not Support)				
Item No.	**Comment**	**Proponent Comment**	**Administration Comment**	**Modification Required?**
7.1	The EWDSP requires that three primary schools and 1 high school is provided within Precinct 15. The structure plan area includes one primary school and one combined	The EWDSP's reference to (indicative) number of 3 primary schools related to 3,800 anticipated dwelling targets.	Administration notes that the Proponent is in discussions with the Department of Education (DoE) regarding an alternative	No modification required.

	model of primary and secondary school. This model is not adopted by the Department for new metropolitan primary schools and this is reflected under OP 2.4. Accordingly, the department requests that separate primary and secondary school sites are provided for on the structure plan in addition to the primary school site on the western portion of the LSP area.	The LSP yields approximately 3,200 dwellings (excluding aged care site). DoE's submission states that based on the revised dwelling targets, DoE is satisfied with the provision of 2 primary schools. A revised plan showing two (2) stand-alone primary schools and one (1) high school was provided to DoE in January 2024 and is the subject of ongoing considerations.	distribution of educational facilities with the Precinct. As discussed in the body of the report, the EWDSP details that three primary schools and one high school is required within Precinct 15. The provision of educational facilities is based upon the anticipated dwelling yield within the Precinct. Given the density code range proposed of R25 – R80, Administration is unable to ascertain how the estimated dwelling yield has been calculated and as such, the associated required educational facilities. It is recommended that the density code ranges and locational criteria are reviewed. With this in mind, it is anticipated that the dwelling yield within the Precinct may change at which time, Administration recommends that DPLH consult with the DoE to confirm the number of Educational Facilities proposed is adequate to service the envisaged number of dwellings to be provided.	
7.2	It is noted that the size of the primary school site on the western portion is 3.5 hectares with co-located Public	Stockland propose to deliver childcare sites adjacent to both PS, but not as part of PS site.	In the absence of an agreed approach between the Proponent and the Department of Education	It is recommended that all primary school sites within the LSP area are a

	Open Space. To align with OP 2.4, the Department requests an additional 2500m^2 for child care services on every primary school site.	This was a preferred outcome with DoE at Illyarie. Need to demonstrate same outcome but private management to DoE. Identify childcare location on LSP? OP2.4 refers to the requirement for an additional 2,500m^2 childcare site where there is no planned site in the vicinity. Stockland propose to deliver childcare sites adjacent to both primary schools in Precinct 15, but not as part of each PS site. This was a preferred outcome with DoE at Stockland's development at Illyarrie in Sinagra. The model delivers the same outcome but within a private management format for the childcare. This was discussed with DoE at a meeting in May 2024, will verbal support provided for this approach.	(DoE), Administration recommends that the primary school site is increased in area to a minimum of 3.75 hectares where collocated with an oval to facilitate Childcare Services.	minimum of 3.75 hectares in area to permit the provision of Childcare Facilities or an alternative size, as agreed with the Department of Education.
7.3	Relocation of the high school site to the west of the transit corridor would be more consistent with the EWDSP. So as to improve the viability of the school and improve its catchment.	The high school has been co-located with Regional Open Space and associated sporting fields, providing a unique opportunity for shared facilities (ovals, gym, indoor recreation, tennis courts, parking). The HS location is cognisant of the	Administration is supportive of the spatial outcome proposed by the LSP. Further, Administration is supportive of a high school being retained in the current location of the combined primary and high	It is recommended that the combined primary and high school site is separated with the primary school being relocated elsewhere in the structure plan area.

		broader context of schools' catchment and distribution (including the location of schools in the surrounding Precincts 7, 8 and 16). **Attachment 1 refers.** The western portion of the LSP is heavily constrained by areas of natural drainage and existing topography (western ridgeline) associated with retention of significant vegetation. Significant elevation changes render the western portion of the LSP area unsuitable for a high school site. This, combined with the benefits of co-locating the HS with Regional Open Space and access to public transport station, supports the eastern portion of the LSP as a preferred HS location. An information pack was provided to DoE in January 2024, further justifying the HS location. This was further discussed at a meeting with DoE in May 2024, and additional information is being prepared to submit to DoE to support this position.	school. However, in accordance with the advice from DoE, it is recommended that the primary school and high school is separated so as to reduce the concentration of vehicular trips in the south eastern portion of the structure plan area. Further, relocation of the primary school in an alternative location will enable the primary school to be central to its catchment. In addition, Administration acknowledges that the residential catchments for high schools are significantly greater than that of primary schools. Therefore, retention of the high school's current location within 500 metres of the transit station is an outcome supported by Administration despite it not being located centrally to its residential catchment.	
7.4	The high school's proximity to the neighbourhood centre provides the opportunity for the exposure of	Consistent with DoE's advice, an appropriate separation distance between the high	Noted. See Administration's response in 7.3.	No modification required.

	incompatible land uses such as licenced premises, service stations and fast food outlets.	school and the neighbourhood centre has been provided (**Attachment 1** refers).	In addition, there is no evidence to substantiate that the neighbourhood centre will accommodate incompatible land uses.	
7.5	However, there is a spatial separation between the site and the neighbourhood centre by a park and ride or medium density housing. Additionally, there is an inconsistency in Figures 18 and 19 in terms of the way in which this area offering spatial separation between the K-12 school site and the Neighbourhood centre.	Noted. This inconsistency will be addressed.	The park and ride facility represented in Figure 19 is a representation of a location in which parking will be developed. In accordance with the requirements of the EWDSP, a parking strategy is required to be developed to address parking associated with the neighbourhood centre and the transit stop. Given that this information has not been provided, Administration recommends as a schedule of modification that additional text is included in Part 1 of the LSP that requires a parking strategy to be lodged for approval prior to the development and subdivision of the neighbourhood centre. Inconsistencies between Figure 18 and 19 will be reviewed and corrected in the LSP.	It is recommended that a parking strategy is developed for the neighbourhood centre prior to the subdivision and development of the centre.
7.6	The concentration of high trip generating land uses in the immediate vicinity, traffic circulation and access for drop off and pick up of students will be problematic particularly during school peak	Consistent with DoE's advice, an appropriate separation distance between the high school and the neighbourhood centre has been provided (**Attachment 1** refers). Once	See Administration's response in 7.3.	No modification required.

	periods. The Department does not support any activity/commercial centres being located within close proximity to the school as this will result in increased traffic management, accessibility issues and increased risk of incompatible uses.	final school locations have been agreed with DoE, the Transport Impact Assessment will be reviewed and updated.		
7.7	Contrary to section 4.6.1 of the LSP which suggests that the Department provided in-principle support for the co-location of the high school adjacent to regional playing fields, the Department did not offer any support during the preliminary engagements with the proponent. Ultimately, the location of the high school centrality to its broader residential/ public primary school catchments remains paramount.	Noted. Refer comments in sec. 7.3.	Noted.	No modification required.
7.8	Based upon Figure 19 – Indicative Master Plan in Structure Plan Report and Landscape Masterplan, the indicative overlay of the oval in 'POS 9' identifies that half of the oval sits within the effective primary school site. It should be highlighted that a maximum area of encroachment of the overall including over-runs into the school site is 0.5 hectares.	Requirement noted. This plan is **indicative** only. This is detailed design for future stages of planning of this POS and primary school.	Noted. Administration is not supportive of any portion of the oval being partially located within the Department of Education Primary School. Administration requires that the co-located oval is a minimum of 4.5 hectares in size to accommodate a full size oval entirely within the site and the associated neighbourhood pavilion/local community centre. The provision of this community facility is in accordance with the City of Wanneroo's endorsed Community Facilities Plan.	It is recommended that POS 9 is increased in area to a minimum of 4.5 hectares in area so as to accommodate the neighbourhood oval and local pavilion/community centre.

7.9	Concern is also raised that both school locations are currently proposed on existing wetlands. Additionally, Figure 15 of the Post Development Surface Drainage of the LWMS and Appendix D of the Engineering Report seek possible allocation of a drainage basin and pump station on POS 9. Further, a pump station is also identified on the K-12 school site.	These are Multiple Use Wetlands, not required to be protected and not proposed to be retained. As such, these sites will be earthworked to support development and the school sites (physical site requirements) will be delivered in accordance with OP2.4.	Noted. In accordance with the Proponent's comments, the proposed school sites will be required to be earthworked to accommodate development. Administration recommends as part of its resolution that prior to the approval of the LSP that the DoE is further consulted to confirm the sufficiency of the school sites proposed.	It is recommended that as part of the resolution, that prior to the adoption of the LSP that further consultation is undertaken with DoE to confirm the sufficiency of the education sites.
7.10	Clarification is sought on whether 'POS 9' and K-12 School' sites are expected to contain stormwater runoff from adjoining properties and serve as a drainage function given the topography of the area.	School locations are still being determined in consultation with DoE. This information can be provided once the locations and adjacent POS requirements have been finalised.	In accordance with Local Water Management Strategy (LWMS) submitted with the LSP, there are no drainage basins proposed within the primary school site. Refer to Administration's response in 7.9.	No modification required.
7.11	It is important to note that the Department only support co-location of active POS without any bioretention or drainage basins in the interests of safety of students and operational requirements of the schools. In addition it is also the Department's expectation that the adjacent active POS achieves a lower level than the school site to facilitate access, passive surveillance and on-site drainage.	School locations are still being determined in consultation with DoE. This information can be provided once the locations and adjacent POS requirements have been finalised.	Noted. Refer to Administration's response in 7.9.	No modification required.
7.12	OP 2.4 requires public school sites not to be encumbered by a significant flora and fauna and other environmental/physical constraints	These are Multiple Use Wetlands and are not required to be protected. Consideration of acid sulphate soils risk is	Noted. Refer to response provided by Proponent in 7.12.	No modification required.

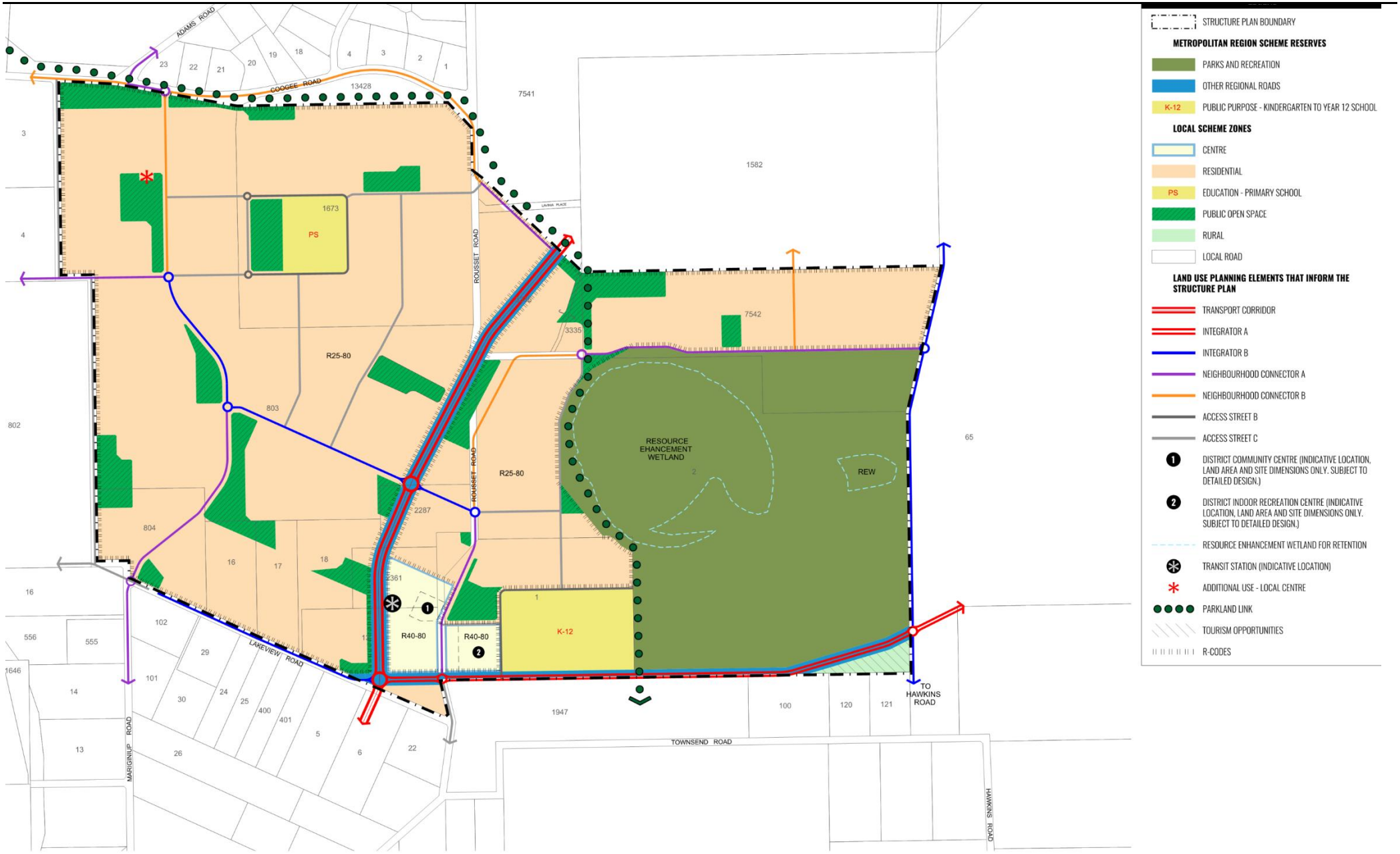
	which may impact on the developability of these sites. Figure 13 – Wetlands of Structure Plan Report indicates that the primary school and 'K-12 school sites fall within the Multiple Use Wetlands identified as UFI 15022 and UFI 14252 respectively. In addition, Figure 3 – Acid Sulphate Soil Risk Nap of Environmental Assessment Report indicates that the PS 1 and K-12 sites are impacted by Class 1: High to moderate Acid Sulphate soil risk. Given that the Multiple Use Wetland generally provides essential hydrological functions, clarification is sought on whether there would be any development limitation on these school sites and that they are geotechnically sound and not subject to inundation, erosion or extension on-site earthworks.	common and is easily managed through the subdivision approval & condition clearance process. If any ASS material is identified, then it can typically be easily managed during construction through standard construction management practices. Multiple use wetlands do not typically represent an environmental constraint to development, as they do not support significant environmental values. The drainage functionality of the LSP area has been considered through the LWMS documentation, with provision of appropriate stormwater management features across the LSP area, primarily within proposed POS areas. Geotechnical and physical considerations will be addressed through the bulk earthworks and engineering processes, to ensure the site is suitable for its intended use. This is standard practice.	In addition to the above, Administration's resolution will require that further consultation is undertaken with the Department of Education to ensure sufficient educational sites are provided.	
7.13	Road reserves adjacent to school sites shall have appropriate carriageway width and integrate pedestrian and cycle paths via a	Figure 25 can be revised as required to allow for DUP's on roads adjacent to school sites. This is consistent with advice	Administration concurs with the comments of the DoE.	It is recommended that Figure 25 as contained within Part 2 of the LSP and the TIA are

	dual-use/shared path. However, Figure 25 – Path Network of the Structure Plan Report indicates that dual use paths have not been proposed within the road reserves adjacent to public school sites although these sites will be served with Access Street B (17.9m wide).	provided by CoW on the TIA regarding shared paths around schools.		amended to indicate that a shared path is required. In addition, it is recommended that Part 1 of the LSP and the TIA are amended to incorporate road reserves in accordance with Local Planning Policy 5.3: East Wanneroo.
Department of Transport (Advice)				
Item No.	**Comment**	**Proponent Comment**	**Administration Comment**	**Modification Required?**
8.1	As foreshadowed in the East Wanneroo District Structure Plan, PTA (through METRONET) has undertaken further work to identify and refine the transit corridor needs and alignment through the EWDSP area, including Precinct 15.	Noted. This is being dealt with directly with DPLH.	Noted. Following consultation being undertaken as part of the LSP, the proponent has provided an amended LSP Map (**Attachment 10**) in accordance with the latest Public Transport Authority Advice.	No modification required.
8.2	DoT advises that the City and applicant should liaise directly with Department Planning Land and Heritage's officers to obtain their advice on how structure planning should proceed while required updates to the EWDSP are being prepared.	Noted. This is already being undertaken.	Noted.	No modification required.
8.3	The Structure plan area has a primary, secondary and several local routes in the DoT's Long-Term	The LTCN plan is shown in the TIA report (Figure 7) and the ped/cycle network for the LSP	Noted. Administration generally concurs with the comments of the Proponent. Figure 10 of the TIA	It is recommended that the north eastern on road cycle lane which

	Cycling Network (LTCN), and opportunities should be identified to provide cycling connections within Precinct 15 to the longer-term cycling network	road network is shown in Fig 10. Factor in the Parkland Links (dotted on Fig 10) and it should already cover the future routes indicated in the LTCN.	demonstrates cycle routes provided within the LSP area. Administration recommends that the north eastern on road cycle lane which provides an east west connection from the eastern boundary road is extended to connect to the other on road cycle lane abutting the neighbourhood centre.	provides an east west connection from the eastern boundary road is extended to connect to the other on road cycle lane abutting the neighbourhood centre.
Public Transport Authority (No comment)				
Item No.	**Comment**	**Proponent Comment**	**Administration Comment**	**Modification Required?**
9.1	Comment not provided at time of consultation.			
Department of Biodiversity and Conservation (Advice)				
Item No.	**Comment**	**Proponent Comment**	**Administration Comment**	**Modification Required?**
10.1	Planning for the future development should make provision to retain as much of the Good- Very Good quality vegetation and associated cockatoo habitat as possible.	No comment provided.	Noted and agreed by Administration. Notwithstanding this, there will be circumstances where it will not be possible to retain vegetation due to the need to undertake earthworking, road development and residential lot configuration.	No modification required.
10.2	Consider if offsets are required.	No comment provided.	Noted.	No modification required.
10.3	Some areas of remnant vegetation have been identified as occurrences of Threatened Ecological Communities (TEC) that area listed under the Commonwealth EPBC Act 1999. These communities are also listed as Priority Ecological	No comment provided.	Noted. Separate approvals will be required by both State and Federal Government Departments to clear native vegetation unless exempted.	No modification required.

	Communities under the WA Biodiversity Conservation Act 2016 (BC Act)			
10.4	Many wetlands within the East Wanneroo area were not accurately mapped, in the Geomorphic Wetlands of the Swan Coastal Plain dataset. Wetland Assessments should be undertaken prior to structure planning development to inform proposed open space areas and future local structure plan design.	No comment provided.	Noted.	No modification required.
10.5	All wetlands protected including Resource Enhancement Wetlands should be allocated a minimum 50m buffer to maintain wetland values and mitigate impacts from adjacent land uses.	No comment provided.	Noted. Administration concurs with the comments of DWER and DBCA which do not agree that a 30 metre wetland buffer is appropriate. With this in mind, Administration recommends that a 50 metre buffer is implemented despite the findings of the EAR. It is recommended as part of Administration's resolution that further consultation is undertaken with DWER and DBCA to confirm the appropriateness of a reduced wetland buffer.	Administration's resolution recommends that targeted consultation or full readvertising of the LSP be undertaken to relevant external agencies prior to the approval of the LSP.
10.6	Wetlands retained should be subject to a wetland management plan to ensure the ongoing protection of wetland value and mitigation of impacts from changes in adjacent land uses.	No comment provided.	Administration concurs with the comments of DBCA. Any retained wetlands will be subject to a Wetland Management Plan which will protect the environmental value of the wetland from encroaching urbanisation.	It is recommended a Wetland Management Plan is included as a requirement of lodgement of a subdivision or

			Administration recommends that this requirement is reflected in Part 1 of the LSP as a requirement of subdivision and development.	development application in Part 1 of the LSP.



RECINCT 15 STRUCTURE PLAN

arious Lots, MARIGINIUP

NORTH
Scale: 1:10 000 @ A3
0 100 200 300m
PLAN: STOMA-2-001 REVISION: F
DATE: 06/08/2024 DRAWN: JP

Unit 2, 464 Murray Street
Perth WA 6000
(08) 6333 1888
info@cdpaus.com.au
www.cdpaus.com.au

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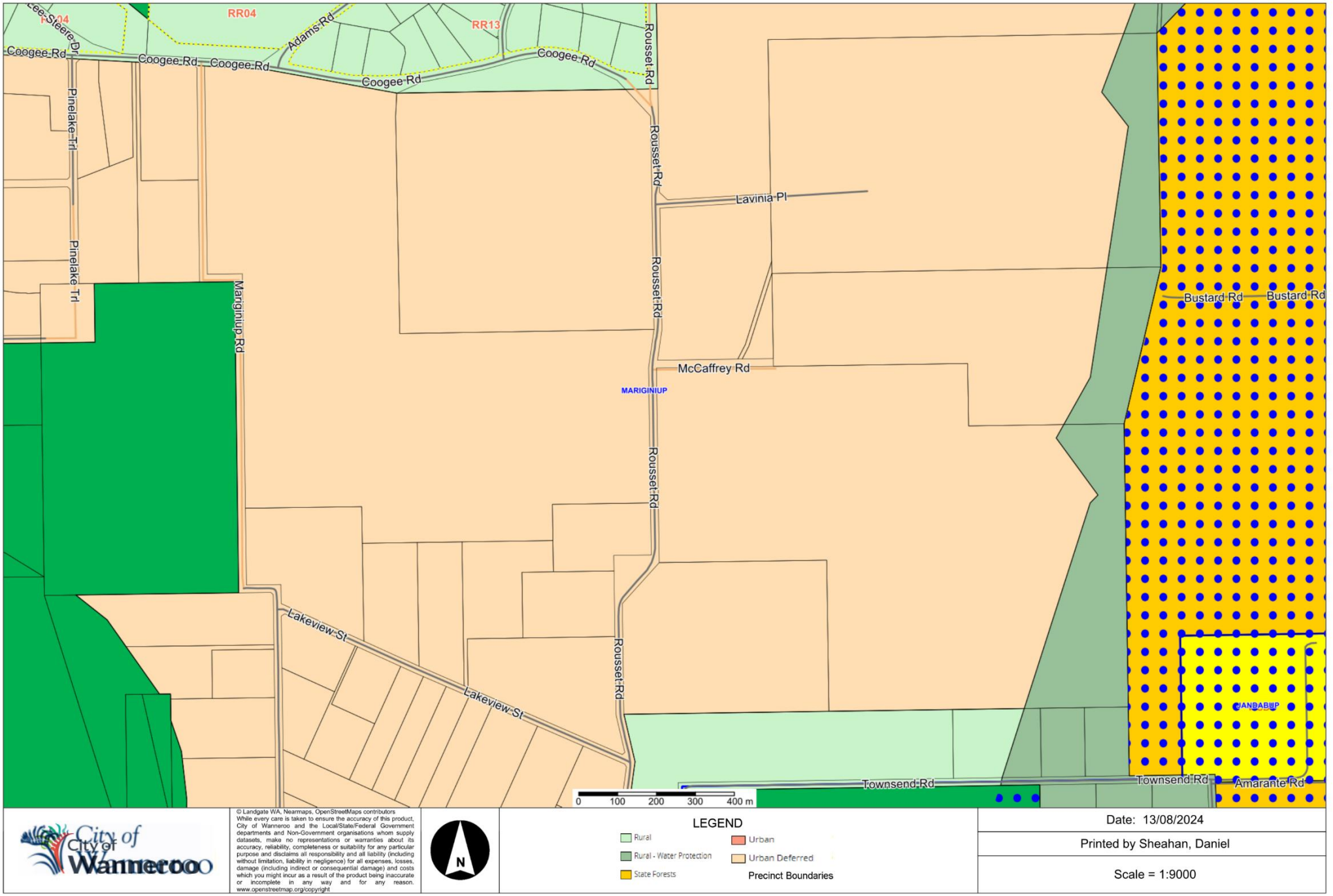
RR04
RR13
Coogee Rd
Adams Rd
Rousset Rd
Pinelake Trl
Lavinia Pl
Bustard Rd
Mariginiup Rd
McCaffrey Rd
MARIGINIUP
Lakeview St
Townsend Rd
Amarante Rd
JANDABUP
0 100 200 300 400 m
© Landgate WA, Nearmaps, OpenStreetMaps contributors
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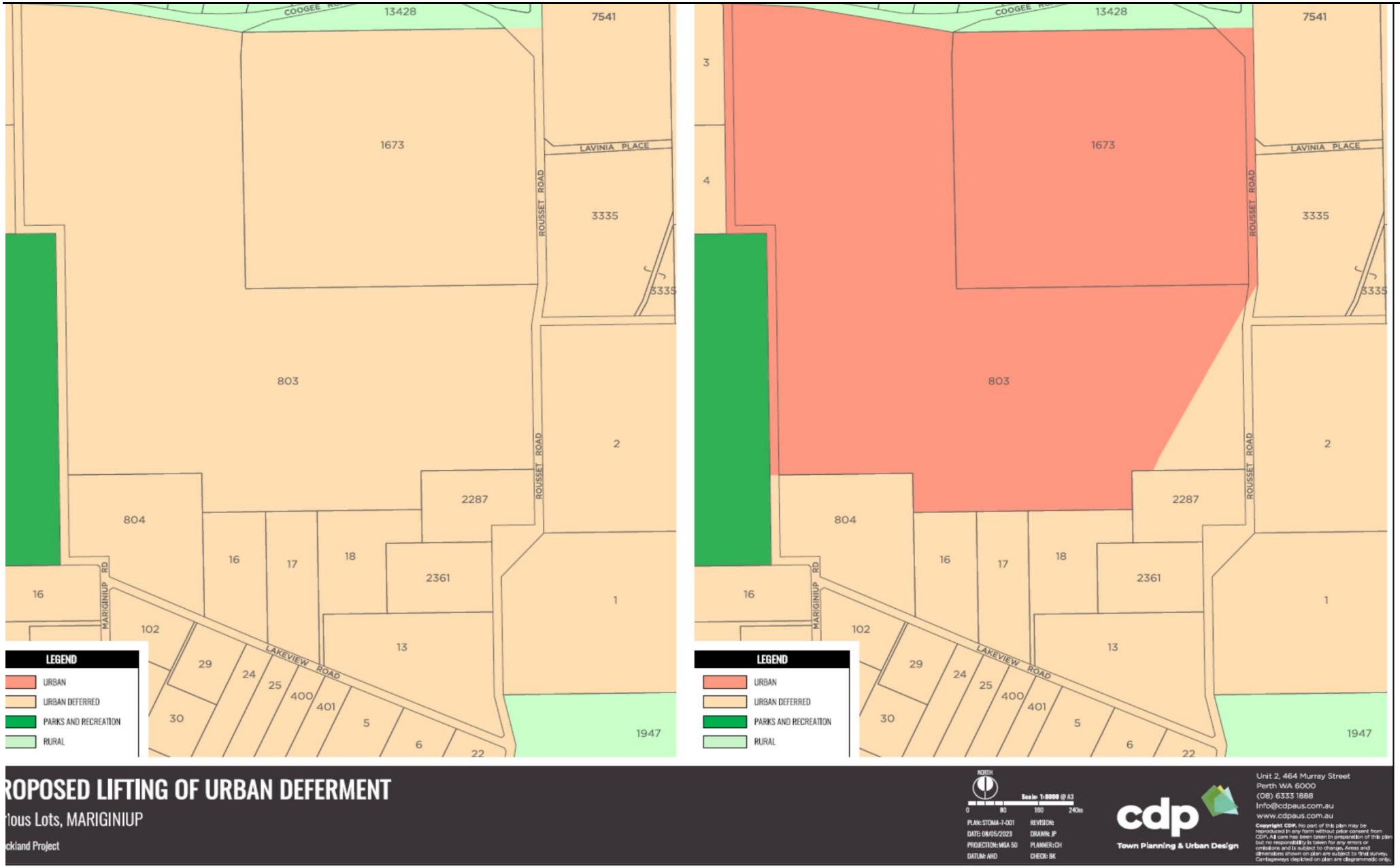
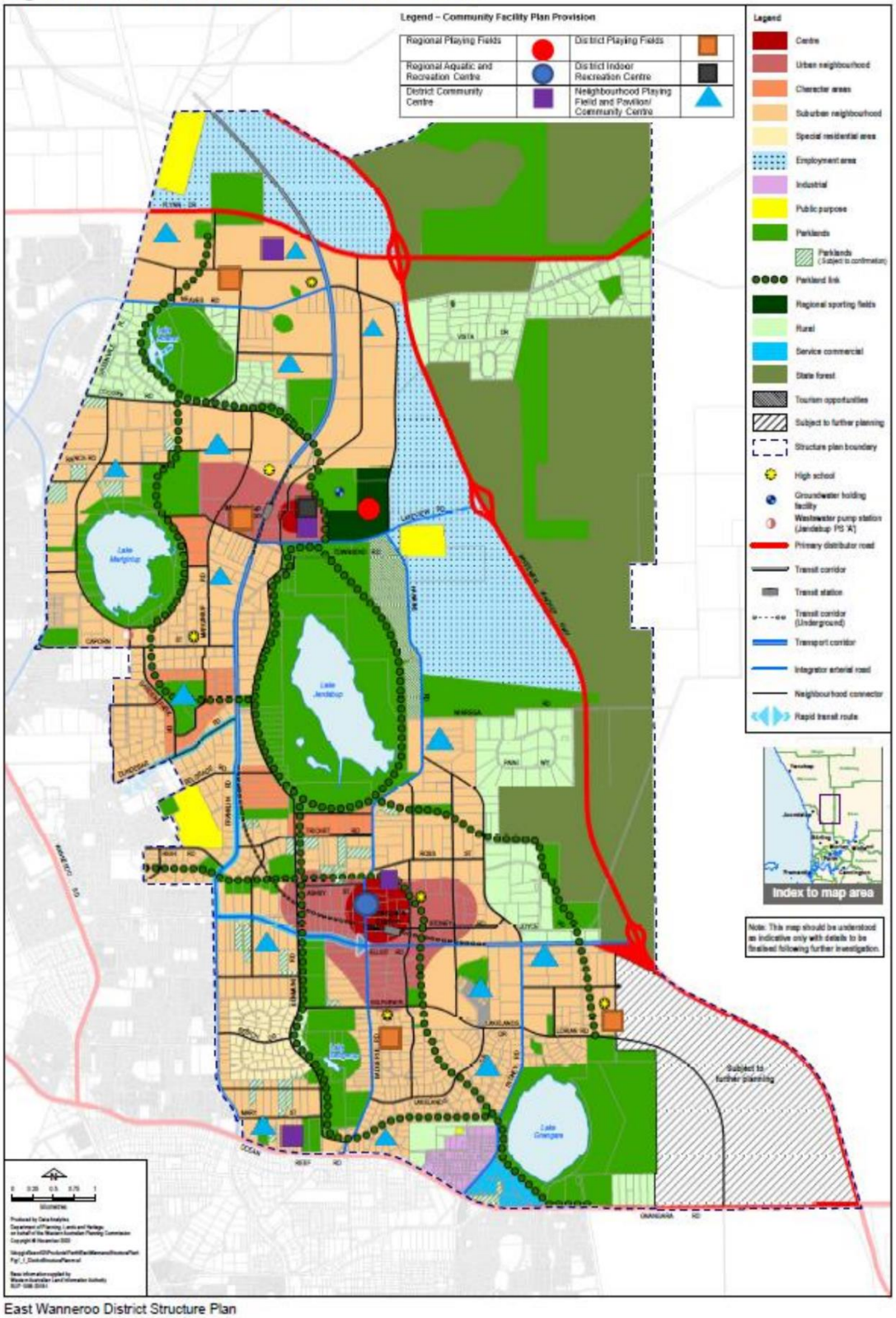
www.openstreetmap.org/copyright
N
LEGEND
Rural
Rural - Water Protection
State Forests
Urban
Urban Deferred
Precinct Boundaries
Date: 13/08/2024
Printed by Sheahan, Daniel
Scale = 1:9000



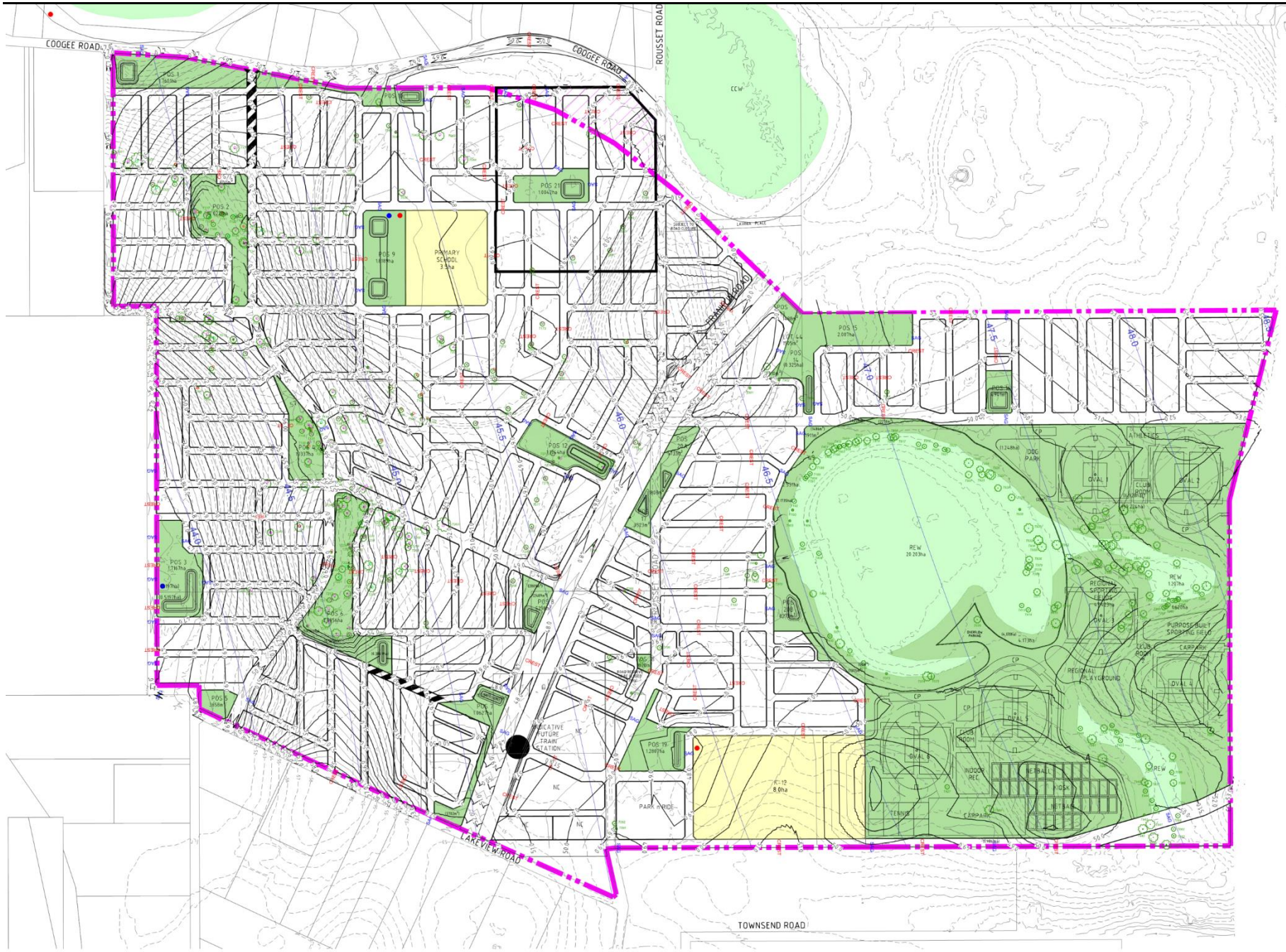
ıre 1 - Proposed Lifting of Urban Deferment Plan

Attachment 10 - East Wanneroo Proposed District and Neighbourhood Facility Provision and Location

Figure 1.1 East Wanneroo District Structure Plan



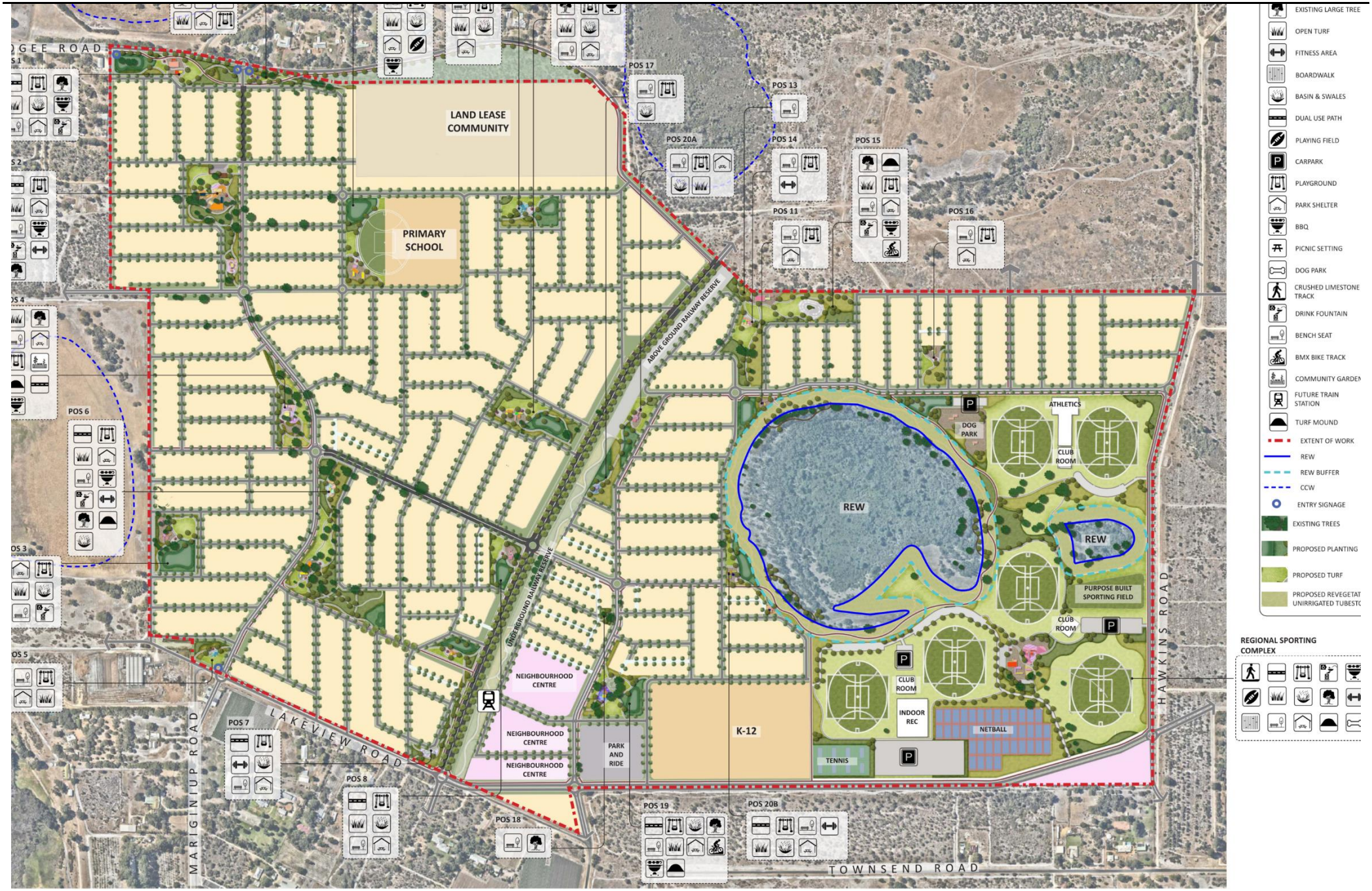
East Wanneroo District Structure Plan

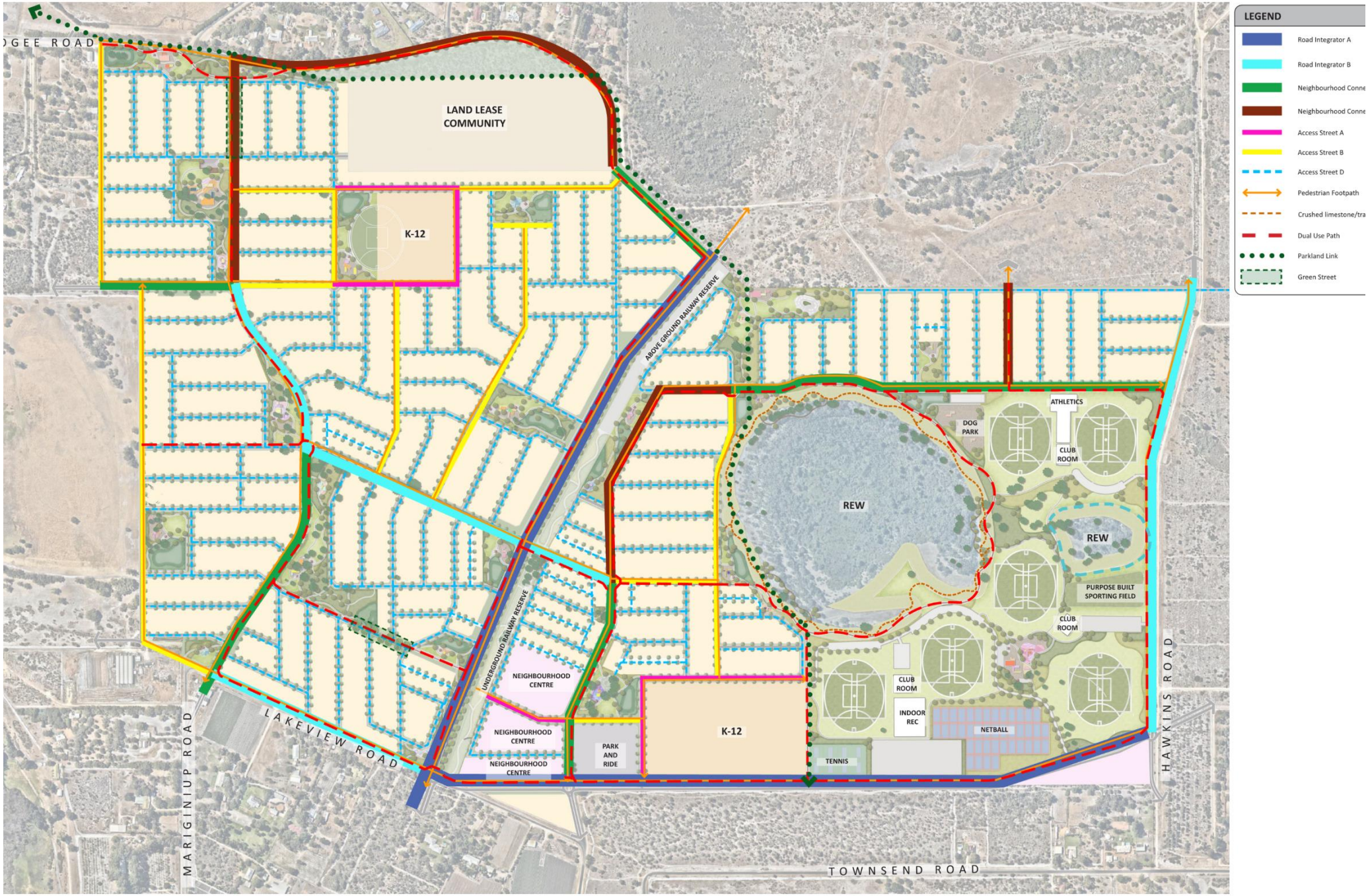

COOGEE ROAD
ROUSSET ROAD
FRANKLAND ROAD
LAKEVIEW ROAD
TOWNSEND ROAD
PRIMARY SCHOOL 3.5ha
INDICATIVE FUTURE TRAIN STATION
PARK N RIDE
REGIONAL PLAYGROUND
PURPOSE BUILT SPORTING FIELD
REGIONAL SPORTING CLUB
ATHLETICS
TENNIS
NETBALL
INDOOR REC
CARPARK
CLUB ROOM
REW 20.203ha
REW 1.267ha
R-12 8.0ha
POS 1 3.603ha
POS 2 2.128ha
POS 3 1.367ha
POS 4 0.937ha
POS 5 1.658ha
POS 6 0.965ha
POS 9 1.699ha
POS 10 1.094ha
POS 12 1.105ha
POS 14 (8.325ha)
POS 15 2.087ha
POS 19 1.280ha
POS 21 1.094ha
LOT 44 1.959ha
LOT 45 1.124.8ha
LOT 46 0.939ha
LOT 47 0.926ha
LOT 48 0.926ha
LOT 49 0.926ha
LOT 50 0.926ha
LOT 51 0.926ha
LOT 52 0.926ha
LOT 53 0.926ha
LOT 54 0.926ha
LOT 55 0.926ha
LOT 56 0.926ha
LOT 57 0.926ha
LOT 58 0.926ha
LOT 59 0.926ha
LOT

2023



Figure 15: Post-development surface water drainage


LAND LEASE COMMUNITY
PRIMARY SCHOOL
POS 17
POS 13
POS 20A
POS 14
POS 15
POS 11
POS 16
POS 6
POS 7
POS 8
POS 18
POS 19
POS 20B
ABOVE GROUND RAILWAY RESERVE
UNDERGROUND RAILWAY RESERVE
NEIGHBOURHOOD CENTRE
NEIGHBOURHOOD CENTRE
NEIGHBOURHOOD CENTRE
PARK AND RIDE
K-12
REW
REW
DOG PARK
ATHLETICS
CLUB ROOM
PURPOSE BUILT SPORTING FIELD
CLUB ROOM
CLUB ROOM
INDOOR REC
NETBALL
TENNIS
MARIGINIUP ROAD
LAKEVIEW ROAD
HAWKINS ROAD
TOWNSEND ROAD
EXISTING LARGE TREE
OPEN TURF
FITNESS AREA
BOARDWALK
BASIN & SWALES
DUAL USE PATH
PLAYING FIELD
CARPARK
PLAYGROUND
PARK SHELTER
BBQ
PICNIC SETTING
DOG PARK
CRUSHED LIMESTONE TRACK
DRINK FOUNTAIN
BENCH SEAT
BMX BIKE TRACK
COMMUNITY GARDEN
FUTURE TRAIN STATION
TURF MOUND
EXTENT OF WORK
REW
REW BUFFER
CCW
ENTRY SIGNAGE
EXISTING TREES
PROPOSED PLANTING
PROPOSED TURF
REGIONAL SPORTING COMPLEX


LEGEND
Road Integrator A
Road Integrator B
Neighbourhood Conne
Neighbourhood Conne
Access Street A
Access Street B
Access Street D
Pedestrian Footpath
Crushed limestone/tra
Dual Use Path
Parkland Link
Green Street
LAND LEASE COMMUNITY
K-12
ABOVE GROUND RAILWAY RESERVE
UNDERGROUND RAILWAY RESERVE
NEIGHBOURHOOD CENTRE
NEIGHBOURHOOD CENTRE
NEIGHBOURHOOD CENTRE
PARK AND RIDE
K-12
REW
REW
DOG PARK
ATHLETICS
CLUB ROOM
PURPOSE BUILT SPORTING FIELD
CLUB ROOM
CLUB ROOM
INDOOR REC
NETBALL
TENNIS
LAKEVIEW ROAD
MARIGINIUP ROAD
HAWKINS ROAD
TOWNSEND ROAD


LAND LEASE COMMUNITY
K-12
ABOVE GROUND RAILWAY RESERVE
UNDERGROUND RAILWAY RESERVE
REW
REW
ATHLETICS
DOG PARK
CLUB ROOM
PURPOSE BUILT SPORTING FIELD
CLUB ROOM
CLUB ROOM
INDOOR REC
NETBALL
TENNIS
NEIGHBOURHOOD CENTRE
NEIGHBOURHOOD CENTRE
NEIGHBOURHOOD CENTRE
PARK AND RIDE
K-12
MARIGINIUP ROAD
LAKEVIEW ROAD
HAWKINS ROAD


ptus gamphocephala
Melaleuca viridiflora
Broad Leafed Paperbark
Eucalyptus marginata
Jarrah
Brachychiton populneus
Kurrajong
Eucalyptus torwood
Hybrid Coral Gum
Corymbia ficifolia
Red Flowering Gum
Eucalyptus woodwardii
Lemon-flowered Gum
Eucalyptus decipiens
Redheart
Melaleuca rhaphiophylla
Swamp Paperbark
Agonins flexuosa
Willow Myrtle
Hibiscus tiliaceus rubra
Cottonwood Hibiscus
Magnolia grandiflora
Southern Maganolia



FIRST 15mm BRA DETAILS

Depth(m):	0.30
Base Area(m²)	1600
Top Area(mAHD):	1747
Slope	1:3

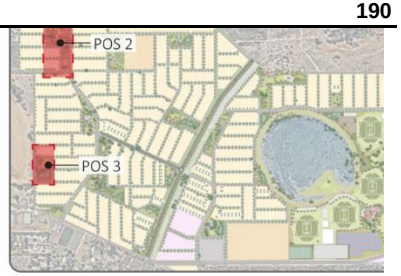
POS TYPOLOGY
- Neighborhood Park

SIZE
- 1.43 ha + Verge

CONCEPT
- D.U.P on northern side of the POS to provide connection to road integrators
- Existing trees to be retained
- Shrub revegetation under existing vegetation
- Provide a pedestrian link through estate
- Significant trees to be retained where possible
- Picnic area with shelter, picnic setting and BBQ area
- Playground to provide activity space
- Open turf to provide activity area to residents
- Provide entry signage
- Drainage basin as per LWMS

- Existing trees and vegetation to be retained where possible.
- Low fuel planting to minimise the threat area intensity for bushfire prone areas
- Water-wise native planting and planting
- Source local materials where possible to minimise transport requirements and provide local employment.
- Consider long-term maintenance requirements.
- Provide a buffer to the adjacent road

FUNCTIONS / MATERIALS
- Existing trees to be retained
- Open turf area for outdoor activity
- Shelter with table settings and BBQ will provide opportunity for socialisation
- Playground for kids
- Connected path to open space perimeter, with connections to the broader path network.
- Entry signage to convey directions and enhance the character of the estate



LOCATION PLAN

: CONCEPT





POS TYPOLOGY
- Neighborhood Park

SIZE
- 2.02 ha + Verge

CONCEPT
- D.U.P on eastern side of the POS to provide connection to road integrators
- Existing trees to be retained
- Shrub revegetation under existing vegetation
- Provide a pedestrian link through estate
- Significant trees to be retained where possible
- Picnic area with shelter, picnic setting and BBQ area
- Playground to provide activity space
- Open turf to provide activity area to residents
- Provide fitness area for residents

ENVIRONMENTAL CONSIDERATIONS
- Existing trees and vegetation to be retained where possible.
- Low fuel planting to minimise the threat area intensity for bushfire prone areas
- Water-wise native planting and planting
- Source local materials where possible to minimise transport requirements and provide local employment.
- Consider long-term maintenance requirements.

FUNCTIONS / MATERIALS
- Existing trees to be retained
- Open turf area for outdoor activity
- Shelter with table settings and BBQ will provide opportunity for socialisation
- Playground for kids
- Connected path to open space perimeter, with connections to the broader path network.
- Outdoor excercise area provide fitness oppotunities for the residents

POS 3 CONCEPT



DRAINAGE LEGEND - CATCHMENT 3

FIRST 15mm BRA DETAILS

Depth(m):	0.30
Base Area(m²)	2500
Top Area(mAHD):	2683
Slope	1:3



POS TYPOLOGY
- Neighborhood Park

SIZE
- 1.3 ha + Verge

CONCEPT
- Concrete footpath to provide connection to road integrators
- Existing trees to be retained
- Shrub revegetation under existing vegetation
- Provide a pedestrian link through estate
- Provide Dog park with agility equiptment
- Significant trees to be retained where possible
- Picnic area with shelter and picnic setting
- playground to provide activity space
- Open turf to provide activity area to residents
- Drainage basin as per LWMS



ENVIRONMENTAL CONSIDERATIONS
- Existing trees and vegetation to be retained where possible.
- Low fuel planting to minimise the threat area intensity for bushfire areas
- Water-wise native planting and planting
- Source local materials where possible to minimise transport require and provide local employment.
- Consider long-term maintenance requirements.
- Provide a buffer to the adjacent road

FUNCTIONS / MATERIALS
- Existing trees to be retained
- Open turf area for outdoor activity
- Shelter and picnic settings
- Nature Playground for kids
- Dog park for Dog agility play opportunities for residents
- Connected path to open space perimeter, with connections to the b path network.



FIRST 15mm BRA DETAILS

Depth(m):	0.30
Base Area(m²)	289
Top Area(mAHD):	353
Slope	1:3

POS TYPOLOGY
- Neighborhood Park

SIZE
- 2.94 ha + Verge

CONCEPT
- D.U.P on western side of the POS to provide connection to road integrators
- Existing trees to be retained
- Shrub revegetation under existing vegetation
- Provide a pedestrian link through estate
- Significant trees to be retained where possible
- Picnic area with shelter, picnic setting and BBQ area
- Playground to provide activity space
- Open turf to provide activity area to residents
- Provide fitness area
- Drainage basin as per LWMS

ENVIRONMENTAL CONSIDERATIONS
- Existing trees and vegetation to be retained where possible.
- Low fuel planting to minimise the threat area intensity for bushfire prone areas
- Water-wise native planting and planting
- Source local materials where possible to minimise transport requirements and provide local employment.
- Consider long-term maintenance requirements.
- Provide a buffer to the adjacent road

FUNCTIONS / MATERIALS
- Existing trees to be retained
- Open turf area for outdoor activity
- Shelter with table settings and BBQ will provide opportunity for socialisation
- Playground for kids
- Outdoor excercise area provide fitness oppotunities for the residents
- Connected path to open space perimeter, with connections to the broader path network.

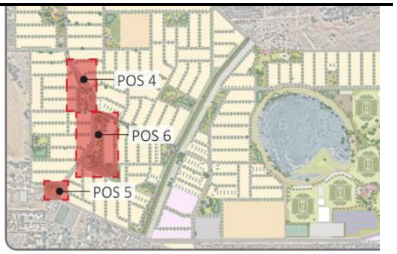


POS TYPOLOGY
- Neighborhood Park

SIZE
- 1.13 ha + Verge

CONCEPT
- D.U.P on eastern side of the POS to provide connection to road integrators
- Existing trees to be retained
- Shrub vegetation under existing vegetation
- Provide a pedestrian link through estate
- Significant trees to be retained where possible
- Picnic area with shelter, picnic setting and BBQ area
- playground to provide activity space
- Open turf to provide activity area to residents
- Provide fitness area for residents





LOCATION PLAN



ENVIRONMENTAL CONSIDERATIONS
- Existing trees and vegetation to be retained where possible.
- Low fuel planting to minimise the threat area intensity for bushfire prone areas
- Water-wise native planting and planting
- Source local materials where possible to minimise transport requirements and provide local employment.
- Consider long-term maintenance requirements.

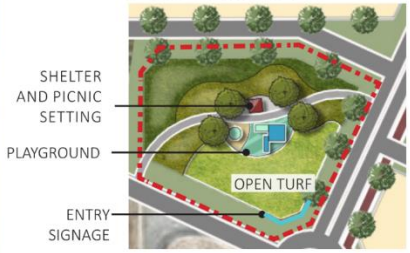
FUNCTIONS / MATERIALS
- Existing trees to be retained
- Open turf area for outdoor activity
- Shelter with table settings and BBQ will provide opportunity for socialisation
- Playground for kids
- Connected path to open space perimeter, with connections to the broader path network.
- Community garden with recycled materials to provide family activity opportunity for residents







POS 5 CONCEPT



POS TYPOLOGY
- Pocket Park

SIZE
- 3,658 m² + Verge

CONCEPT
- Playground for kids
- Shelter and picnic settings
- Plantings to provide buffer to external road
- Small turf area to provide open space
- Provide a pedestrian link through estate from the road
- Entry signage to convey directions and enhance the character of the estate

POS 7 CONCEPT







DRAINAGE LEGEND - CATCHMENT 7

FIRST 15mm BRA DETAILS

Depth(m):	0.30
Base Area(m²)	961
Top Area(mAHD):	1076
Slope	1:3

POS TYPOLOGY
- Neighborhood Park

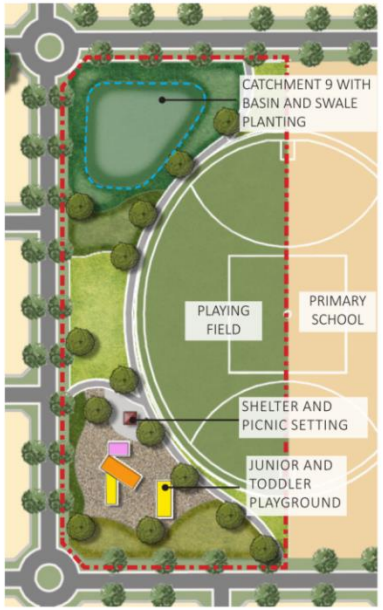
SIZE
- 1.17 ha + Verge

CONCEPT
- D.U.P most side of the POS to provide connection to road integrators
- Shrub vegetation to provide buffer along main integrator
- Provide a pedestrian link through estate
- Picnic area with shelter and picnic setting
- playground to provide activity space
- Open turf to provide activity area to residents
- Provide fitness area for residents
- Drainage basin as per LWMS

ENVIRONMENTAL CONSIDERATIONS
- Low fuel planting to minimise the threat area intensity for bushfire prone areas
- Water-wise native planting and planting
- Source local materials where possible to minimise transport requirements and provide local employment.
- Consider long-term maintenance requirements.
- Provide a buffer to the adjacent road

FUNCTIONS / MATERIALS
- Open turf area for outdoor activity
- Shelter and picnic settings
- Playground for kids
- Fitness area for residents
- Connected path to open space perimeter, with connections to the broader path network and DUP
- Outdoor excercise area provide fitness oppotunities for the residents

POS 9 CONCEPT



DRAINAGE LEGEND - CATCHMENT 9

FIRST 15mm BRA DETAILS

Depth(m):	0.30
Base Area(m²)	1521
Top Area(mAHD):	1665
Slope	1:3

POS TYPOLOGY
- Neighbourhood Park

SIZE
- 1.81 ha + Verge

CONCEPT
- Concrete footpath to provide connection to road integrators
- Picnic area with shelter, picnic setting and BBQ area
- playground to provide activity space
- Open turf to provide activity area
- Provide Playing field to share with Primary School
- Drainage basin as per LWMS

ENVIRONMENTAL CONSIDERATIONS
- Low fuel planting to minimise the threat area intensity for bushfire prone areas
- Water-wise native planting and planting
- Source local materials where possible to minimise transport requirements and provide local employment.
- Consider long-term maintenance requirements.
- Provide a buffer to the adjacent road

FUNCTIONS / MATERIALS
- Open turf area for playing field and outdoor activity
- Shelter with table settings and BBQ will provide opportunity for socialisation
- Playground for kids
- Connected path to open space



LOCATION PLAN

TURF
SHRUB PLANTING (AMENITY)
LOW FUEL PLANTING
BASIN
LOT
DUAL USE PATH
FOOTPATH
MULCH ONLY
STREET TREES
EXISTING TREES
PROPOSED TREES
CRUSHED LIMESTONE PATH
BOARDWALK
REVEGETATION
EXTENT OF WORK
REW
REW BUFFER

POS 8 CONCEPT





DRAINAGE LEGEND - CATCHMENT 8

FIRST 15mm BRA DETAILS

Depth(m):	0.30
Base Area(m²)	1024
Top Area(mAHD):	1142
Slope	1:3

POS TYPOLOGY
- Local Park

SIZE
- .660 ha + Verge

CONCEPT
- Concrete footpath to provide connection to road integrators and DUP
- Picnic area with shelter and picnic setting
- playground to provide activity space
- Open turf to provide activity area
- Significant trees to be retained where possible
- Drainage basin as per LWMS

FUNCTIONS / MATERIALS
- Open turf area for playing field and outdoor activity
- Shelter and picnic settings
- Playground for kids
- Connected path to open space

ENVIRONMENTAL CONSIDERATIONS
- Low fuel planting to minimise the threat area intensity for bushfire prone areas
- Water-wise native planting and planting
- Source local materials where possible to minimise transport requirements and provide local employment.
- Consider long-term maintenance requirements.
- Provide a buffer to the adjacent road

MARIGINIUP- Stockland

LANDSCAPE DETAILED PLAN POS 7, 8 AND 9

DWG MAR01_DES
REV B
DATE 2023-08-09
SCALE 1 : 1000 @ A1

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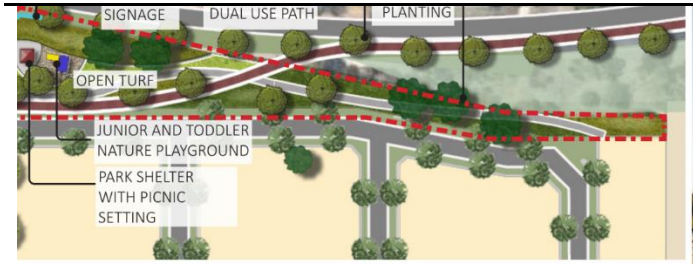
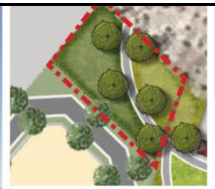
emerge ASSOCIATES







- Pocket Park

SIZE

- 1,488 m² + Verge

CONCEPT

- Plantings to provide buffer to external road
- Provide a pedestrian link through estate and



LOCATION PLAN

TYPOLOGY
ocket Park

231 ha + Verge

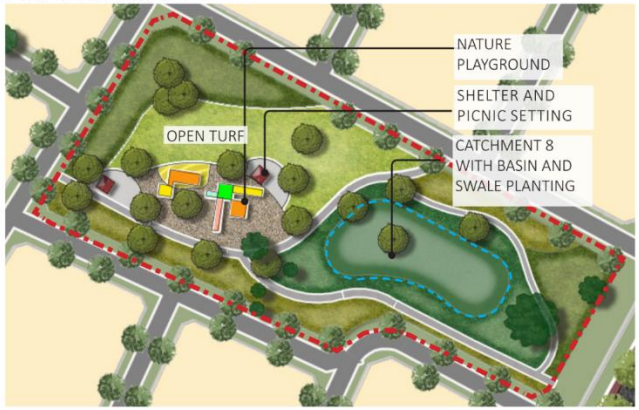
CEPT
U.P on northern side of the POS to provide
nnection to road integrators
rub vegetation to provide buffer along main
egrator
ovide a pedestrian link through estate
gnificant trees to be retained where possible
cnic area with shelter and picnic setting
ayground to provide activity space
pen turf to provide activity area to residents
ovide entry signage

RONMENTAL CONSIDERATIONS
isting trees and vegetation to be retained where
ssible.
w fuel planting to minimise the threat area intensity
r bushfire prone areas
ater-wise native planting and planting
urce local materials where possible to minimise
ansport requirements and provide local employment.
nsider long-term maintenance requirements.
ovide a buffer to the adjacent road

CTIONS / MATERIALS
isting trees to be retained
pen turf area for outdoor activity
elter and picnic settings
ayground for kids
try signage to convey directions and enhance the
aracter of the estate
nnected path to open space perimeter, with
nnections to the broader path network.



POS 12 CONCEPT



DRAINAGE LEGEND - CATCHMENT 12

FIRST 15mm BRA DETAILS

Depth(m):	0.30
Base Area(m²)	1521
Top Area(mAHD):	1665
Slope	1:3

POS TYPOLOGY

- Neighborhood Park

SIZE

- 1.4 ha + Verge

CONCEPT

- D.U.P near eastern side of the POS to provide connection to road integrators
- Significant trees to be retained where possible
- Shrub vegetation
- Provide a pedestrian link through estate
- Picnic area with shelter, picnic setting and BBQ area
- All ages playground to provide activity space
- Open turf to provide activity area to residents
- Drainage basin as per LWMS

ENVIRONMENTAL CONSIDERATIONS

- Existing trees and vegetation to be retained where possible.
- Low fuel planting to minimise the threat area intensity for bushfire prone areas
- Water-wise native planting and planting
- Source local materials where possible to minimise transport requirements and provide local employment.
- Consider long-term maintenance requirements.
- Provide a buffer to the adjacent road

FUNCTIONS / MATERIALS

- Existing trees to be retained
- Open turf area for outdoor activity
- Shelter with table settings and BBQ will provide opportunity for socialisation
- Playground for all ages
- Connected path to open space with connections to the broader path







POS 14 CONCEPT



POS TYPOLOGY

- Local Park

SIZE

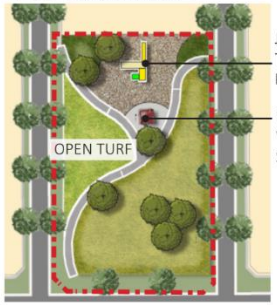
- 5,686 m² + Verge

CONCEPT

- Shelter and picnic settings
- Plantings to provide buffer to external road
- Small turf area to be part of connecting POS turf area to provide a wider open space
- Significant trees to be retained where possible
- Outdoor excercise area provide fitness oppotunities for the residents
- Provide a pedestrian link through estate from the road through connecting POS



POS 16 CONCEPT



POS TYPOLOGY

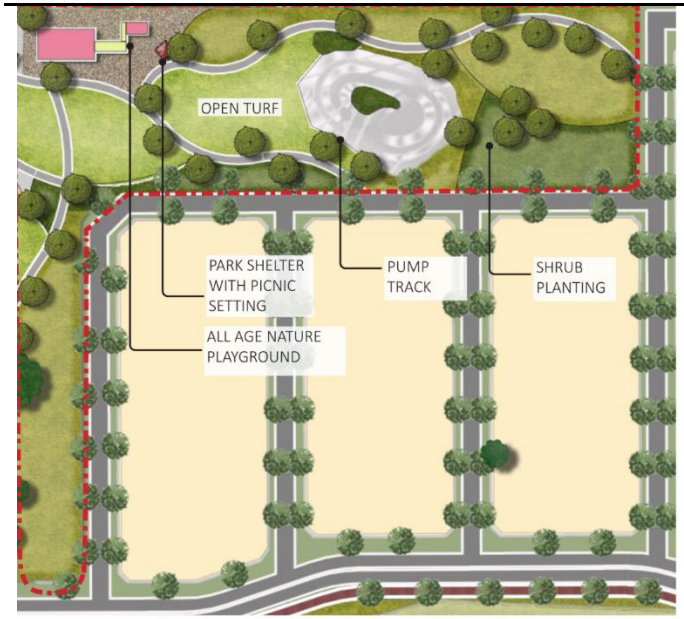
- Pocket Park

SIZE

- 4,941 m² + Verge

CONCEPT

- Plantings to provide buffer to external road
- Small Playground for kids
- Provide a pedestrian link through estate and fro road
- Drainage basin as per LWMS



Neighbourhood Park

SIZE
- 1.92 ha + Verge

CONCEPT
- Concrete footpath to provide a pedestrian link through estate and connecting the POS to road integrators
- Shrub vegetation to provide as a buffer to adjacent road
- Picnic area with shelter, picnic setting and BBQ area
- All ages playground to provide activity space
- Provide pump track
- Open turf to provide activity area to residents
- Turf mounding to create a unique landscape topography
- Drainage basin as per LWMS







- Low fuel planting to minimise the threat area intensity for bushfire prone areas
- Water-wise native planting and planting
- Source local materials where possible to minimise transport requirements and provide local employment.
- Consider long-term maintenance requirements.
- Provide a buffer to the adjacent road

FUNCTIONS / MATERIALS
- Existing trees to be retained
- Open turf area for outdoor activity
- Shelter with table settings and BBQ will provide opportunity for socialisation
- All age Nature Playground for kids
- Pump track will create exercise and play opportunity as well as socialisation
- Connected path to open space perimeter, with connections to the broader path network.
- Provide a pedestrian link through estate and connecting POS from the road



LOCATION PLAN



POS 11 CONCEPT



DRAINAGE LEGEND - CATCHMENT 11

FIRST 15mm BRA DETAILS	
Depth(m):	0.30
Base Area(m²)	1089
Top Area(mAHD):	1211
Slope	1:3



POS TYPOLOGY
- Pocket Park

SIZE
- 4,941 m² + Verge

CONCEPT
- Plantings to provide buffer to external road
- Small Playground for kids
- Provide a pedestrian link through estate and from the road
- Drainage basin as per LWMS

POS 17 CONCEPT



DRAINAGE LEGEND - CATCHMENT 17

FIRST 15mm BRA DETAILS	
Depth(m):	0.30
Base Area(m²)	576
Top Area(mAHD):	666
Slope	1:3

POS TYPOLOGY
- Pocket Park

SIZE
- 4,480 m² + Verge

CONCEPT
- Plantings to provide buffer to external road
- Small Playground for kids
- Provide a pedestrian link through estate and connecting POS from the road
- Drainage basin as per LWMS

POS 18 CONCEPT



POS TYPOLOGY
- Pocket Park

SIZE
- 1,020 m² + Verge

CONCEPT
- Plantings to provide buffer to external road
- Significant trees to be retained where possible
- Provide a pedestrian link through estate from the road







FIRST 15mm BRA DETAILS

Depth(m):	0.30
Base Area(m²)	1089
Top Area(mAHD):	1211
Slope	1:3

POS TYPOLOGY
- Neighbourhood Park

SIZE
- 1.28 ha + Verge

CONCEPT
- D.U.P on western side of the POS to provide connection to road integrators
- Concrete footpath to provide connection to road integrators
- Shrub vegetation to provide buffer from adjacent road
- Provide a pedestrian link through estate from neighbourhood centre
- Opportunity of BMX bike tracks to be implemented in existing tree canopy at where is appropriate
- Open turf to provide activity area to residents
- Turf mounding to create a unique landscape topography
- Significant trees to be retained where possible
- Picnic area with shelter, picnic setting and BBQ area
- Playground to provide activity space
- Drainage basin as per LWMS

FUNCTIONS / MATERIALS
- Playground for kids
- Turf mounding to create unique landscape topography
- Pump track will create exercise and play opportunity as well as socialisation
- Shelter with table settings and BBQ will provide opportunity for socialisation
- Existing trees to be retained
- Open turf area for outdoor activity
- Connected path and pedestrian link to open space perimeter, with connections to the neighbourhood centre, school and train station

ENVIRONMENTAL CONSIDERATIONS
- Existing trees and vegetation to be retained where possible.
- Low fuel planting to minimise the threat area intensity for bushfire prone areas
- Water-wise native planting and planting
- Source local materials where possible to minimise transport requirements and provide local employment.
- Consider long-term maintenance requirements.
- Provide a buffer to the adjacent road





LOCATION PLAN

DRAINAGE LEGEND - CATCHMENT 21

FIRST 15mm BRA DETAILS

Depth(m):	0.30
Base Area(m²)	676
Top Area(mAHD):	773
Slope	1:3

POS TYPOLOGY
- Local Park

SIZE
- .9 ha + Verge

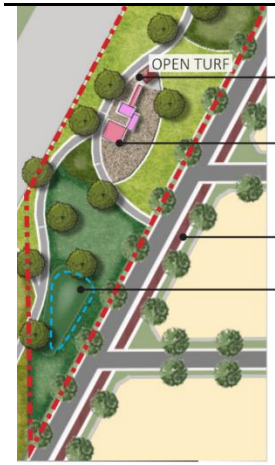
FUNCTIONS / MATERIALS
- Existing trees to be retained
- Open turf area for outdoor activity
- Shelter and picnic settings
- Playground for kids
- Connected path to open space perimeter, with connections to the broader path network.

CONCEPT
- Shrub vegetation to provide as buffer to adjacent road
- Provide a pedestrian link through estate
- Significant trees to be retained where possible
- Picnic area with shelter and picnic setting
- playground to provide activity space
- Open turf to provide activity area to residents
- Drainage basin as per LWMS

ENVIRONMENTAL CONSIDERATIONS
- Existing trees and vegetation to be retained where possible.
- Low fuel planting to minimise the threat area intensity for bushfire prone areas
- Water-wise native planting and planting
- Source local materials where possible to minimise transport requirements and provide local employment.
- Consider long-term maintenance requirements.
- Provide a buffer to the adjacent road







- to adjacent road
- Provide a pedestrian link through estate and connecting POS from the road
- Picnic area with shelter and picnic setting
- Playground to provide activity space
- Open turf to provide activity area to residents
- Drainage basin as per LWMS

ENVIRONMENTAL CONSIDERATIONS

- Low fuel planting to minimise the threat area intensity for bushfire prone areas
- Water-wise native planting and planting
- Source local materials where possible to minimise transport requirements and provide local employment.
- Consider long-term maintenance requirements.
- Provide a buffer to the adjacent road







LOCATION PLAN

DRAINAGE LEGEND - CATCHMENT 20A

FIRST 15mm BRA DETAILS	
Depth(m):	0.30
Base Area(m²)	289
Top Area(mAHD):	353
Slope	1:3

POS TYPOLOGY

- Local Park

SIZE

- .6329 ha + Verge

FUNCTIONS / MATERIALS

- Open turf area for outdoor activity
- Shelter and picnic settings
- Playground for kids
- Connected path to open space perimeter, with connections to the broader path network.





LEGEND

- TURF
- SHRUB PLANTING (AI
- LOW FUEL PLANTING
- BASIN
- LOT
- DUAL USE PATH
- FOOTPATH
- MULCH ONLY
- STREET TREES
- EXISTING TREES
- PROPOSED TREES
- CRUSHED LIMESTONE
- BOARDWALK
- REW
- REVEGETATION
- EXTENT OF WORK
- REW
- REW BUFFER

DRAINAGE LEGEND - CATCHMENT 20B

FIRST 15mm BRA DETAILS	
Depth(m):	0.30
Base Area(m²)	1225
Top Area(mAHD):	1354
Slope	1:3

POS TYPOLOGY

- Local Park

SIZE

- .8273 ha + Verge

FUNCTIONS / MATERIALS

- Open turf area for outdoor activity
- Shelter and picnic settings
- Playground for kids
- Outdoor excercise area provide fitness oppotunities for the residents
- Connected path to open space perimeter, with connections to the broader path network and DUP

CONCEPT

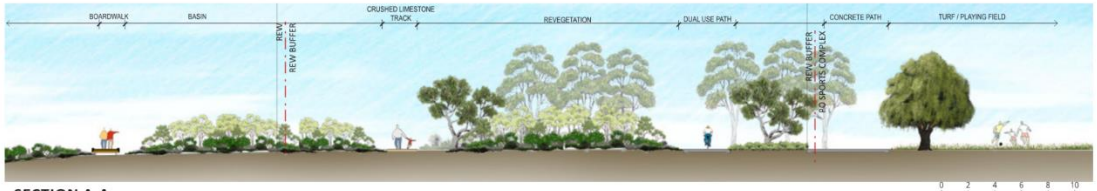
- D.U.P on southern side of the POS to provide connection to road integrators
- Provide fitness area for residents
- Shrub vegetation to provide buffer to adjacent road
- Provide a pedestrian link through estate and REW
- Picnic area with shelter and picnic setting
- playground to provide activity space
- Open turf to provide activity area to residents
- Drainage basin as per LWMS

ENVIRONMENTAL CONSIDERATIONS

- Low fuel planting to minimise the threat area intensity for bushfire prone areas
- Water-wise native planting and planting
- Source local materials where possible to minimise transport requirements and provide local employment.
- Consider long-term maintenance requirements.

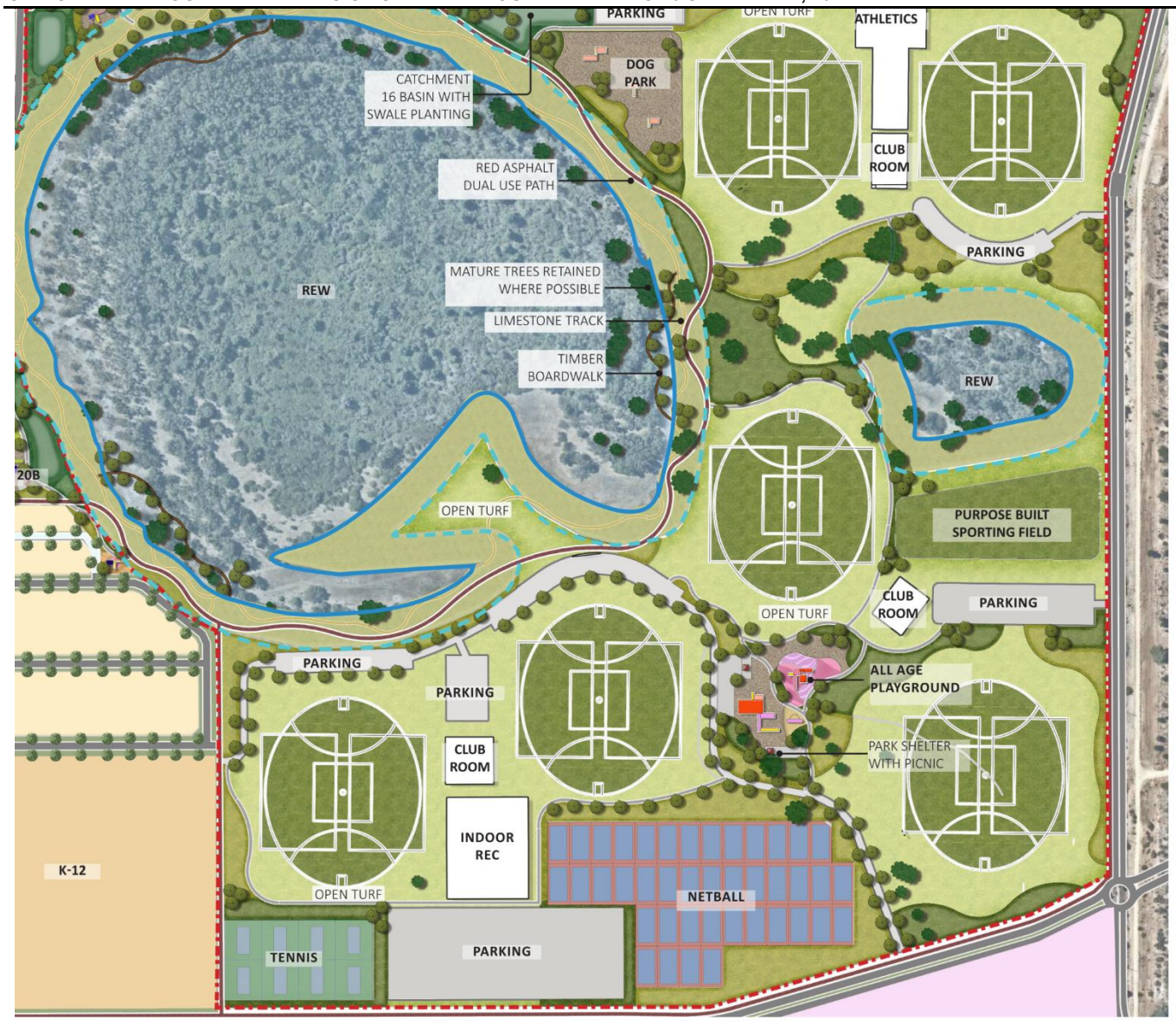


REGIONAL POS SECTION



SECTION A-A

SCALE 1 : 200 @ A1



- 47.423 ha + Verge

CONCEPT POS 7

- Playing field to provide with senior 6xAFL oval, 2
- Dual use path to provide cyclists and pedestrian with connection to wetland area
- Connected path to open space perimeter, with connections to the broader path network and DUP
- Provide a pedestrian link through estate, REW and road integrators
- All age playground to provide play space
- Fitness area to provide exercise space
- 2x Shelter with picnic settings to provide BBQ area
- Shrub vegetation to provide buffer to adjacent road
- Open turf to provide activity area to residents
- Mounded turf to create good views to the playing field as well as to provide opportunities for sitting, laying, and gathering
- Large area of existing vegetation & significant trees to be retained and protected
- Dog park with agilities to be included in the POS
- Drainage basin as per LWMS design

ENVIRONMENTAL CONSIDERATIONS

- Large area of existing vegetation to be retained and protected for local flora and fauna habitat
- Revegetation planting around REW buffers to enhance local flora and fauna habitat. Palette aligns with spring survey results
- Significant existing trees to be retained in open space where possible
- Water-wise native planting.
- Consider long-term maintenance requirements.
- Source local materials where possible to minimise transport requirements and provide local employment.
- Dirt and crushed limestone track/path in existing vegetation area instead of



LOCATION PLAN

FUNCTIONS / MATERIALS

- Significant existing trees to be retained
- Playing field including 6x AFL Senior oval
- Open turf area for outdoor activity
- Mounded turf to create good views
- Shelter with table settings and BBQ will provide opportunity for socialisation
- All-age playground for all people
- Dog park for dog agility play opportunity for residents
- Turf mounding to create unique landscape topography
- Boardwalk to provided good view above drainage basin
- Limestone path in shrub planting
- Outdoor excercise area provide fitness oppotunities for the residents
- Connected path to open space perimeter, with connections to the broader path network and DUP

LEGEND

- TURF
- SHRUB PLANTING (AI
- LOW FUEL PLANTING
- BASIN
- LOT
- DUAL USE PATH
- FOOTPATH
- MULCH ONLY
- STREET TREES
- EXISTING TREES
- PROPOSED TREES
- CRUSHED LIMESTONE
- BOARDWALK
- REW
- REVEGETATION
- EXTENT OF WORK
- REW
- REW BUFFER





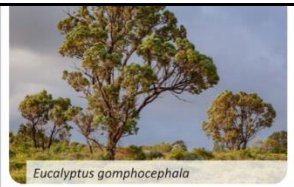


DRAINAGE LEGEND - CATCHMENT 16

FIRST 15mm BRA DETAILS	
Depth(m):	0.30
Base Area(m²)	2401
Top Area(mAHD):	2582
Slope	1:3






Eucalyptus gomphocephala


Jacaranda mimosifolia


Olea europaea (Swan Hill)

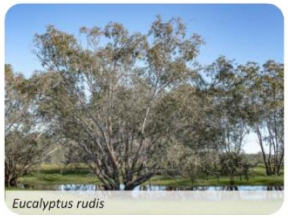

Melaleuca leucadendron

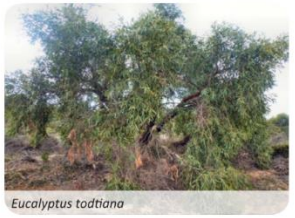

Agonis flexuosa


Callistemon 'KPS'


Corymbia calophylla


Eucalyptus gomphocephala


Eucalyptus rudis


Eucalyptus todtiana


Eucalyptus marginata


Melaleuca rhaphiophylla

SHRUB PLANTI


Acacia lasiocarpa


Conostylis aculeata ssp. preissii


Dianella revoluta


Dampiera linearis


Eremophila maculata


Grevillea crithmifolia


Grevillea thelemanniana


Hemiandra pungens


Patersonia occidentalis


Olearia axillaris


Rhagodia baccata


Darwinia citriodora


Dianella cassa blue


Eremophila glabra


Lepidosperma calcicola


Lepidosperma gladiatum


Lomandra longifolia


Meeboldina scariosa


Anigozanthos manglesii


Adenanthos cygnorum


Adenanthos cygnorum


Acacia pulchella


Beaufortia squarrosa


Baumea juncea


Banksia grandis


Calothamnus sanguineus


Darwinia citriodora


Eucalyptus rudis


Hypocalymma angustifolium


Juncus pallidus


Jacksonia sternbergiana


Kunzea glabrescens


Kennedia prostrata


Regelia inops


Verticordia densiflora

LOW FUEL PLANTI


Anigozanthos manglesii


Austrostipa compressa


Conostylis aculeata


Dampiera linearis


Juncus pallidus


Kennedia prostrata


Kunzea recurva


Melaleuca thymoides

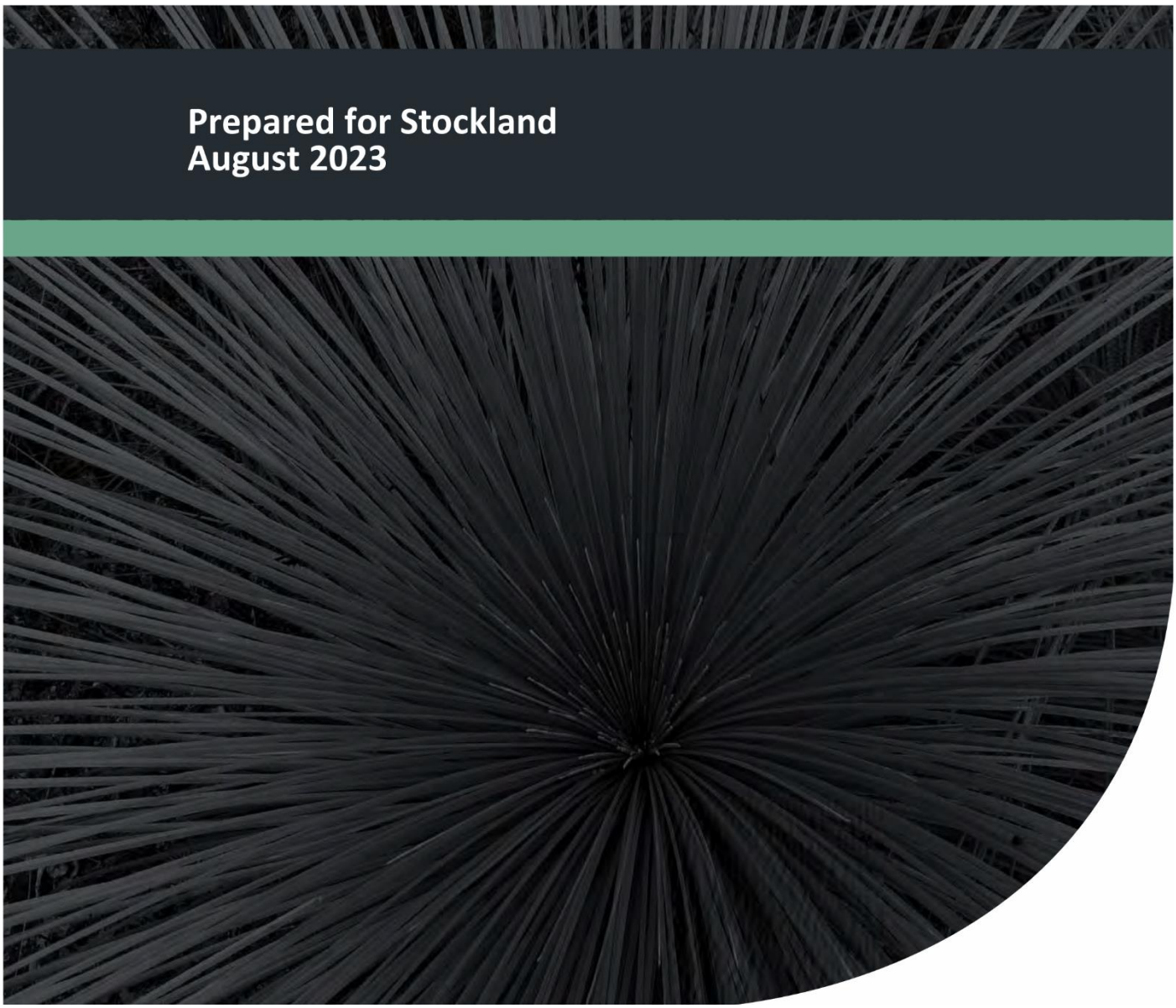

Patersonia occidentalis

emerge ASSOCIATES
Integrated Science & Design

Environmental Assessment Report

Precinct 15 Structure Plan

Project No: EP22-019(15)



Document Control

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Doc no.:	**EP22-019(15)--012 PPS**				
Version	**Date**	**Author**		**Reviewer**	
1	April 2023	Pascal Scholz	PPS	Andreas Biddiscombe	ADB
	Draft report issued for client and project team review.				
A	August 2023	Pascal Scholz	PPS	Andreas Biddiscombe	ADB
	Updated structure plan and minor amendments.				
B	August 2023	Pascal Scholz	PPS	Andreas Biddiscombe	ADB
	Minor amendments to Flora and Vegetation Assessment report (Appendix C).				

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Executive Summary

Stockland (the proponent) are progressing structure planning to enable future development of the land parcels comprising Precinct 15 of the East Wanneroo District Structure Plan (EWDSP) area. The Precinct 15 Structure Plan (SP) area extends across multiple land parcels under control of multiple proprietors; however, the proponent is seeking to progress planning across the whole of Precinct 15 in accordance with the requirements of the EWDSP. The SP will guide the future development of Precinct 15, an area of approximately 310 hectares (ha) incorporating a total of 14 lots (herein referred to as 'the site').

The EWDSP guides the progressive urbanisation of East Wanneroo and outlines the requirement to prepare individual structure plans for each of the 28 precincts to inform future urban development. The EWDSP has established the district-scale layout of future land uses, which each SP is to be consistent with. The key EWDSP land use elements that have informed and been accommodated within the proposed Precinct 15 SP layout include a 'regional sporting facility', an area of regional 'parkland' (associated with a significant wetland feature), a co-located railway and regional road alignment, a railway station and neighbourhood centre. Whilst accommodating these district layout elements, the SP also provides a localised level of layout resolution which has been designed to respond to the onsite conditions and environmental values, amongst other considerations.

This Environmental Assessment Report (EAR) supports the SP and is the principal supporting environmental document for the SP process. It includes a preliminary assessment of the proposed SP land uses, future management considerations and associated predicted environmental outcomes, against the applicable environmental factors (as defined by the Environmental Protection Authority).

The primary structural basis of the SP layout has been guided informed by the location and extent of the various district-scale land uses shown in the EWDSP, as discussed above. This has provided a level of restriction to the ability for the SP layout to strategically respond to environmental values within the site. Notwithstanding, the proponent has taken a range of measures to provide for the future retention of significant environmental values where possible (i.e. where there remains flexibility in the layout design process outside of the key structural elements defined by the EWDSP). This is primarily achieved through the strategic location and sizing of the future local public open space (POS) areas, which are not stipulated in the EWDSP layout.

In this context, the SP layout has been specifically designed to respond to the identified environmental values within the site where possible including the proposed future retention of:

- Two resource enhancement wetlands (unique feature identifiers #15433, #14254, #14261 and #14244), covering an area of 21.4 ha in size in addition to provision of 30 m buffer areas.
- Up to 200 mature native trees with a diameter at breast height of greater than 50 cm (which also represent potential nesting trees for conservation significant black cockatoo species; namely Carnaby's black cockatoo and forest red-tailed black cockatoo).
- Up to 6.7 ha of potential suitable black cockatoo foraging habitat.

In addition to targeted REW and mature retention outcomes discussed above; other native trees, shrubs and flora (including priority flora species *Jacksonia sericea*) may also be opportunistically

retained where possible and appropriate within intersecting POS areas, through incorporation as part of the urban development landscaping process. These values may therefore continue to also provide habitat for conservation significant native fauna recorded within the site, including black cockatoos, quenda and the black-striped burrowing snake. As such, it is likely that heightened retention outcomes beyond those discussed above will ultimately be realised.

As part of the future subdivision and development process, the following management plans may be necessary, the implementation of which would further minimise potential environmental impacts that have the potential to arise through implementation of the SP:

- Acid Sulfate Soil and Dewatering Management Plan
- Construction Environmental Management Plan
- Urban Water Management Plan/s
- Foreshore Management Plan
- Aboriginal Cultural Heritage Management Plan
- Bushfire Management Plan.

Overall, a range of environmental impact mitigation measures (primarily impact avoidance and minimisation) are proposed within the SP layout and through the future environmental management framework. In this context, it is anticipated that implementation of the proposed SP can be suitably managed through future stages of the land use planning processes (including subdivision and development) such that the EPA objectives for the relevant environmental factors can be achieved.

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Appendices

Appendix A

Precinct 15 Structure Plan and Indicative Master Plan (CDP 2023)

Appendix B

East Wanneroo District Structure Plan (DPLH 2022)

Appendix C

Detailed Flora and Vegetation Assessment (Emerge Associates 2023)

Appendix D

Detailed Fauna and Targeted Black Cockatoo Assessment (Emerge Associates 2023)

Appendix E

Aboriginal Heritage Desktop Assessment (Horizon 2023)

Appendix F

Landscape Masterplan (Emerge Associates 2023)

List of Abbreviations

Table A1: Abbreviations – General terms

General terms	
AHD	Australian Height Datum
AHIS	Aboriginal Heritage Inquiry System
ASS	Acid Sulfate Soil
BMP	Bushfire Management Plan
CBC	Carnaby's Black Cockatoo
CCW	Conservation Category Wetland
DWMS	District Water Management Strategy
EAR	Environmental Assessment Report
ESA	Environmentally Sensitive Area
FRTBC	Forest Red-tailed Black Cockatoo
ha	Hectares
km	Kilometres
LMP	Landscape Master Plan
LWMS	Local Water Management Strategy
MNES	Matters of National Environmental Significance
MUW	Multiple Use Wetland
PEC	Priority Ecological Community
PDWSA	Public Drinking Water Source Area
POS	Public Open Space
REW	Resource Enhancement Wetland
TEC	Threatened Ecological Community
UFI	Unique Feature Identifier
WoNS	Weeds of National Significance
WBA	Wetland Buffer Assessment

Table A2: Abbreviations – Legislation and policies

Legislation and policies	
ACH Act	Aboriginal Cultural Hertiage Act 2021
AH Act	Abroiginal Heritage Act 1972
BC Act	Biodiversity Conservation Act 2016
EP Act	Environmental Protection Act 1986
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999

Table A3: Abbreviations – Organisations

Organisations	
CoW	City of Wanneroo
DBCA	Department of Biodiversity Conservation and Attractions
DCCEEW	Department of Climate Change, Energy, the Environment and Water
DPLH	Department of Planning, Lands and Heritage
DWER	Department of Water and Environmental Regulation
EPA	Environmental Protection Authority
WAPC	Western Australian Planning Commission

Table A4: Abbreviations – Planning and building terms

Planning and building terms	
DPS	District Planning Scheme
EWDSP	East Wanneroo District Structure Plan
EWSP	East Wanneroo Structure Plan
SP	Structure Plan
MRS	Metropolitan Region Scheme

1 Introduction

1.1 Background

Stockland (the proponent) are progressing structure planning to enable future development of the land parcels comprising Precinct 15 of the East Wanneroo District Structure Plan (EWDSP) area. The Precinct 15 Structure Plan (SP) area extends across multiple land parcels under control of multiple proprietors; however, the proponent is seeking to progress planning across the whole of Precinct 15 in accordance with the requirements of the EWDSP. The SP will guide the future development of Precinct 15 incorporating a total of 14 lots, as outlined in **Table 1**, an area herein referred to as 'the site'. The Precinct 15 SP and associated Indicative Master Plan is provided in **Appendix A.**

The site is situated approximately 25 km north of the Perth Central Business District within the City of Wanneroo (CoW) and is bounded by harvested state forest plantations to the east, remnant bushland and rural-residential areas to the north, rural-residential land and Mariginiup Lake (Bush Forever area 147) to the west and Lakeview Street and Bush Forever area 324 to the south. The location of the site, cadastral boundaries and lot numbers are shown in **Figure 1**.

The site is approximately 310 hectares (ha) in size and is predominantly zoned 'Urban Deferred' under the Metropolitan Region Scheme (MRS), whilst a portion along the eastern site boundary is zoned 'Rural - Water Protection'. The site is zoned 'General Rural' and 'Rural Resource' under the CoW *District Planning Scheme No. 2* (DPS No. 2). The MRS zones and reserves are shown in **Plate 1**.

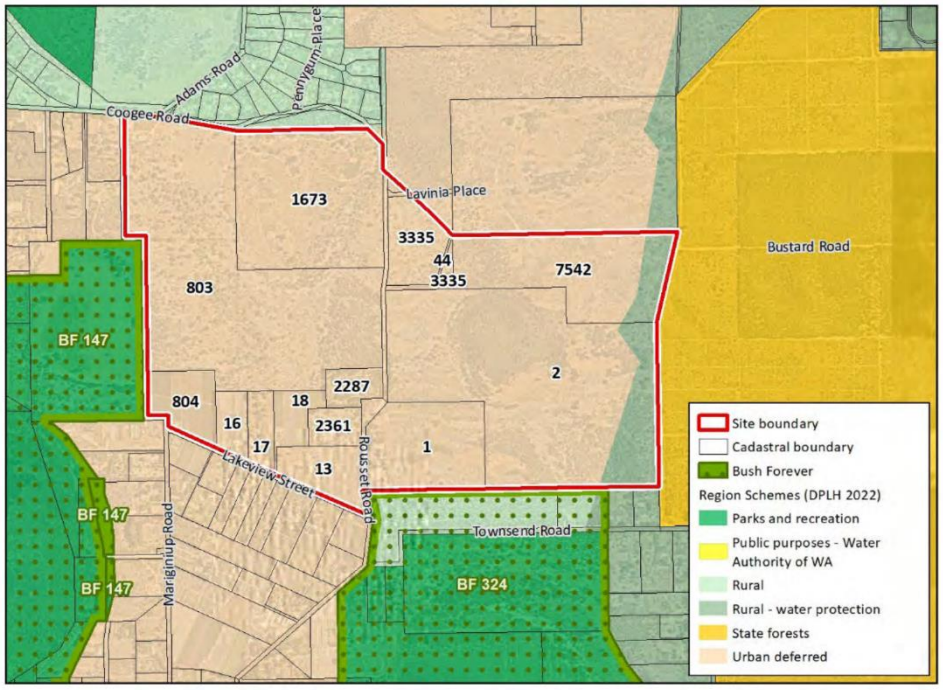

Plate 1: Metropolitan Region Scheme zones and reserves within and surrounding the site

The EWDSP guides the progressive urbanisation of East Wanneroo, consistent with the land uses identified in the *North-West Sub-regional Planning Framework 2018.* It provides an additional level of detail to the historical sub-regional level *East Wanneroo Structure Plan* (DoP 2011). The EWDSP outlines the requirement to prepare a structure for each of the 28 precincts to inform future urban development. The EWDSP has established the district-scale layout of future land uses, which each SP is required to be consistent with. The EWDSP map is provided in **Appendix B**.

The key EWDSP land use elements that have informed and been accommodated within the proposed Precinct 15 SP layout include a 'regional sporting facility', an area of regional 'parkland' (associated with a significant wetland feature), a co-located railway and regional road alignment, a railway station and neighbourhood centre. Whilst accommodating these district layout elements, the SP also provides a localised level of layout resolution which has been designed to respond to the onsite conditions and environmental values, amongst other considerations.

Table 1: Lot description and ownership

Lot no.	Address	CoW DPS No.2 zoning	Land ownership	Area (ha)
1	170 Rousset Road	General Rural	Agostino Nominees Pty Ltd	20.2
2	220 Rousset Road	General Rural	Justin Corporation Pty Ltd	84.5
13	38 Lakeview Street	Rural Resource	Lakewood Estate Development Pty Ltd	8.2
16	62 Lakeview Street	Rural Resource	Private ownership	4.1
17	54 Lakeview Street	Rural Resource	Lakewood Estate Development Pty Ltd	4.0
18	46 Lakeview Street	Rural Resource	Private ownership	4.6
803	200 Mariginiup Road	General Rural	Justin Corporation and Shafto Pty Ltd	83.1
804	90 Lakeview Street	General Rural	Justin Corporation and Shafto Pty Ltd	8.1
1673*	285 Rousset Road	General Rural	Milino Pty Ltd and Ramat Pty Ltd	*40.7
2287	201 Rousset Road	Rural Resource	Private ownership	4.0
2361	175 Rousset Road	Rural Resource	Private ownership	4.0
3335*	264 Rousset Road	General Rural	Leghorn Pty Ltd and Milino Pty Ltd	*11.2
7541*	310 Rousset Road	General Rural	Shafto Pty Ltd and private ownership	*75.0
7542	30 McCaffrey Road	General Rural	Michael Neil Pty Ltd	30.3

**Lot partially included within site boundary (lot area includes the entirety of the lot)*

1.2 Purpose of this report

The proponent engaged Emerge Associates (Emerge) to prepare an Environmental Assessment Report (EAR), which is the principal supporting environmental document for the Precinct 15 SP. The EAR supports the structure planning process and provides a synthesis of information regarding the environmental values and attributes of the site. The EAR is consistent with the Western Australia Planning Commission's (WAPC) *Structure Plan Framework* (WAPC 2015) and:

- Identifies and assesses the existing environmental values and attributes of the site (**Section 2**).

- Discusses the land use planning context and the proposed SP, in the context of applicable statutory requirements under applicable legislation (**Section 3**).
- Provides an assessment of the proposed SP layout and land uses and predicted environmental outcomes against the applicable Environmental Protection Authority (EPA) environmental factors and objectives (**Section 4**).

1.3 Previous surveys and assessments

The following surveys, investigations and assessment reports were prepared to support preparation of the SP in accordance with the EWDSP requirements and are relevant to this EAR:

- Detailed Fauna and Targeted Black Cockatoo Assessment (Emerge Associates 2023b)
- Detailed Flora and Vegetation Assessment (Emerge Associates 2023c)
- Aboriginal Heritage Investigation Report (Horizon 2023)
- Landscape Masterplan (Emerge 2023)
- Bushfire Management Plan (Emerge 2023)
- Local Water Management Strategy (Pentium 2023).

2 Existing Environment

The outcomes of desktop and site-specific investigations undertaken by Emerge and others have informed the identification and assessment of the existing environmental attributes and values within the site and are discussed in the below sections.

The Environmental Protection Authority (EPA) identifies a number of environmental principles, factors and objectives within the *Statement of Environmental Principles, Factors and Objectives* (EPA 2018), which are used to guide the determination of significant environmental impacts and whether impacts can be appropriately mitigated or managed. Existing environmental values have been described according to their applicable EPA environmental factor (where applicable to the site), which include:

- Landforms
- Terrestrial environmental quality
- Flora and vegetation
- Terrestrial fauna
- Inland waters
- Social surroundings.

2.1 Landforms

2.1.1 Landform, soils and geology

The site occurs on the Swan Coastal Plain, the geomorphic unit that characterises much of the Perth metropolitan area, and specifically within the transition between the Spearwood dune system and the Bassendean dune system. The Spearwood Dunes system typically consists of siliceous sands over limestone, with hilly to undulating terrain, whilst the older Bassendean Dune system is characterised by lower relief, with variable depth to groundwater, consisting of lower sandy hills interspersed with permanent and seasonal wetlands (Churchward and McArthur 1980; Gozzard 2011).

Fine scale soil landscape mapping by DPIRD (2019) shows seven units as occurring within the site, as described in **Table 2** and shown in **Figure 2.**

Table 2: Soil landscape mapping units within the site (DPIRD 2019)

Soil landscape unit	Description
Spearwood seasonal swamps phase	Depressions with free water in winter. Humus podzols and peat.
Karrakatta sand yellow phase	Low hilly to gently undulating terrain. Yellow sand over limestone at 1-2 m.
Bassendean seasonal swamps phase	Depressions with free water in winter. Humus podzols and peat.
Bassendean permanent lakes and swamps phase	Depressions. Humus podzols and peats around the edges often with some diatomite zoned vegetation with heath on upper slopes.
Bassendean, Jandakot phase	Jandakot low dunes. Slopes <10% and generally more than 5m relief. Grey sand over pale yellow sands generally underlain by humic and iron podsols.

Table 2: Soil landscape mapping units within the site (DPIRD 2019) (continued)

Soil landscape unit	Description
Bassendean, Joel phase	Poorly drained depressions. Humus podzols.
Bassendean, Gavin phase	Flat or gently undulating landscape. Iron-humus podzols and some diatomite deposits.

Douglas Partners (2022b, a) conducted geotechnical investigations in 2022 within a large portion of the site, including Lots 2, 803, 1673, 3335 and Lot 7542. The investigations across the site included the excavation of a total of 69 test pits. Detailed logs indicate that the site is generally underlain by sand derived from tamala limestone and Bassendean sands consistent with the regional geological mapping. Ground conditions across the site generally comprise a layer of sandy topsoil between 0.05 m and 0.2 m thick followed by a 1 m- 3 m thick layer of sand, whilst localized cement soils and organic soils were also encountered in portions of the site.

Desktop research and field surveys completed to date did not identify any restricted landforms or unique geological features within the site. Notwithstanding, the site contains a prominent dunal ridgeline in its western extent.

2.1.2 Topography

The site is generally flat with the exception of the dunal ridgeline in the western portion of the site marking the transition between the Bassendean to the Spearwood dunal systems. Elevations across the site range from a minimum of 46 m Australian height datum (AHD) in the central portion of the site, largely associated with existing wetland features, to 59 mAHD along the dunal ridgeline in the western portion, as shown in **Figure 2**.

2.2 Terrestrial Environmental Quality

2.2.1 Acid sulfate soils

Acid sulfate soils (ASS) is the name commonly given to naturally occurring soils and sediment containing iron sulphide (iron pyrite) materials. In their natural state, ASS is generally present in waterlogged and/or anoxic conditions and do not present any risk to the environment. However, when oxidised, ASS can pose issues through sulphuric acid production, which can present a range of risks for the surrounding environment, infrastructure, and human health.

The Department of Water and Environmental Regulation (DWER) provides broad-scale mapping indicating areas of potential ASS risk (DWER 2023). A review of the DWER mapping indicates that discrete areas in the eastern portion of the site are classified as having a 'high to moderate' risk of ASS occurring within 3 m of the natural soil surface, which generally aligns with mapped wetland features within the site. Additionally, a large portion of the site is classified as having a 'moderate to low' risk of ASS occurring within 3 m of the natural soil surface but 'high to moderate' risk of ASS beyond 3 m of the natural soil surface. The western portion of the site associated with the ridgeline is classified as having no known risk of ASS occurring, as shown in **Figure 3**.

2.2.2 Potential site contamination

A review of the publicly available DWER Contaminated Sites Database indicates that no areas within the site are registered as a contaminated site pursuant to the *Contaminated Sites Act 2003*.

Geotechnical investigations undertaken by Douglas Partners in 2022 did not include the assessment of surface or sub-surface materials or groundwater for contaminants.

2.2.3 Historical context

Historical aerial images available from 1965 and onwards (Landgate 2023) show that the western and central portion of the site were subject to vegetation clearing likely for agricultural land uses such as cattle grazing prior to 1965, as shown in **Plate 2**.



Plate 2: Historical aerial imagery 1965

By circa 1970, vegetation clearing extended in particular in the north eastern portion of the site likely to expand the agricultural land to this area. Scattered remnant and/or planted trees remained in the balance of the site whilst vegetation regrowth is evident in some portions of the site between 1965 and the 1970s, as shown in **Plate 3**.



Plate 3: Historical aerial imagery 1970

By 1983 the wetland features within the site appear to have become depleted of surface water, as shown in **Plate 4**. Pine plantations to the east of the site are also clearly visible and extensive. Whilst patches of vegetation in portions of the site have been left to regenerate and largely still occur to date, periodic clearing of vegetation occurred throughout the 1980s and likely into the 2000s.

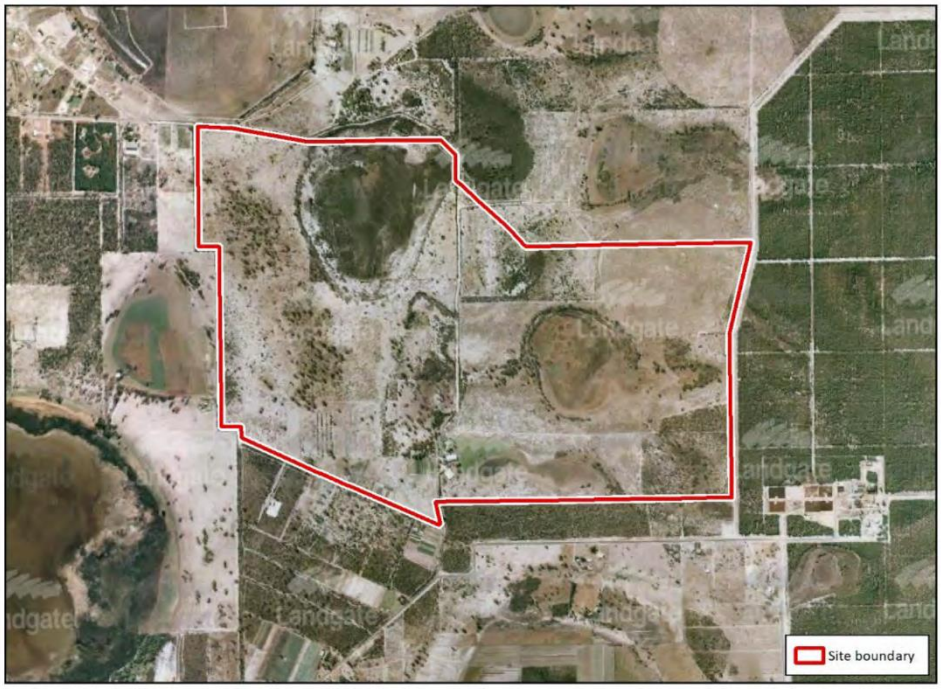

Plate 4: Historical aerial imagery year 1983

Since the early 2000s it appears that vegetation regrowth within the site has increased (**Plate 5**), to this date the site has remained largely unchanged and vegetation has continued to regenerate in portions of the site.

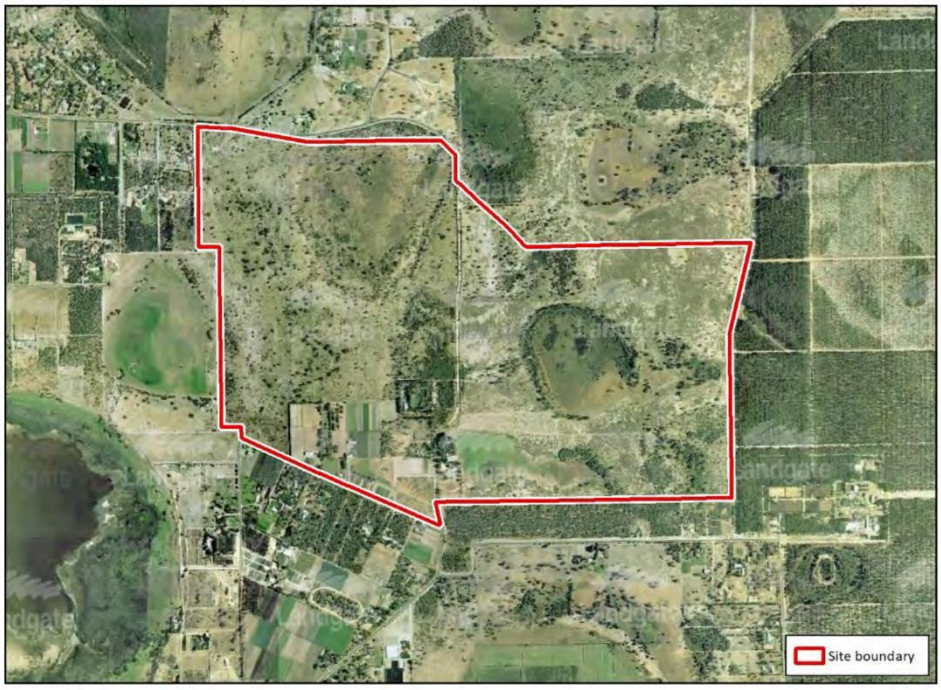

Plate 5: Historical aerial imagery year 2000

Overall, the site has been subject to extensive historical disturbance, primarily associated with clearing of most vegetation across the site prior to 1965. Some remnant vegetation remains today, along with areas that have naturally regenerated over time.

2.3 Flora and Vegetation

2.3.1 Regional context

Variations in native vegetation within the site can be classified based on regional vegetation associations. Heddle *et al.* (1980) mapping shows the site as comprising the 'Pinjar' complex, which is described as 'vegetation ranging from woodland to *Eucalyptus marginata – Banksia* spp. to a fringing woodland of *Eucalyptus rudis – Melaleuca preissiana* and sedgelands'. This complex was determined to have 35.5% remaining of its original pre-European extent within the Swan Coastal Plain, of which 4.6% is protected for conservation purposes (Government of Western Australia 2019).

The EPA's *Environmental Guidance for Planning and Development Studies* (EPA 2008b) states that the loss of biodiversity caused by habitat fragmentation is significantly greater once a habitat type falls below 30% of its original extent. The Guidance also references the biodiversity conservation national objective and target of retaining 30% of the original extent of each vegetation complex, and the states' minimum target of 10% for constrained urban areas such as the Swan Coastal Plain. The percentage remaining of the 'Pinjar' vegetation complex (35.5%) is above the 30% retention objective and above the 10% minimum retention target for the Swan Coastal Plain.

Vegetation is typically considered to represent an intact occurrence of its overarching vegetation complex when it is in 'good' or better condition. As outlined in **Section 2.3.4**, vegetation in some portions of the site has been assessed to be in 'good' or 'very good' condition; therefore, this indicates that these areas of remnant native vegetation within the site, in particular where there is an abundance of *Eucalyptus marginata*, *Banksia* spp., *Eucalyptus rudis* and *Melaleuca preissiana*, is consistent with vegetation associations of the 'Pinjar' complex.

2.3.2 Site-specific investigations

Emerge (2023c) completed a detailed flora and vegetation assessment of the site on multiple dates between August 2022 and February 2023, including during the spring flowering period. The assessment boundary incorporates the site in addition to parts of the unconstructed Mariginiup Road reserve along the western site boundary, given it is anticipated that this road be will constructed to support residential development of the area.

Multiple lots within the southern portion of the site were unable to be directly accessed during the survey (refer to **Appendix B** Figure 2); however, observations of flora and vegetation was completed from the lot boundaries of adjacent lots and public road reserves. The lots which could not be directly accessed were observed to primarily contain market gardens and highly cleared rural-residential areas. As such the access restriction was considered unlikely to represent a significant limitation with respect to assigning vegetation types, vegetation condition or threatened and priority ecological communities. The primary limitation relates to compiling a full species list (primarily understorey species), and therefore the confirmation of presence/absence of threatened and priority species, although such values were considered unlikely to occur within lots comprising market gardens.

The assessment was completed to a 'detailed' survey standard of a flora and vegetation survey in accordance with EPA's *Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA 2016). The assessment report is provided in **Appendix B**.

The results of the assessment have been used to inform the following sections.

2.3.3 Vegetation types

Emerge (2023c) recorded 17 broad plant communities within the site, as described in **Table 3** and shown in **Figure 4**. Plant communities have been grouped as either 'upland' or 'wetland' type vegetation communities. Whilst wetland features within the site were observed to be dry year-round during the field surveys, the 'wetland' type communities are likely associated, if not dependent on shallow groundwater, and have therefore been classified as 'wetland' vegetation.

Table 3: Description and extent of plant communities within the site (Emerge Associates 2023)

Plant community	Description	Area (ha)
Upland communities		
BaBmEpAn	Low woodland of *Banksia menziesii*, *Banksia attenuata*, *Eucalyptus todtiana* and *Nuytsia floribunda* over open shrubland of *Adenanthos cygnorum*, *Eremaea pauciflora* and *Jacksonia furcellata* over low shrubland of *Hibbertia hypericoides*, *Hypocalymma robustum* and *Scholtzia involucrata* over forbland of *Alexgeorgea nitens*, *Lyginia barbata* and open grassland of **Ehrharta calycina* and **Briza maxima*.	5.4
BaBmJfXp	Low woodland of *Banksia menziesii*, *Banksia attenuata* and *Allocasuarina fraseriana* over shrubland of *Jacksonia furcellata* over low shrubland of *Hibbertia hypericoides*, *Acacia huegelii* and *Conostephium pendulum* over forbland of *Desmocladus flexuosus* and *Alexgeorgea nitens* over open grassland of **Ehrharta calycina* and **Briza maxima*.	0.6
EmXp	Woodland of *Eucalyptus marginata* over low woodland of *Banksia menziesii* (or absent) over shrubland of *Xanthorrhoea preissii* and *Jacksonia sternbergiana* over low open shrubland of *Hibbertia hypericoides*, *Jacksonia sericea* and *Persoonia saccata* over forbland of *Mesomelaena pseudostygia* and *Desmocladus flexuosus* over open grassland of **Ehrharta calycina* and **Briza maxima*.	23.7
Xp	Scattered *Eucalyptus todtiana* over open shrubland of *Xanthorrhoea preissii* and *Jacksonia furcellata* over open low shrubland of *Lechenaultia biloba* over forbland of *Haemodorum spicatum* and *Patersonia occidentalis* over open grassland of **Ehrharta calycina* and **Briza maxima*.	21.4
Wetland communities		
BaBmKgSi	Low woodland of *Banksia attenuata* and *Banksia menziesii* over shrubland of *Kunzea glabrescens* and *Adenanthos cygnorum* over low shrubland of *Acacia pulchella* var. *pulchella*, *Bossiaea eriocarpa* and *Scholtzia involucrata* over forbland of *Sowerbaea laxiflora*, *Stylidium repens* and *Lyginia barbata* over open grassland of **Ehrharta calycina* and **Briza maxima*.	1.8
BiAc	Low open woodland of *Banksia ilicifolia* and *Eucalyptus todtiana* over open shrubland of *Adenanthos cygnorum*, **Acacia longifolia* and *Kunzea glabrescens* over low shrubland of *Macarthuria australis*, *Scholtzia involucrata* and *Acacia pulchella* var. *pulchella* over forbland of *Alexgeorgea nitens*, *Desmocladus flexuosus* and **Carpobrotus edulis* open grassland of *Microlaena stipoides*, **Ehrharta* spp. and **Briza maxima*.	5.0
Cc	Closed forest of *Corymbia calophylla* and *Eucalyptus rudis* over open shrubland of *Xanthorrhoea preissii* over closed fernland of *Pteridium esculentum* over forbland of *Sowerbaea laxiflora* and open grassland of **Ehrharta calycina* and **Briza maxima*.	0.7
EmKg	Open forest of *Eucalyptus marginata* and *Melaleuca preissiana* over tall shrubland of *Kunzea glabrescens* and **Acacia longifolia* over shrubland of *Xanthorrhoea preissii*, *Pultenaea reticulata* and *Conostephium pendulum* over forbland of *Phlebocarya ciliata* and *Dasypogon bromeliifolius* over open grassland of **Ehrharta calycina* and **Briza maxima*.	4.7
ErAc	Open forest of *Eucalyptus rudis* over shrubland of *Adenanthos cygnorum*, *Regelia ciliata* and *Kunzea glabrescens* over forbland of **Carpobrotus edulis* and *Trachymene pilosa* over open grassland of **Ehrharta calycina* and **Vulpia myuros*.	7.8
ErAs	Open forest of *Eucalyptus rudis* over open tall shrubland of *Astartea scoparia* and **Acacia longifolia* over sparse open shrubland of *Hibbertia cuneiformis* over forbland of *Dielsia stenostachya* over open grassland of **Briza maxima* and **Romulea rosea*.	10.8

Plant community	Description	Area (ha)
ErLb	Open forest of *Eucalyptus rudis* over open tall shrubland of *Exocarpos sparteus*, *Astartea scoparia* and *Jacksonia furcellata* over forbland of *Lyginia barbata*, *Lepidosperma longitudinale* and *Hypolaena exsulca* over grassland of *Ehrharta* spp. and **Pentameris airoides*.	8.6
HaRc	Scattered *Melaleuca preissiana* over shrubland of *Hypocalymma angustifolium* and *Regelia ciliata* over forbland of *Dasypogon bromeliifolius*, *Hypolaena exsulca* and *Lyginia barbata* over open grassland of **Ehrharta calycina* and **Briza maxima*.	4.6
Kg	Scattered *Eucalyptus rudis* over closed tall shrubland of *Kunzea glabrescens* and **Acacia longifolia* over shrubland of *Hypocalymma angustifolium* over scattered grassland of **Ehrharta longiflora*.	12.1
KgAl	Scattered *Eucalyptus rudis* and **Pinus pinaster* over closed tall shrubland of *Kunzea glabrescens* and **Acacia longifolia* over shrubland of *Pultenaea reticulata* over forbland of *Machaerina vaginalis* and *Lyginia barbata* over scattered grassland of **Ehrharta longiflora* and **Briza maxima*.	10.4
Mp	Open forest of *Melaleuca preissiana* over shrubland of *Adenanthos cygnorum* and *Xanthorrhoea preissii* over forbland of *Dasypogon bromeliifolius*, *Patersonia occidentalis* and *Phlebocarya ciliata* over open grassland of **Ehrharta calycina.*	2.7
Mt	Open shrubland of *Melaleuca teretifolia* over forbland of **Carpobrotus edulis* and **Lotus angustissimus* over grassland of **Bromus diandrus*, **Ehrharta* spp and **Pentameris airoides.*	11.4
Other		
Non-native	Heavily disturbed areas comprising non-native or planted vegetation with occasional scattered native trees, shrubs or forbs. Buildings, bare ground and areas of horticulture were also included in this community.	181.8

2.3.4 Vegetation condition

Emerge (2023c) assessed vegetation condition within the site to range from 'Very Good' to 'Completely Degraded', as shown in **Figure 5** and detailed in **Table 4**.

Table 4: Vegetation condition within the site

Condition category (Keighery 1994)	Area (ha)
Pristine	0
Excellent	0
Very good	25.2
Good	64.6
Good - degraded	2.0
Degraded	40.2
Completely degraded	181.8

2.3.5 Threatened and Priority Ecological Communities

Threatened Ecological Communities (TECs) are recognised as ecological communities that are rare or under threat and therefore warrant special protection.

At a Commonwealth level, TECs are afforded statutory protection under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). At the State level, TECs are afforded statutory protection under the *Biodiversity Conservation Act 2016* (BC Act). Under both Acts, TECs are listed as either 'critically endangered', 'endangered' or 'vulnerable', noting listing status may be different between Commonwealth and State levels.

At a State level, an ecological community under consideration for listing as a TEC but which does not yet meet survey criteria or has not been adequately defined, or which is rare but not currently threatened, is referred to as a 'Priority Ecological Community' (PEC). Whilst PECs are not afforded statutory protection under the BC Act, they are recognised and categorised by the Department of Biodiversity, Conservation and Attractions (DBCA) and are considered through approval processes.

Emerge Associates (2023c) identified the following TECs and PECs as occurring within the site:

- 12.1 ha of 'Banksia Woodlands of the Swan Coastal Plain' TEC (EPBC Act 'Endangered') and PEC (DBCA 'Priority 3(iii)')[1]
- 6.9 ha of low lying *Banksia attenuata* woodlands or shrublands PEC (DBCA 'Priority 3(i)').

With respect to the identified PECs, DBCA define the respective categories as follows:

- Priority 3(i): Poorly known ecological communities, that are known from several to many occurrences, a significant number or area of which are not under threat of habitat destruction or degradation.
- Priority 3(iii): Poorly known ecological communities, made up of large, and/or widespread occurrences, that may or may not be represented in the reserve system, but are under threat of modification across much of their range from processes such as grazing by domestic and/or feral stock, inappropriate fire regimes, clearing, hydrological change etc.

The extent and location of the TEC and PECs across the site is shown in **Figure 6** with photographic representation provided in **Plate 6** and **Plate 7**.

No other TECs or PECs were recorded or considered likely to occur within the site.

[1] The Banksia Woodlands of the Swan Coastal Plain TEC and PEC have the same description, area and condition thresholds, but have different listing status at Commonwealth and State levels.



Plate 6: Banksia Woodlands TEC and PEC within the site



Plate 7: 'Low lying Banksia attenuata woodlands or shrublands' PEC

2.3.6 Significant flora

Certain flora species that are considered to be rare or under threat warrant special protection under Commonwealth and/or State legislation. At a Commonwealth level, flora species may be listed as 'threatened' pursuant to the EPBC Act. At a State level, plant species may also be classed as 'threatened' under the BC Act. Species that are potentially rare or threatened, meet the criteria for near-threatened, or have recently been removed from the threatened species list are classed as 'priority' flora species. However, priority flora species are not afforded statutory protection.

As part of the detailed flora assessment undertaken by Emerge (2023c), one priority flora species was recorded within the site namely *Jacksonia sericea* (Priority 4).

DBCA define Priority 4 (P4) species as 'rare, near threatened and other species in need of monitoring' that are not currently threatened and are considered to have been adequately surveyed and/or have been removed from the list of threatened species.

Jacksonia sericea (P4) is locally common within the western portion of the site. The species is also common across calcareous and sandy soils of the Swan Coastal Plain from the south of Mandurah to the north of Joondalup, with numerous records occurring within 10 km of the site. A total of 301 individual plants were recorded within the **BaBmEpAn**, **BaBmJfXp, BaBmKgSi** and **EmXp** plant communities. All recorded locations of the species are shown in **Figure 6**. Photographic representation of *Jacksonia sericea* is provided in **Plate 8** and **Plate 9**.

No other priority or threatened flora were recorded or considered likely to occur within the site.



Plate 8*: Jacksonia sericea* (P4) habit



Plate 9*: Jacksonia sericea* (P4) flower

2.3.7 Weeds

The term 'weed' can refer to any plant that requires some form of action to reduce its effect on the economy, the environment, human health and amenity. At a State level, a particularly invasive or detrimental weed species may be listed as a 'declared pest' pursuant to the *Biosecurity and Agriculture Management Act 2007* (BAM Act), indicating that it warrants special management to limit its spread. At a Commonwealth level, the Australian government has compiled a list of 32 Weeds of National Significance (WoNS) (DoEE 2019c).

Emerge (2023c) recorded a total 51 introduced flora species, two of which are listed as declared pests under the BAM Act namely *Asparagus asparagoides* (bridal creeper) and *Moraea flaccida* (one-leaf cape tulip). Bridal creeper is also listed as a WoN.

2.3.8 Bush Forever

The Government of Western Australia's *Bush Forever Policy* (Government of WA 2000) is a strategic plan for conserving regionally significant bushland within the Swan Coastal Plain portion of the Perth Metropolitan Region. The objective of Bush Forever is to protect comprehensive representations of all original vegetation complexes by targeting a minimum of 10% of each for protection. Bush Forever areas represent regional ecosystems and habitat and have a vital role in conserving Perth's biodiversity. Bush Forever areas are mapped within the MRS.

No Bush Forever areas occur within the site. Bush Forever area 147 (Mariginiup Lake and Adjacent Bushland, Mariginiup) directly abuts the south-western corner of the site, and Bush Forever area 324 (Jandabup Lake and Adjacent Bushland, Jandabup/Mariginiup) lies adjacent to the southern boundary. Bush Forever area 324 extends to the south, and significant flora species are known to occur in this site. The location of both Bush Forever areas external to the site are shown in **Plate 1** and **Figure 7**.

2.3.9 Ecological linkages

Ecological linkages are linear landscape elements that allow the movement of fauna, flora and genetic material between areas of remnant habitat. The Perth Biodiversity Project, supported by the Western Australian Local Government Association have identified and mapped regional ecological linkages within the Perth Metropolitan Region (WALGA and PBP 2004). While the linkages generally align with areas of vegetation and Bush Forever areas, in many locations these linkages are not contiguous with vegetation coverage.

Regional Ecological Linkage No. 16 extends over the south eastern portion of the site further to the south and east intersecting with Ecological Linkage No. 12, which runs in a north to south direction adjacent to the western site boundary, as shown in **Figure 7**.

2.3.10 Environmentally Sensitive Areas

'Environmentally sensitive areas' (ESAs) are prescribed under the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* and identify where the Clearing Permit exemptions prescribed under the Regulations do not apply. They include areas of native vegetation associated with significant wetlands, threatened flora, threatened communities and Bush Forever areas.

The site is not mapped as an ESA; however, multiple ESA's occur abutting the site boundary to the south and west associated with Bush Forever areas 147 and 324 and to the north likely associated with mapped conservation category wetlands.

2.3.11 City of Wanneroo Local Biodiversity Plan

The CoW's Local Biodiversity Plan (LBP) (CoW 2018) outlines targets for the retention, protection and management of local natural areas (LNAs), which are defined in the LBP as all unprotected natural areas over which the CoW can exercise the most control through its decision-making powers, policies and reserve management. LNAs are identified within private property, public or regional open space and state government freehold land not zoned 'Parks and Recreation' under the MRS.

The LBP maps and prioritises LNAs based on their relative ecological value, which is determined through a weighted multi-criteria spatial analysis considering the following ecological criteria:

- Regional vegetation complex (and the percentage of the complex remaining)
- Proximity to conservation areas or Bush Forever areas
- Environmentally Sensitive Areas
- Patch size
- Occurrence of/proximity to threatened or priority flora
- Occurrence of/proximity to threatened or priority ecological communities
- Black cockatoo foraging habitat
- Proximity to wetlands or wetland buffers
- Ecological linkages.

Based on the multi-criteria analysis, the LBP assigns each LNA a relative ecological value score between 0 and 10 (low to high priority). Based on this score, the LBP identifies those areas with the highest prioritisation for protection and conservation.

Within the site, LBP maps a number of LNAs which range in a priority score from a minimum of 4 to a maximum of 8 (out of a possible score of 10), as shown in **Plate 10**.

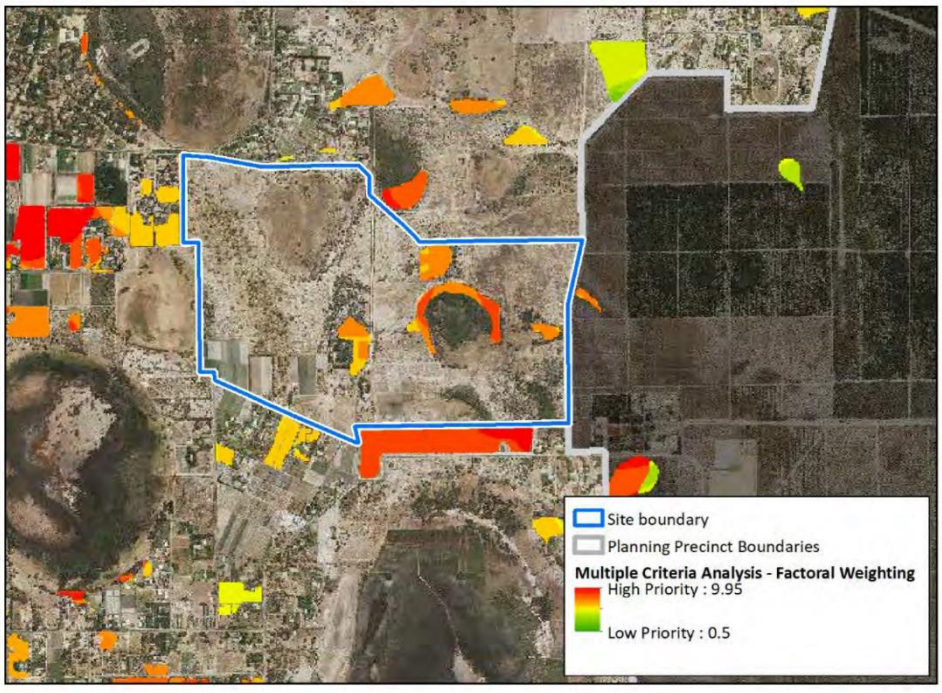

Plate 10: Local natural area priority rating, City of Wanneroo

2.4 Terrestrial Fauna

2.4.1 Site-specific surveys and investigations

Emerge (2023b) completed a detailed fauna and targeted black cockatoo assessment of the site (and the unconstructed Mariginiup Road reserve) between 28 March and 12 December 2022. The assessment methodology included:

- A fauna trapping program
- An assessment of fauna habitat within the site and its suitability to provide habitat for conservation significant fauna.
- A targeted survey to determine the presence of habitat for threatened black cockatoo species.

Multiple lots within the southern portion of the site were unable to be accessed during the survey (refer to **Appendix C** Figure 2); however, observations of fauna habitat was completed from the lot boundaries of adjacent lots and road reserves. The lots which could not be directly accessed were observed to primarily contain market gardens and highly cleared rural-residential areas. As such the access restriction is unlikely to represent a significant limitation with respect to assigning fauna habitat types, but instead limit the ability to provide a complete record of mature native trees with a diameter at breast height of > 50 cm potentially providing suitable habitat for conservation significant species such as black cockatoo, although these are unlikely to occur in areas actively used as market gardens.

The assessment was completed to the standard of a 'detailed' fauna survey and a 'targeted' black cockatoo survey with reference to the Environmental Protection Authority's (EPA's) technical guidance (EPA 2020) and the *Environment Protection and Biodiversity Conservation Act* black cockatoo referral guidelines (DAWE 2022). The assessment report is provided in **Appendix C**.

2.4.2 Fauna habitat

Emerge (2023b) identified 11 broad fauna habitats within the site, as outlined in **Table 5** and shown in **Figure 8**.

The majority of the site (59%) comprises **cleared** fauna habitat, which consist of heavily disturbed areas of grassland with the occasional scattered native tree or shrubs and would potentially only provide suitable habitat for common and widespread non-native species.

The highest fauna habitat values were considered to be associated with the **jarrah forest**, **banksia woodland**, and **jarrah woodland** habitats which occur over approximately 12.05% of the site. The remainder of the site comprises various forest, woodland and shrubland habitats with little to no understorey.

Table 5: Fauna habitats identified within the site

Fauna habitat	Description	Area (ha)
Jarrah forest	Open forest of *Eucalyptus marginata* and *Melaleuca preissiana* over native shrubs and non-native grasses.	4.7
Marri forest	Closed forest of *Corymbia calophylla* and *Eucalyptus rudis* over shrubland of *Xanthorrhoea preissii* over fernland of *Pteridium esculentum.*	0.7
Melaleuca forest	Open forest of *Melaleuca preissiana* over shrubland of *Adenanthos cygnorum* and *Xanthorrhoea preissii* over native forbland and non-native grasses.	2.7
Banksia woodland	Open woodland of *Banksia attenuata, B. menziesii, Eucalyptus todtiana and Nuytsia floribunda over* native shrubs and non-native grasses.	12.8
Flooded gum woodland	Closed woodland to open forest of *Eucalyptus rudis* over native shrubs over native forbland and non-native grasses.	27.1
Jarrah woodland	Open woodland of *Eucalyptus marginata* and *E. todtiana* over shrubland of *Xanthorrhoea preisii* over non-native grasses.	20.2
Balga shrubland	Open shrubland of *Xanthorrhoea preissii* over non-native grasses.	19.5
Melaleuca shrubland	Open shrubland of *Melaleuca teretifolia* over non-native forbland and grasses.	11.4
Myrtle shrubland	Scattered *Eucalyptus rudis* or *Melaleuca Preissiana* over tall shrubland of *Kunzea glabrescens* or *Hypocalymma angustifolia* over non-native grasses.	26.9
Non-native planted	Predominantly planted non-native trees and shrubs.	8.0
Cleared	Heavily disturbed areas comprising predominantly grassland with the occasional scattered tree or shrub. Areas of hardstands, tracks, buildings or agricultural land were also included in this habitat type.	179.5

2.4.3 Species of conservation significance

Certain fauna species that are considered to be rare or under threat warrant special protection under state and/or federal legislation. At a Commonwealth level, fauna species may be listed as 'threatened' pursuant to the EPBC Act. At a State level, fauna species may also be classed as 'threatened' under the BC Act. In addition to this, the DBCA maintains a list of priority fauna species which, while not considered 'threatened' under the BC Act and therefore are not afforded statutory protection, elicit some concern over their long-term survival.

Emerge Associates (2023b) recorded four fauna species of conservation significance within the site during site-specific investigations and fauna trapping, namely:

- Carnaby's black cockatoo (*Calyptorhynchus latirostris*), listed as 'endangered' under the EPBC Act and BC Act, discussed in **Section 2.4.3.1**.
- Forest red-tailed black cockatoo (*Calyptorhynchus banksii naso*), listed as 'vulnerable' under the EPBC Act and BC Act, discussed in **Section 2.4.3.2**.
- Black-striped burrowing snake (*Neelaps calonotos*), DBCA 'priority 3', discussed in **Section 2.4.3.3**.
- Quenda (*Isoodon fusciventer*), DBCA 'priority 4 ', discussed in **Section 2.4.3.4**.

In addition, a further ten species of conservation significance were identified as 'possible' to occur within the site due to the presence of suitable habitat, discussed in **Section 2.4.3.5**.

2.4.3.1 Carnaby's black cockatoo

Carnaby's black cockatoo (CBC) were observed flying over the site, which was not unexpected as the site is within the modelled distribution range of the species.

Dominant primary food plants for CBC within the site are *Banksia menziesii* (firewood banksia), *Banksia attenuata* (candle stick banksia), jarrah and marri. The dominant secondary food plant is *Xanthorrhoea preissii* (grass tree). A total of up to 38.5 ha of potential primary foraging habitat for CBC and up to 19.5 ha of secondary foraging habitat for CBC was recorded within the site, as shown in **Figure 9**. These areas are likely an over-estimation of actual CBC foraging habitat, given they are based on broad fauna habitat type mapping which does not exclude cleared areas between patches of vegetation and trees (which are common across the highly disturbed site), nor does it exclude flora species within these areas which are not known to be foraged upon by black cockatoos.

A total of 365 black cockatoo habitat trees were recorded within the site, as shown in **Figure 9**. A 'habitat tree' was defined as a native eucalypt that is typically known to support black cockatoo breeding (such as marri, jarrah, blackbutt, tuart, wandoo, salmon gum or to a lesser extent flooded gum), with a diameter at breast height (DBH) of greater than 50 cm (or DBH greater than 30 cm for wandoo or salmon gum). The habitat trees identified within the site comprise 156 *Eucalyptus rudis* (flooded gum), 155 jarrah, 30 marri, 15 stag (dead) trees and nine *E. todtiana* (pricklybark). Of the recorded 365 habitat trees, 37 were assessed to potentially contain hollows suitable for black cockatoo nesting based on an initial inspection from ground level. These 37 habitat trees were then further assessed through an internal hollow inspection, which determined none contained hollows of suitable morphology to support black cockatoo nesting.

No evidence of CBC roosting activity was observed within the site; however, it is noted that the habitat trees within the site would provide suitable roosting habitat for CBC.

2.4.3.2 Forest red-tailed black cockatoo

Forest red-tailed black cockatoo (FRTBC) were observed foraging within the site, which was not unexpected as the site is within the modelled distribution range of the species.

Dominant primary food plants for FRTBC within the site are jarrah and marri. A total of up to 29.2 ha of potential native primary foraging habitat for FRTBC was recorded within the site, as shown in **Figure 10**. No secondary foraging habitat was identified for FRTBC. As outlined in **Section 2.4.3.1**, these areas are likely an over-estimation of actual FRTBC foraging habitat.

As discussed above, a total of 365 black cockatoo habitat trees were recorded within the site, as shown in **Figure 10**. No habitat trees were determined to contain suitable hollows for black cockatoo breeding.

No evidence of FRTBC roosting activity was observed within the site; however, it is noted that the habitat trees within the site would provide suitable roosting habitat for FRTBC.

2.4.3.3 Black-striped burrowing snake

The black-striped burrowing snake was recorded within the site by cage trap within the **banksia woodland** habitat area (**Plate 11**). This habitat is considered ideal for the species and banksia woodland vegetation, which is common across the local area, has likely supported a healthy population of this species for some time. A DBCA record from 1976 recorded the species 300 m to the west of the trapping location within the site. The species is known to inhabit sandy soils found in banksia or eucalyptus woodlands, but has also been observed on coastal dunes vegetated with heath. Based on this, areas of sandy soils with relatively intact vegetation cover within the site were mapped as suitable habitat for this species, as shown in **Figure 11**. Notwithstanding, it is acknowledged that the species being a burrower, it is possible that it could inhabit any area within the site comprising sandy soils including areas of '**cleared**' habitat.



Plate 11: Black striped burrowing snake caught within the site

2.4.3.4 Quenda

On preliminary assessment, multiple areas within the site were considered suitable habitat for quenda and the field survey confirmed this with multiple sightings. Quenda were recorded on cameras in multiple areas of the site (**Plate 12**) and were also caught by cage traps. The unique conical diggings of quenda were also observed throughout the site.

Given quenda inhabit vegetation with dense understorey occurrence of the species within the site would likely be limited to sections within the site where vegetation provides suitable habitat (including the majority of woodland and shrubland type vegetation within the site), likely excluding any areas comprising sparse grassland with little to no native vegetation cover; however, quenda may also forage across or traverse other habitats within the site. Areas of potential Quenda habitat within the site have been mapped on this basis, as shown in **Figure 12**.



Plate 12: Quenda recorded on camera trap within the site.

2.4.3.5 Other species that possibly occur

At the time of the site-specific survey, a total of ten species of conservation significance were identified as 'possible' to occur within the site as it contains habitat of at least marginal quality and/or extent for a species, and the site being located within the known distribution range, which is supported by recent literature from near the site (Emerge Associates 2023b). However, these species were not recorded and include migratory species that may only opportunistically fly over the site on commute or while searching for food. This include the following species:

- Douglas's broad-headed bee (*Hylaeus globuliferus*), listed as 'critically endangered' under the EPBC Act and BC Act.
- Chuditch (*Dasyurus geoffroii*), listed as 'vulnerable' under the EPBC Act and BC Act.
- Pacific swift (*Apus pacificus*), listed as 'migratory' under the EPBC Act and BC Act.
- Peregrine falcon (*Falco peregrinus*), listed as 'other specially protected' under the BC Act.
- Spiny katydid (*Austrosaga spinifer*), DBCA 'priority 2'.
- Swan Coastal Plain shield-backed trapdoor spider (*Idiosoma sigillatum*), DBCA 'priority 3'.
- A short-tongued bee (*Leioproctus contrarius*), DBCA 'priority 3'.
- Woollybush bee (*Hylaeus globuliferus*), DBCA 'priority 3'.
- Graceful sun-moth (*Synemon gratiosa*), DBCA 'priority 4'.
- Western brush wallaby (*Notamacropus irma*), DBCA 'priority 4'.

The conservation significant invertebrates (bees, graceful sun moth, Swan Coastal Plain shield-backed trapdoor spider and spiny katydid) could all occur within the site based on the soils and vegetation present. However, records of these species are sparse in the local area. While numerous common invertebrates were captured in pitfall and funnel traps, the Emerge (2023b) survey was targeting vertebrate fauna and as such targeted invertebrate surveys would be required to determine the presence of these species.

Chuditch are a small to medium sized mammal that occur in a range of woodland and shrubland habitats. Emerge (2023b) did not record evidence of this species within the site. Whilst the survey used camera and cage traps, which can capture chuditch, the survey was not designed to specifically target the detection of this species. Notwithstanding, given that there are no recent records in the local area, Emerge (2023b) considered it is not likely chuditch occur in the site. Chuditch are threatened species and are rarely recorded in developed portions of the Swan Coastal Plain. Nonetheless, as chuditch can roam over a large range, and suitable habitat is present in the site, it is possible that chuditch may occasionally or temporarily occur.

Habitat suitable for the western brush wallaby also exists within the site but evidence of the species was not recorded during the Emerge (2023b) survey. Similar to the chuditch, they may visit the site as suitable habitat is present although it is likely on an occasional and temporary basis.

Pacific swift and peregrine falcon are highly mobile species that may opportunistically fly over or forage in the site for short periods of time as part of a much larger home range. Neither of these species would breed within the site. Any occurrence of Pacific swift or peregrine falcon in the site would likely be in the air space and largely independent from terrestrial habitat.

2.5 Inland Waters

2.5.1 East Wanneroo District Water Management Strategy

In accordance with *Better Urban Water Management* (WAPC 2008), a district water management strategy (DWMS) was prepared on behalf of DPLH to support the EWDSP in 2021, which incorporated the site. The DWMS provides a summary of the existing water resources and environmental conditions within the EWDSP area to demonstrate that the land is capable of urban land uses. The DWMS highlights the need for a more detailed investigation for individual precincts including the preparation of a local water management strategy (LWMS) and urban water management plans at later planning stages.

2.5.2 Local Water Management Strategy

Pentium Water (2023) prepared an LWMS the site which provides a comprehensive assessment of the existing hydrological settings and how the future proposed development within the site will integrate water sensitive urban design outcomes and how the proposed land use addresses the protection of water dependent environments, water use and identify existing and required stormwater management infrastructure.

2.5.3 Groundwater

2.5.3.1 Regional groundwater

Information on the regional groundwater resources (DWER 2023) indicates that the site is underlain by a multi-layered aquifer system comprised of the following resources:

- Perth - Superficial Swan (unconfined)
- Perth - Leederville (confined)
- Perth – Yarragadee North (confined).

The historic maximum groundwater level (MGL) dataset shown in the *Perth Groundwater Map* (DWER 2022a) shows the depth to groundwater levels from soil surface across the site range from 1 m within wetland features in the eastern portion of the site to 15 m in the western portion of the site along the ridgeline. Depth to water within the majority of the site is between 4 m and 5 m.

2.5.3.2 Site-specific groundwater data

Groundwater monitoring has been undertaken within the site from May 2022 to July 2023. Pentium Water (2023) installed ten groundwater bores and four piezometers across the site in May and August 2022 for the purpose of pre and post - development monitoring with the groundwater monitoring undertaken across the site on a monthly basis (with the exception of December 2022) since installation.

Groundwater levels across the site have ranged from a minimum of 42.50 mAHD in April 2023 in the north western portion of the site to a maximum of 49.44 mAHD in November in the north eastern corner of the site (Pentium 2023). Relative to existing surface levels, the measured groundwater levels ranged from a minimum of 0.86 metres below ground level (mbgl) in the south eastern portion of the site in September 2022 to a maximum of 8.03 mbgl in the central east portion of the site in April 2023 (Pentium 2023).

Based on the MGL contours, groundwater flows generally east to west across the site, which is consistent with the regional mapping (Pentium 2023).

2.5.4 Surface water

The *Hydrography Linear* dataset (DWER 2020) shows the following surface water related features within the site:

- Two 'earth dams' within the northern and central portion of the site.
- Two 'areas subject to inundation' within the north-western and southern portion of the site, comprising multiple use wetland #15022 and #14252 respectively.
- A 'lake – non-perennial' in the eastern portion of the site associated with resource enhancement wetland #15443.
- A 'drain – major' in the central portion of the site intersecting through multiple use wetland #14248 linking resource enhancement wetlands #14247 and #15443.

The majority of the site drains into local depressions that are associated with the multiple use wetlands and resource enhancement wetlands within the site, whilst the ridge in the western portion of the site results in drainage into Little Mariginiup Lake (CCW #8161) located to the west of the site (Pentium 2023).

2.5.5 Wetlands

Wetlands include "*areas of seasonally, intermittently or permanently waterlogged soils or inundated land, whether natural or otherwise, fresh and saline, e.g. waterlogged soils, ponds, billabongs, lakes, swamps, tidal flats, estuaries, rivers and their tributaries*" (Wetlands Advisory Committee 1977). Wetlands can further be recognised by the presence of vegetation associated with waterlogging or the presence of hydric soils such as peat, peaty sand or carbonate mud (Hill *et al.* 1996).

Wetlands of international significance (such as Ramsar wetlands) are afforded protection under the EPBC Act. No such wetlands occur within or in proximity to the site.

At a regional level, DBCA maintains the Geomorphic Wetlands of the Swan Coastal Plain dataset (DBCA 2023), which categorises wetland features into management categories to guide land use and conservation, as outlined in **Table 6**. Wetland types are based on landform shape and water permanence, whilst management categories of wetlands are determined based on hydrological, biological and human use features.

Table 6: Geomorphic wetland management categories

Management Category	Description of wetland	Management objectives
Conservation Category Wetland (CCW)	Support high levels of attributes	Preserve wetland attributes and functions through reservation in national parks, crown reserves and state owned land. Protection provided under environmental protection policies.
Resource Enhancement Wetland (REW)	Modiefied or degraded but still supporting susbtanstial attributes and functions	Restore wetland through maintenance and enhancement of wetland functions and attributes. Protection via crown reserves, state or local government owned land, environmental protection policies and sustainable management on private properties.
Multiple Use Wetland (MUW)	Few remaining importnant wetland attributes and fucntions but still provide important hydrological functions	Use, development and management considered in the context of water, town and environmental planning through land care.

A review of the dataset indicated that there are multiple REWs and MUWs occurring within the site and several CCWs within close proximity of the site, as outlined in **Table 7** and shown in **Figure 13**.

Table 7: Geomorphic wetlands present within the site and surrounds.

UFI	Geomorphic classification	Location	Area (ha)
Conservation category wetlands			
14241	Sumpland	Approximately 30 m to the north of the site	12.8
7960 (Lake Adams)	Dampland	Approximately 90 m to the north-west of the site	33.2
7959 (Lake Adams)	Dampland	Approximately 90 m to the north-west of the site	56.7
8161 (Little Mariginiup)	Sumpland	Approximately 60 m to the west of the site	17.5
Resource enhancement wetlands			
15443	Dampland	Eastern portion of the site	17.3
14244	Dampland	Eastern portion of the site	1.2
14245	Dampland	Eastern portion of the site	2.9
14253	Dampland	South eastern portion of the site	2.6
14247	Dampland	Central portion of the site	5.3
14261	Dampland	Eastern portion of the site	1.4
14254	Dampland	Eastern portion of the site	1.6

UFI	Geomorphic classification	Location	Area (ha)
Multiple use wetlands			
15022	Dampland	North western portion of the site	38.3
8164	Dampland	Central portion of the site	9.7
14252	Dampland	Southern portion of the site	8.7
14248	Dampland	Central portion of the site	1.8
15442	Dampland	Eastern Portion of the site	6.4

2.5.6 Public drinking water source areas

DWER proclaims Public Drinking Water Source Areas (PDWSAs) to protect identified drinking water sources, including surface water and groundwater sources (DoW 2009). They are proclaimed under the *Metropolitan Water Supply, Sewerage and Drainage Act 1909* or the *Country Areas Water Supply Act 1947* as Water Reserves, Catchment Areas or Underground Water Pollution Control Areas.

The eastern portion of the site zoned 'rural – water protection' under the MRS is associated with the Priority 2 (P2) Gnangara Underground Water Pollution Control Area, as shown in **Figure 13**. *Water Quality Protection Note* (WQPN) *25 Landuse Compatibility Tables for Public Drinking Water Source Areas* (DoW 2016) indicates that subdivision of land for residential purposes within a P2 in an area zoned 'Urban Residential' or 'Urban Deferred' and the creation of recreational parks and/or sporting ovals is incompatible. However, it is envisaged that the future rezoning of land within the site that intersects the PDWSA will trigger reclassification of the areas of P2 to P3* (which are defined as areas changed from P1 or P2 as a result of government-approved strategic planning for urban development in the MRS), as outlined in WQPN 38 (DWER 2018).

Parts of multiple wellhead protection zones intersect the eastern portion of the site, associated with the nearby location of the Wanneroo groundwater treatment plant (WGTP). The WGTP draws water from shallow and deep groundwater aquifers, prior to treating the water and then piping the water for distribution. This would be considered as part of any PDWSA reclassification from P2 to P3*.

2.6 Social Surroundings

2.6.1 Aboriginal cultural heritage

In Western Australia, Aboriginal cultural heritage is currently managed pursuant to the *Aboriginal Cultural Heritage Act 2021*[2]. DPLH maintain the Aboriginal Cultural Heritage Inquiry System (ACHIS), which is a directory containing locations and information about Aboriginal Cultural Heritage (ACH) in the State. A desktop assessment of the ACHIS identified ACH 'Directory Place 22160 Marrynginup' extending across the majority of the site, whilst two other ACH features are mapped in proximity to the site, as shown in **Figure 14** and detailed in **Table 8**.

[2] In August 2023, the WA Government announced that the ACH Act would be repealed and replaced by an amended version of the *Aboriginal Heritage Act 1972* (AH Act). At the time of writing, this change to the statutory framework is yet to be legislated.

Table 8: Aboriginal cultural heritage within and in proximity to the site

Site ID & name	Status	ACH type	Site description	Location (ACHIS, DPLH)
22160 (Marrynginup)	ACH Directory	Place	• Artefacts/scatter • Ceremonial • Historical • Modified tree • Camp • Hunting place • Meeting place • Water resource • Named place • Natural feature	Extending across the majority of the site.
3741 (Lake Mariginiup)	ACH Directory	Place	• Of mythological significance • Hunting Place	Approximately 400 m south-west of the site, west of Mariginiup Road.
3396 (Lake Adams)	ACH Historic	Place	• Of mythological significance • Hunting Place • Plant resource • Water source	Approximately 100 m north-west of the site, north of Coogee Road

Horizon Heritage completed an Aboriginal Heritage desktop assessment of the site and surrounding area (**Appendix E**). The scope of this assessment was to understand the extent of the characteristics of any known or likely ACH values within the site, based on a desktop assessment and research. The assessment did not include onsite archaeological or ethnographic Aboriginal heritage surveys.

'ACH Directory Place 22160 Marrynginup' is mapped on the DPLH directory with a large polygon, which restricts publicly displaying its reliable location and site boundary. The site custodian gave Horizon permission to access and geographically define the actual ACH Place boundary and for Emerge to utilise any geographical information in this EAR.

The true extent and spatial boundary of ACH Place 22160 Marrynginup is largely associated with CCW UFI 14241 to the north of the site and only slightly intersects into the north central portion of the site, as shown in **Figure 14**. ACH Place 22160 is identified in the ACHIS to be a very significant and sensitive area (healing area) important for Aboriginal spiritual health and cultural well-being, as was confirmed by Horizon (2023).

It is possible that surface expressions of *in situ* cultural material (artefacts) could be present (Horizon 2023) within the portion of ACH Place 22160 intersecting into the site, albeit unlikely given the area having been subject to historical vegetation clearing and ground disturbance. It is also possible that artefacts potentially occur around the margins of landscape features like lakes, swamps, wetlands and any sand hill features within the broader site. Wetland features within and surrounding the site have been determined to be of particular significance as numerous camp sites have previously been identified in proximity of freshwater lakes in the broader Wanneroo area (Horizon 2023).

Horizon (2023) recommended that consultation with the Whadjuk People (Whadjuk Aboriginal Corporation) and the site custodian should be undertaken and that an Aboriginal Cultural Heritage Management Plan should be prepared and implemented prior to vegetation clearing and other ground disturbance works associated with development of the site.

The need for statutory approvals or consents (pursuant to the ACH Act or AH Act, pending resolution of the legislative framework) will require consideration prior to development works commencing.

2.6.2 Non-Indigenous heritage

A desktop search of the Australian Heritage Database (Department of the Environment 2019), the State Heritage Office database and City of Wanneroo Scheme Heritage List, indicates there are no listed non-indigenous heritage sites located within, or in proximity to the site.

2.6.3 Surrounding land uses

The East Wanneroo area supports a variety of exiting land uses, some of which have the potential to be incompatible within sensitive urban land uses due to the potential for amenity impacts associated with dust, noise, gaseous or odour emissions. Such land uses relevant to the site and surrounding area include existing poultry farms, basic raw materials extraction areas, market gardens, turf farms and nurseries.

EPA (2005) *Guidance Statement No. 3. Separation Distances between Industrial and Sensitive Land Uses* includes recommended generic separation distances between industrial and sensitive land uses to avoid land use conflicts.

2.6.3.1 Poultry farms

No existing poultry farms are known to occur within or nearby to the site. The closest known poultry farm operation is situated approximately 1.3 km west of the site.

EPA (2005) recommends a generic separation distance of 300-1000 m between sensitive land uses and poultry farms, depending on size of the operations.

2.6.3.2 Market gardens, turf farms and nurseries

The south-western portion of the site contains existing market garden land uses, which will ultimately transition to urban land uses through implementation of the SP.

A range of market gardens, orchards and plant or tree nurseries occur in proximity to the site. Where these occur within 500 m, these are shown in **Figure 15**. The type and scale of these existing operations is variable. No existing turf farms are known to occur in proximity to the site.

Table 9 outlines the EPA's (2005) recommended generic separation distance for the above land uses.

Table 9: EPA (2005) recommended generic separation distances for various land uses

Industry type and description	Recommended generic separation distance (EPA 2005)
Greenhouse (using manure or compost)	200-300 m
Market gardens (broad-scale operations)	300-500 m, depending on size
Nurseries (no composting)	100 m
Orchards (broad-scale operations)	500 m
Turf farms and lawns (broad-scale turf production)	500 m

2.6.3.3 Basic raw materials

State Planning Policy (SPP) 2.4 Basic Raw Materials (BRM) (WAPC 2021) provides a policy framework to ensure BRM and extractive industries matters are considered during planning and development decision-making, to facilitate the responsible extraction and use of the State's BRM resources. SPP 2.4 identifies (and spatially defines) two supply categories for BRM:

- **Significant geological supplies (SGS)**, which are identified as the highest priority extraction areas for BRM. SGS are BRM identified by the Department of Mines, Industry Regulation and Safety (DMIRS) that represent strategic, long-term supplies of BRM requiring protection.
- **Extraction sites**, which comprise all commercial sites from which BRM are extracted, and quarries. These may overlap with SGS areas but many occur outside of SGS areas. ES may include future, proposed, approved and operating commercial extractive industries under the *Planning and Development (Local Planning Schemes) Regulations 2015*, the *Local Government Act 1995*, the *Mining Act 1978* or a combination of these Acts.

In the Perth and Peel regions, SPP 2.4 also identifies BRM 'exclusion areas' – for either environmental, resource conflict or land use planning reasons – which must be avoided.

No SPP 2.4 SGS, extraction sites or exclusion areas are mapped within the site, as shown in **Figure 15**. The nearest SPP 2.4 SGS is approximately 5km south-east of the site within the locality of Melaleuca, part of which is subject to active sand resource extraction being undertaken at the Hanson Gaskell Quarry.

Large areas of harvested or remaining pine plantations immediately east of the site are mapped within a SPP 2.4 'extraction site'. Two existing sand quarries currently operate within a small portion of the mapped SPP 2.4 'extraction site', as shown in **Figure 15**:

- Hanson Jandabup Quarry, situated approximately 0.9 km east of the site
- Holcim Jandabup Quarry, situated approximately 1.2 km south-east of the site.

EPA (2005) recommends a generic separation distance of 300-500 m between sensitive land uses and "extractive industries – sand and limestone, with no grinding of milling works".

2.7 Other considerations

2.7.1 Bushfire hazards

The majority of the site is identified within a 'bushfire prone area' on the state-wide Map of Bush Fire Prone Areas (OBRM 2022), as shown in **Plate 13**. State Planning Policy (SPP) 3.7 *Planning in Bushfire Prone Areas* and the associated Guidelines require strategic planning proposals, including structure plans, to be supported by a bushfire hazard level assessment. Emerge Associates (2023a) have prepared a Bushfire Management Plan (BMP) for the site and addresses this requirement, and examines the various responses to the identified bushfire risk (following development) that will make the ultimate use of the land suitable for its intended purpose.

The BMP identified a variety of bushfire hazards within and surrounding the site, including different patches of forest, woodland, scrub and grassland hazards. Further information is provided in the BMP, which also provides an assessment of how future development within the site can satisfy the policy measures of SPP 3.7.

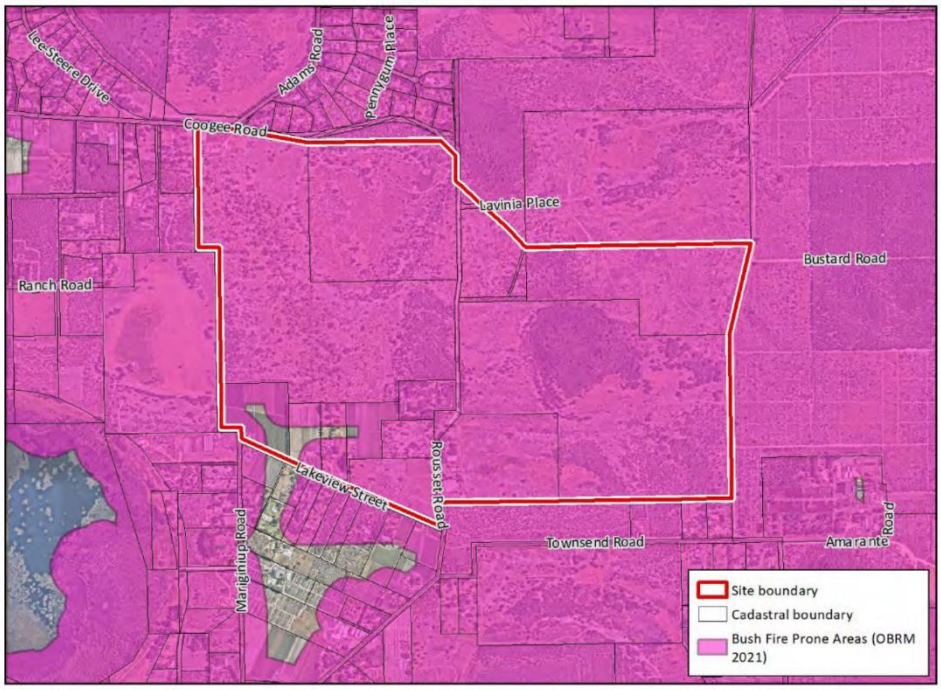

Plate 13: Bushfire prone areas

2.8 Summary of existing environmental values

Table 10 summarises the existing environmental values occurring within the site, as outlined and discussed in **Sections 2.1** to **2.6**.

Table 10: Summary of existing environmental values within the site by EPA factor

EPA factor	Summary of existing environmental values within the site
Landforms	• No restricted landforms or unique geological features have been identified within the site. Notwithstanding, the site contains a prominent dunal ridgeline in its western extent.
Terrestrial environmental quality	• Areas in the eastern portion of the site are classified as having a 'high to moderate' risk of ASS occurring within 3 m of the natural soil surface. Additionally, a large portion of the site is classified as having a 'moderate to low' risk of ASS occurring within 3 m of the natural soil surface but a 'high to moderate' risk of ASS beyond 3 m of the natural soil surface. The western portion of the site associated with the ridgeline is classified as having no known risk of ASS occurring. • The site is not registered as a contaminated site pursuant to the *Contaminated Sites Act 2003*.
Flora and vegetation	• 181.1 ha (58%) of the site comprises non-native or planted vegetation with occasional scattered native trees or shrubs in 'Completely Degraded' condition. A further 40.2 ha (13%) of the site supports vegetation in 'Degraded' condition. These areas are no longer representative of an intact native plant community due to significant historical disturbance. • 89.8 ha (29%) of the site comprises native vegetation in 'good' or better condition and represents intact occurrences of the Pinjar regional vegetation complex.

EPA factor	Summary of existing environmental values within the site
	• 12.1 ha of the Banksia Woodlands TEC and PEC and 6.9 ha of the Low Lying Banksia Priority 3 PEC occurs within the site. No other TECs or PECs have been identified or are likely to occur. • No threatened flora species have been recorded or are likely to occur within the site. • One priority flora species has been identified within the site; being 301 individuals of *Jacksonia sericea* (P4). No other priority flora species are likely to occur within the site. • No existing conservation areas or reserves such as Bush Forever areas intersect the site. • One ecological linkage partially crosses the site. A variety of significant environmental values (as outlined in this Table) occur in this area of the site and may contribute to the function of the mapped ecological linkages in this area.
Terrestrial fauna	• A total of 10 fauna habitats were identified within the site associated with patches of native wetland and upland type vegetation in varying condition. • Four conservation significant species were recorded within the site including CBC (threatened – endangered) , forest red-tailed black cockatoo (threatened - vulnerable), black-striped burrowing snake (priority 3) and quenda (priority 4). • Native vegetation within the site provides for up to 38.5 ha of potential primary foraging habitat for CBC and 25.7 ha for FRTBC. These values are likely an over-estimation of actual foraging habitat within the site for each species. • A total of 365 mature native black cockatoo habitat trees occur within the site, none of which contain suitable nesting hollows. • A total of 69.6 ha of vegetation within the site provides potential habitat for quenda and 65.4 ha of potential habitat for the black-striped burrowing snake. This is based on broad fauna habitat type mapping. • A total of ten conservation significant species were determined 'possible' to occur within the site; however, most of which would use the site only opportunistically.
Inland waters	• No conservation category wetlands (CCWs) have been identified within the site; however, multiple CCWs occur adjacent to the site. • Multiple REW features occur within the site including REWs UFI 15443, 14254, 14261 and 14244.
Social surroundings	• Aboriginal Cultural Heritage Directory Place 22160 Marrynginup is mapped with a large polygon across the majority of the site with the true extent situated north of the site (with a partial intersection) and was determined to be a significant and sensitive area (healing area) which is important for Aboriginal spiritual health and cultural well-being. • No listed non-indigenous heritage places are known to occur within the site. • A range of existing market gardens, nurseries, orchards and SPP 2.4 BRM policy areas occur in proximity to the site.
Other considerations	• Vegetation surrounding the site will pose a permanent bushfire hazard to the development within the site, which has been considered as part of the Bushfire Management Plan prepared to support the SP and future development within the site.

In addition, the following environmental values known to occur within the site are also listed as matters of national environmental significance (MNES) and therefore afforded protection under the EPBC Act:

- Banksia Woodlands TEC
- Black cockatoo habitat (CBC and FRTBC).

3 Land Use Planning Context

3.1 Historical land use planning content

3.1.1 East Wanneroo Structure Plan (2011)

The East Wanneroo Structure Plan (EWSP) was approved in 2011 to provide a high level response to the potential opportunities, issues and constraints within the East Wanneroo area, including the site, and an implementation framework for future MRS amendments and district structure planning processes. The EWSP identified the East Wanneroo area for urban development and raised emphasis on the district structure planning requirements due to the multiplicity of landholdings in the area and the need to coordinate and stage the provision of required infrastructure and facilities.

3.1.2 MRS Amendment 1308/41 (2018)

Following approval of the EWSP in 2011, the WAPC initiated MRS amendment 1308/41 in 2015 to rezone more than 2200 ha of land (including the majority of the site) from 'Rural' to 'Urban Deferred'. The proposed amendment was advertised for public comment in April 2016 and subsequently updated to include additional areas within the proposed 'Urban Deferred' zone. The amendment came into effect in September 2018.

MRS Amendment 1308/41 aligned with the approved EWSP and the State Government's *North-West Sub-Regional Planning Framework* (published March 2018), which identified the amendment area for 'urban expansion'. Subsequent to the MRS amendment, the Department of Planning, Lands and Heritage (DPLH) proceeded with the preparation of the EWDSP, which considered the entire East Wanneroo area and not just land limited to the MRS amendment, as discussed in **Section 3.1.3**.

3.1.2.1 Environmental Protection Authority advice

In February 2016 the EPA determined that MRS amendment 1308/41 should not be assessed under the EP Act as the environmental impacts of the scheme amendment were not so significant as to warrant formal assessment. Notwithstanding this, the EPA provided advice and recommendations.

The EPA advised that the amendment could be managed to meet the EPA's environmental objectives, through the preparation of future local planning scheme provisions and structure plans to manage and protect the identified environmental factors of flora and vegetation, terrestrial fauna, amenity and human health (now social surroundings) and inland waters environmental quality (now inland waters). The EPA further recommended that future amendments to the City of Wanneroo LPS would need to contain specific mechanisms and provisions to adequately secure, protect and manage environmental values within the amendment area. The key environmental considerations identified by the EPA included:

- Flora and vegetation: TECs, TF and vegetation complexes with less than 30% remaining.
- Terrestrial fauna: CBC habitat.
- Inland waters: CCWs.
- Social surroundings: separation distances between proposed sensitive land uses and existing market gardens, poultry, mushroom farms, turf farms and plant nurseries.

3.1.3 East Wanneroo District Structure Plan (2021)

The EWDSP guides the progressive urbanisation of an 85 km^2 area of East Wanneroo and builds upon the EWSP (2011), *North-West Sub-regional Planning Framework* (2018) and MRS Amendment 1308/41 (2018). Future implementation of the EWDSP is anticipated to provide for forecasted increases in the local population from the existing 15,000 to approximately 150,000 people. The EWDSP is provided in **Appendix B** with precinct 15 (the site) highlighted.

The EWDSP requires a structure plan to be prepared for each of the identified 28 EWDSP precincts, to guide future urban development. The EWDSP has established the district-scale layout of future land uses, which each SP is required to be consistent with. The key EWDSP land use elements that have informed and been accommodated within the proposed Precinct 15 SP layout include a 'regional sporting facility', an area of regional 'parkland' (associated with a significant wetland feature), a co-located railway and regional road alignment, a railway station and neighbourhood centre. Whilst accommodating these district layout elements, the SP also provides a localised level of layout resolution which has been designed to respond to the onsite conditions and environmental values, amongst other considerations, as further outlined in **Section 3.2**.

3.1.3.1 Environmental Assessment Study

Emerge Associates (2018) prepared an environmental assessment study (EAS) commissioned by DPLH to support preparation of the EWDSP. The EAS identified 'priority areas for further investigation' across the EWDSP area, which are identified as 'Parklands (subject to confirmation)' on the EWDSP map. No such areas are identified within the site.

3.2 Precinct 15 Structure Plan

The Precinct 15 SP prepared for the site (**Appendix A**) provides a framework for the provision of future land use, subdivision and development within the site. Additionally, an Indicative Master Plan (**Appendix A**) has been prepared for the site which provides a more detailed conceptual layout for residential cells, the road network, public open spaces (POS) areas, schools, the neighbourhood centre, sporting fields, the rail corridor and park and ride facilities.

The SP has been developed through an iterative and collaborative design process involving a variety of stakeholders, including a multi-disciplinary design team providing expertise in the following fields:

- Town planning and urban design
- Environmental planning
- Aboriginal heritage
- Hydrology
- Civil and geotechnical engineering
- Traffic engineering
- Economic analysis.

3.2.1 Structure plan layout

As outlined in **Section 3.1.3**, the SP layout is required to be consistent with the approved EWDSP layout and associated land uses. In this context, provision of the following land uses identified in the EWDSP within the site form the structural basis of the SP and indicative Master Plan layout:

- 'Regional sporting fields' in the south-east of the site.
- 'Parklands' area associated with the major REW feature in the east of the site (UFIs 15443, 14254 and 14261).
- 'Parkland link' running north-south through the centre of the site.
- 'Integrator arterial roads' running north-south and east-west (Lakeview Road) through the site.
- 'Transit corridor (underground)' running north-south through the site, with an associated 'transit station', providing a combined rail (underground) and road (above ground) corridor.
- 'Centre' associated with a neighbourhood centre adjacent to the transit station.
- 'Urban neighborhood' and 'suburban neighborhood' areas across the balance of the site, including provision of a primary school and high school.

The location and extent of these land uses is spatially defined in the EWDSP map, which have been reflected in the SP layout and associated Indicative Master Plan to ensure the required consistency with the EWDSP.

In this context, the SP layout provides for a transit orientated community hub amongst wider residential land uses, which integrates natural features retained and preserved within public open space (POS) areas to protect key ecological values as well as significant regional sporting facilities. Specifically, the SP and indicative Master Plan layout provide:

- Approximately 110 ha of mixed density residential land.
- Development of a local neighbourhood centre providing retail and commercial land uses.
- POS areas comprising approximately 10% of the overall site's development footprint, providing vegetation retention opportunities and wetland protection areas including 30 m buffer zones.
- Potential provision of a new Mariginiup train station including a Park n Ride.
- An integrated movement and access network with connections to nearby existing and future major roads.
- Approximately 50 ha of regional sporting fields including ovals, tennis courts, playgrounds, club rooms, indoor sporting facilities, car parks and dog parks.
- Approximately 12 ha for Land Lease Community housing.

3.2.2 Environmental considerations in preparation of the structure plan

Environmental values and considerations have been a core pillar of the iterative and collaborative SP design process, which has culminated in the proposed SP and Indicative Master Plan layout provided in **Appendix A**.

As outlined above, the primary structural basis of the SP layout has been guided informed by the location and extent of the various district-scale land uses shown in the EWDSP, as discussed above. This has provided a level of restriction to the ability for the SP layout to strategically respond to environmental values within the site. Minimum residential density requirements specified in the EWDSP also restrict the ability to respond to and retain environmental assets within the site.

Notwithstanding, the proponent has taken a range of measures to provide for the future retention of significant environmental values where possible (i.e. where there remains flexibility in the layout design process outside of the key structural elements defined by the EWDSP). This is primarily achieved through the strategic location and sizing of the future local public open space (POS) areas, which are not stipulated in the EWDSP layout.

3.2.2.1 Mature trees

Mature native trees are a significant environmental asset within the site. Amongst other values, mature trees identified within the site provide black cockatoo habitat (foraging, potential roosting and potential breeding), are generally of a large and mature size, can largely be grouped into discrete consolidated patches, and also co-align with other environmental features such as wetlands and the natural ridgeline.

In this context, the mature trees within the site are generally of high retention value and the SP layout design process has appropriately responded to this. The key design considerations and outcomes in this respect are summarised as follows:

- Early conceptual designs for the SP would have resulted in removal of the western ridgeline to facilitate use of the significant BRM sand resource underlying this area, which would essentially remove any ability for trees to be retained in this area due to the significant reduction in existing surface levels. The proponent chose to explore alternative options whereby tree retention could instead be facilitated in this area, resulting in significant modifications to the conceptual bulk earthworks design being undertaken.
- As a result of this, the multi-disciplinary design team worked collaboratively to facilitate the proposed SP layout whereby three core POS areas have been provided at different points along the ridgeline, which focus on the most dense patches of mature tree occurrence to maximise tree retention. Existing levels will generally be maintained in these areas to facilitate tree retention, meaning considerable modification to the bulk earthworks design was necessary. Overall, this has provided for the retention of up to 58 mature trees with a DBH > 50 cm in this area, in addition to a significant further number of co-located trees with a DBH < 50 cm that have not been assessed in onsite surveys to date (due to their smaller size).
- Separately, significant tree retention outcomes are proposed in the east of the site through the retention of two key REW features. The large central REW proposed for retention, along with it's associated buffer, provides for the retention of an addition 64 mature trees. An additional 21 mature trees are also identified for future retention in the smaller REW proposed for retention and it's associated buffer. Further opportunities then exist to retain a further mature tree in a potential green link between these REWs. This is discussed further below.

3.2.2.2 Wetlands

Wetland retention considerations across the site have been driven by the core retention of the main REW in the east of the site (UFIs 15443, 14254 and 14261), given this was identified at a district-scale for retention in the EWDSP. There are no mapped CCW features within the site, but four other REWs are also mapped within the site.

Through the iterative SP layout design process, it was considered infeasible to retain all four remaining REW values within the site whilst also achieving the necessary requirements of the EWDSP; specifically the Precinct 15 dwelling number and density requirements, as well as provision of the required number and type of sporting fields within the regional open space areas.

In this context, a comparative assessment of retention opportunities for each of the four REWs was undertaken as part of the SP layout design process, to understand if any of the REWs would be suitable and feasible to retain (whilst also achieving the necessary EWDSP outcomes for Precinct 15).

This included consideration of:

- Whether it would be viable to retain the REW and maintain the integrity of its ecological and hydrological functions, whilst also accommodating the required EWDSP land uses.
- Co-alignment with mature trees, to maximise retention outcomes that provide for both wetland and mature tree retention.
- Vegetation condition of the wetland, with wetlands containing more intact native vegetation more likely to remain viable into the future and provide a greater conservation asset.
- Linkage opportunities to other POS areas, to maximise potential green links between POS areas within the site.

Table 11 provides a summary of how these considerations were comparatively assessed for each of the four remaining REWs not identified for retention in the EWDSP.

Table 11: REW retention considerations

	REW 14253	REW 14247	REW 14245	REW 14244
EWDSP status & spatial constraints	• Not identified for retention at DSP stage. • Severed by identified future east-west integrator arterial road. • Within identified future regional sporting fields.	• Not identified for retention at DSP stage. • Severed by proposed major transit corridor (road and rail). • Within area identified for residential land use.	• Not identified for retention at DSP stage. • Severed by identified future east-west integrator arterial road. • Within identified future regional sporting fields.	• Not identified for retention at DSP stage. • Not severed by any road or rail. • Within identified regional sporting fields.
Relative occurrence of mature trees (DBH > 50 cm)	• Low	• Low	• High	• High
Vegetation condition	• Primarily 'good' condition	• Combination of 'good', 'degraded' and 'completely degraded' condition.	• Primarily 'very good' condition	• Primarily 'good' condition
Linkage opportunities to other POS	• Moderate, but would inhibit regional sporting field functionality.	• Low	• Moderate, but would inhibit regional sporting field functionality.	• Moderate, but would inhibit regional sporting field functionality.

Based on the outcomes of the above, and in addition to REWs 15443, 14254 and 14261, an additional REW has been identified for retention in the SP, being REW 14244. This wetland contains native vegetation in an intact condition, is co-aligned with a large patch of mature trees, and critically is not severed by any arterial road or railway corridors identified in the EWDSP. Whilst it is located within the regional sporting fields, it's location, size and dimensions allow for the required number and type of playing fields to still be provided around the retained wetland. Furthermore, there are also opportunities to provide a green linkage between REW 14244 with the primary REW feature (UFIs 15443, 14254 and 14261). Additional retention of REWs within the regional sporting fields (e.g. REW 14253 or 14245) would not be feasible whilst also achieving the required sporting field requirements of EWDSP due to area constraints. It is also noted that both of these wetlands will also be severed by the regional arterial road identified in the EWDSP.

Overall, the retention of the primary REW feature (UFIs 15443, 14254 and 14261) as well as REW 14244 provides a conservation outcome that balances achieving environmental outcomes within the significant spatial constraints of the site and EWDSP design and density requirements.

3.2.2.3 Other retention considerations

The EWDSP design constraints discussed above also limit the ability for other environmental values within the site to be retained in future POS, including occurrences of the Banksia Woodlands TEC, as this occurs solely within the EWDSP regional sporting fields area and the unconstructed Mariginiup Road reserve, within which the ability to retain intact vegetation communities within conservation POS is significantly restricted. Furthermore, the potential to retain small patches of intact native vegetation with the intent of maintaining an intact native vegetation community within relatively small POS areas (with a high perimeter to area ratio) is not conducive to those areas being ecologically viable in the long term – due to edge effects and proliferation of weeds, amongst other threatening processes.

Notwithstanding this, and in addition to targeted REW and mature retention outcomes discussed above; other native trees, shrubs and flora (including priority flora species *Jacksonia sericea*) may also be opportunistically retained where possible and appropriate within intersecting POS areas, through incorporation as part of the urban development landscaping process. These values may therefore continue to also provide habitat for conservation significant native fauna recorded within the site, including black cockatoos, quenda and the black-striped burrowing snake. As such, it is likely that heightened retention outcomes beyond those discussed above will ultimately be realised which include environmental values beyond just wetlands and mature trees.

The key aspects of the SP layout considerations to the environmental values are shown in **Figure 16.**

3.2.3 Wetland buffer assessment

The EWDSP outlines that a wetland buffer assessment (WBA) is to be completed to support the Precinct 15 SP, given the EWDSP identifies REW 15433 in the eastern portion of the site to be retained and therefore requiring a buffer adjacent to urban land uses.

CoW *Local Planning Policy 4.1 Wetlands* intends for any development to appropriately protect and manage the environmental attributes of wetlands, and also requires wetland buffers to be determined, protected and managed for all wetlands identified for protection.

As outlined above, the SP accommodates for the future retention of two dampland type REW features in the eastern portion of the site:

- REW UFI #15443, REW UFI #14254 and REW UFI #14261
- REW UFI #14244.

3.2.3.1 Policy context

There is currently a gap in contemporary policy and guidance in Western Australia in relation to the determination of wetland buffers and as such, older guidance has been used (*Environmental Guidance for Planning and Development Guidance Statement* (GS) *33* (EPA 2008a) and the draft *Guideline for the Determination of Wetland Buffer Requirements* (WAPC 2005)) for the purpose of this assessment.

The role of a wetland buffer is to maintain the ecological processes, values and functions of a wetland and to protect the wetland from potential adverse impacts (EPA 2008a). GS 33 states that wetlands that are to be protected require a minimum 50 m buffer distance. GS 33 does not outline a scientific rationale as to why a 50 m buffer is prescribed as the minimum separation distance, but also states that alternatively a site-specific buffer assessment could be undertaken. The WAPC (2005) developed draft guidelines which can be used for site-specific buffer assessments, and notes that buffering may involve a combination of a setback distance and/or a physical barrier.

3.2.3.2 Separation distance

A separation distance requirement for a wetland buffer is effectively based on the combined distance and management necessary to counterbalance potential impacts on the wetland, such as but not limited to habitat protection, edge effects on wetland values, bushfire management and water quality management.

In determining a setback using site-specific studies the overall setback should be determined by:

- The wetland's values
- The activities, land uses or development near the wetland, existing and proposed; and
- The threats posed by the adjacent activities, land uses or development.

Wetland values

The environmental values of the two REWs proposed for retention are summarised as follows:

- Similar to most wetlands across the Swan Coastal Plain, both wetlands are expressions of groundwater. They also act as natural low-points in the landscape where surface water runoff flows toward and drains.
- Based on a review of historical aerial imagery, onsite observations and historical groundwater trends, both wetlands historically held free surface water routinely or permanently across an annual period. However, as groundwater levels have historically lowered across the Gnangara Mound region (generally correlated with the expansion and growth of pine plantations and introduction of land uses with high groundwater abstraction, such as market gardens) this is no longer common for either wetland, with both features typically absent of free surface water throughout an annual period.

- Existing vegetation within the wetlands comprise a mixture of native and non-native (weed) species, comprising the following plant communities in 'good' or 'very good' condition:
    - **ErAs**: open forest of *Eucalyptus rudis* over open tall shrubland of *Astartea scoparia* and **Acacia longifolia* over sparse open shrubland of *Hibbertia cuneiformis* over forbland of *Dielsia stenostachya* over open grassland of **Briza maxima* and **Romulea rosea.*
    - **KgAl:** scattered *Eucalyptus rudis* and **Pinus pinaster* over closed tall shrubland of *Kunzea glabrescens* and **Acacia longifolia* over shrubland of *Pultenaea reticulata* over forbland of *Machaerina vaginalis* and *Lyginia barbata* over scattered grassland of **Ehrharta longiflora* and **Briza maxima*.
- Photographs of each wetland are provided in **Plate 14** to **Plate 17**.



Plate 14: Outer edge of REW 15443/14254/14261



Plate 15: Inner portion of REW 15443/14254/14261



Plate 16: External view of REW 14244



Plate 17: Internal view of REW 14244

Activities, land uses or development near the wetlands, existing and proposed

Currently, rural land uses occur adjacent to the wetlands predominantly characterised by highly disturbed former agricultural grazing land. In the future, proposed land uses adjacent to the wetlands (as identified in the proposed structure plan) include residential lots, local roads, active public open space areas and regional sporting fields.

As outlined in the DWMS and LWMS, it is anticipated that urbanisation of East Wanneroo will cause groundwater levels to substantially rise from their existing levels (in the order of 3-4m across the EWDSP area) over time, due to the following changes in land use across the wider area:

- Removal of rural land uses with high groundwater abstraction needs (e.g. market gardens).

- Introduction of urban land uses that will increase impervious surfaces and decrease vegetation coverage, leading to decreased evapotranspiration (uptake of groundwater by plants).
- Harvesting of remaining pine plantation (which have a high groundwater uptake) and transition to other land uses.

This may result in future groundwater levels being near or at the existing ground surface. Retained wetlands which are linked to groundwater are therefore anticipated to contain more free standing surface water over an annual period.

The EWDSP proposes an artificial groundwater level control system (via a subsoil drainage pipe network) and the use of imported fill to manage the anticipated increased groundwater levels in future development areas. The EWDSP identifies a 'groundwater holding facility' to be co-located with REW 15443, where subsoil drainage is intended to discharge to enable centralised treatment and transfer of excess harvested groundwater, however whether this will ultimately be progressed in this location is yet to be confirmed. DPLH are currently preparing the district-scale developer contribution plan for the EWDSP, which includes consideration of how excess harvested water will be utilised and/or re-used elsewhere. Further information is provided in the LWMS.

Threats posed to the wetlands by the adjacent activities, land uses or development

Table 12 outlines the potential threats to the retained REWs and associated potential impacts, based on the existing wetlands values and the existing and proposed land uses in proximity to the wetlands identified for retention. The WAPC guidance recommends separation distances and management measures on the basis of potential threats. Separation measures are required to mitigate only those threats that are present – for example, if there is no threat from potential loss of vegetation, there is no need for a separation requirement to manage this impact (WAPC 2005).

Table 12: Threats to retained wetlands and associated potential impacts

Threat	Potential impacts
Changes to hydrology (altered water levels and flow rates)	As outlined above, urbanisation of the East Wanneroo area in accordance with the EWDSP is anticipated to result in increased groundwater levels at a district-scale, including within the site. Given the wetlands proposed for retention are expressions of groundwater, it is expected that development of the site and the wider East Wanneroo area will impact existing wetland water levels, specifically resulting in altered (increased) levels. Given this represents an in-part reversal of the historical drying (and wetland level reduction) trend, these impacts may not be necessarily detrimental and conversely may potentially improve the overall function and health of the wetland, as it returns toward it's historical 'pre-disturbance' state. However, increases in wetland water levels do also result in an increased risk of localised flooding if groundwater (and wetland) levels become too high, which may in turn potentially modify the current flora and vegetation composition and fauna usage patterns. Groundwater levels across the EWDSP area are proposed to be artifically controlled to a set level, through the use of a subsoil drainage network, and transfer of excess/harvested water for re-use elsewhere, which will manage flood risk. Whilst having connectivity with groundwater, the retained wetlands also act as natural low-points in the landscape where surface water runoff currently flows toward and drains. The lower elevation of the wetlands relative to adjacent areas will remain through implementation of urban development, with treated surface water runoff continuing to flow toward retained wetlands. However, the quantity of surface water runoff is likely to increase due to the increase in impermeable surfaces leading to a net reduction in at-source infiltration. This could lead to increased surface water flow rates and quantities which, without management, have the potential to impact retained wetlands through increased erosion and sedimentation, increased total water levels and increased flood risk.

Threat	Potential impacts
	Some of these impacts, such as increases to total water levels may not necessarily be a determinental impacts, given it may serve as an in-part reversal of historical declines in wetland water levels as discussed above. However, to mitigate the potential detrimental impacts, the LWMS proposes a stormwater management strategy that will manage post-development peak flow rates of stormwater runoff to wetlands to not exceed pre-development peak flow rates, through the use of stormwater detention infrastructure. Overall, changes to hydrology of wetlands are anticipated as a result of urbanisation at a district and local scale. This may result in some positive impacts to wetland function, such as in-part reversal of the historical drying and wetland level reductions. Many of the potential detrimental impacts are proposed to be managed through the artifically controlled groundwater system (subsoil dranage network) as well as stormwater management infrastructure to manage peak flow rates to retained wetlands.
Changes to hydrology (reduced water quality)	Historical clearing of much of the site, particuarlly in areas upstream of wetlands, has reduced the extent of natural water treatment areas via vegetation (through nutrient uptake). Furthermore, these areas were historically replaced by nutrient-loading land uses such as cattle grazing and general agricultural land uses. Whilst the proposed urbanisation of the site will result in the removal of nutrient inputs due to a change in land use from grazing and general agricultural land uses, it will also introduce other potential nutrient input sources from residential land uses. Without mitigation, this has potential to result in increased nutrient loads or contaminants within groundwater or surface water runoff feeding wetlands, potentially resulting in eutrophication issues. The LWMSs propose a range of groundwater and stormwater management criteria and strategies to be implemented to achieve the criteria and that will manage water quality for retained wetlands. Generally, these are captured by the following requirements set out in the LWMS: • Treating stormwater runoff at, or close to, source within proposed bio-retention areas. • Use of reticulated sewerage systems. Implementation of the LWMS and the proposed groundwater and stormwater management strategies and design requirements will minimise the likliehood of potential impacts to retained wetlands occurring.
Clearing or ground disturbance	Where wetlands are proposed for retention, no clearing of native vegetation is proposed within the wetland areas. However, where development occurs adjacent to wetlands, there is a risk that construction activities extend beyond the intended/approved works area, potentially resulting in clearing or ground disturbance in these areas. Implementation of standard construction and environmental management plans would control the potential for unauthorised clearing, such that the potential impacts are unlikely to occur.
Dust, noise and light emissions	Future development is likely to result in: • temporarily increased dust generation and dust emissions, primarily associated with construction activities and particularly if undertaken in dryer months. Dust emissions have the potential to impact wetlands through covering of vegetation and the ground surface with layers of dust. • increased noise generation during construction and also long-term due to the increased amount of human activity and more intensive land use. This has the potential to impact upon wetland fauna presence and behaviours. • Introduction of street lighting, which could spill to retained wetland areas. This has the potential to impact upon wetland fauna presence and behaviours, as well as vegetation growth cycles in wetlands. Potential impacts related to construction processes will be temporary and typically can be suitably minimised through implementation of standard construction environmental management protocols. More permanent increases in noise and lighting generation may be more suitably managed through separation distances provided by wetland buffers.
Shading	There is a risk that future development may include structures that result in shading of adjacent areas. Shading has the potential to decrease the amount of natural light experienced by adjacent wetlands, potentially affecting vegetation growth cycles.
Introduction or spread of weeds	Weeds are common across the site. Whilst future development is likely to reduce the total amount of weeds across the site due to the removal of existing rural land uses, if new weeds are introduced or existing weeds spread into wetlands then the potential impact would be an increase in weed diversity and density which could then outcompete and displace native vegetation.

Threat	Potential impacts
Introduction or spread of disease (*Phytophthora* dieback)	If dieback is introduced or spread into retained wetlands then potential impacts would be the loss of native vegetation susceptible to dieback. Implementation of hygiene protocols during construction can mitigate the risk of dieback spread. More permanent risks of dieback spread relate to increases in human activity in areas adjacent to retained wetlands.
Increase in feral animals	Feral animals are known to occur within the site. Future development is likely to increase domestic pet ownership and may also result in attraction of feral animals such as foxes and cats. An increase in domestic and feral animal populations could impact upon retained wetlands through increased risk of native fauna predation (including quenda, which are known to occur within the site). Implementation of suitable fencing, domestic pet local laws and feral animal control programs could mitigate some risk, but potential impacts remain possible.
Increased fire risk	There is potential for an increased fire risk to retained wetlands if a buffer is provided which contains revegetation and/or unmanaged vegetation, due to the increased fuel load. This has the potential to increase fire frequency and intensity within retained wetlands.
Unauthorised access (pedestrian)	Unauthorised pedestrian access has the potential to impact wetlands through trampling or taking of vegetation, bank erosion, introduction of weeds and disease, litter accumulation, and disturbance of fauna.
Unauthorised access (vehicle)	Unauthorised vehicle access has the potential to impact wetlands through trampling or taking of vegetation, bank erosion, introduction of weeds and disease, litter accumulation, disturbance of fauna, increased fire risk and risk of pollution due to oil and fuel spills.

3.2.3.3 Comparative risk assessment

A risk-based assessment of the identified threats (and their potential impacts) of future development to retained wetlands at each of three different buffer widths (0 m, 30 m, and 50 m) has been undertaken. This assessment uses risk categories outlined in Australian Standard AS4360 (**Table 13**) and the results are provided in **Table 14**.

Table 13: Risk Assessment Matrix (AS4360)

	Consequence				
Likelihood	**Insignificant (A)**	**Minor (B)**	**Moderate (C)**	**Major (D)**	**Catastrophic (E)**
Almost certain (5)	Low	Moderate	High	Extreme	Extreme
Likely (4)	Low	Low	Moderate	High	Extreme
Possible (3)	Low	Low	Moderate	High	Extreme
Unlikely (2)	Very Low	Low	Low	Moderate	High
Very Unlikely (1)	Very Low	Very Low	Low	Moderate	Moderate

For the purpose of this assessment, it is assumed that a 0 m buffer would result solely in the installation of a boundary fence and no further buffer treatment. In contrast, it is assumed that a 30 m or 50 m buffer would include revegetation and landscaping of the buffer zone incorporating design elements consistent with those outlined in the Foreshore Strategy (**Section 3.2.4**).

Table 14: Wetland buffer risk assessment

Threat to retained wetland	Risk rating			Comment
	0 m buffer	30 m buffer	50 m buffer	
Changes to hydrology (altered water levels and flow rates)	Low (2C)	Very Low (1B)	Very Low (1B)	Anticipated district-scale changes to hydrology (e.g. rise in regional groundwater levels and wetland levels due to district scale change in land use) will be similar irrespective of wetland buffer widths and therefore have not been considered in this comparitive assessment. As such, this comparitive assessment focuses on potential increases to surface water flow rates which are relevant in the local (site) context. As outlined above, Peak flow rates to wetlands will be managed through the provision of contemporary stormwater management infrastructure, and it is assumed that all such infrastructure will be required to be located outside of any wetland buffer area, as reflected in the proposed SP. As such, there is negligible difference in risk between each of the three buffer widths if the potential impacts will be managed the same way for each option outside of the wetland buffer. Notwithstanding, a vegetated 30 or 50 m provides an added level of contingency if stormwater infrastricture fails, as the revegetation areas will reduce the potential impacts (in terms of both likelihood and consequence) of erosion, sedimentation and flood risks to the wetland core.
Changes to hydrology (reduced water quality)	Low (2C)	Very Low (1B)	Very Low (1B)	Similarly, impacts to retained wetlands associated with reduced water quality are proposed to be mitigated through measures that do not rely on a wetland buffer (reticulated sewerage is proposed across the site and stormwater treatment bio-retention areas are proposed, outside of wetland buffers). As such, there is negligible difference in risk between each of the three buffer widths, assuming that the potential impacts will be managed the same way for each option outside of the wetland buffer. Notwithstanding, a vegetated 30 or 50 m provides an added level of contingency if stormwater infrastricture fails, as the revegetation areas will reduce the potential impacts (in terms of both likelihood and consequence) of reduced water quality by providing a nutrient uptake function.
Clearing or ground disturbance	Low (2C)	Low (1C)	Low (1C)	The likelihood is reduced assuming suitable construction management measures are implemented. Notwithstanding, the likelihood is comparatively higher if no buffer is provided, as construction works have no separation to the retained wetland, therefore increasing the risk of accidental incursion.
Dust emissions	Low (3A)	Very Low (2A)	Very Low (2A)	The likelihood is reduced assuming suitable construction management measures are implemented. Notwithstanding, the likelihood of residual risk of dust impacts to the wetland is higher with no buffer width as there is no separation distance between works areas and the wetland core, unlike a 30 m or 50 m buffer.
Noise emissions	Moderate (4C)	Moderate (3C)	Moderate (3C)	The likelihood is reduced assuming suitable construction management measures are implemented. Notwithstanding, the likelihood of residual risk of more permanent noise impacts is higher with no buffer width as there is no separation distance between works areas and the wetland core over which noise levels will reduce, unlike a 30 m or 50 m buffer.
Light emissions	Moderate (4C)	Low (2C)	Low (2C)	The likelihood of risk of permanent light impacts is higher with no buffer width as there is no separation distance between roads and residential areas to the wetland core over which light levels will disipate.

Threat to retained wetland	Risk rating			Comment
	0 m buffer	30 m buffer	50 m buffer	
Shading	Low (2C)	Low (1C)	Low (1C)	Overall, the likelihood and consequence of shading impacts are likely to be relatively low given residential buildings are typically not large (compared to commercial or industrial land uses, for example). Nowithstanding, no buffer has the greatest likelihood of shade from built form, the likelihood of which decreases as buffer distance increases.
Introduction/spread of weeds	High (5C)	Moderate (3C)	Moderate (3C)	A 0 m buffer provides no separation between the wetland and residential areas, increasing the likelihood of impact as weeds from adjacent residential areas, roads or parklands can easily extend into the adajcent wetland core. A 30 or 50 m buffer would be revegetated, which if implemented and maintained to a suitable standard will provide increased protection from the introduction or spread of weeds. However, the risk of these buffers is that weed management is not consistently implemented to suitable levels thereby providing additional areas for weed proliferation and spread.
Introduction/spread of disease (*Phytophthora* dieback)	Low (2C)	Moderate (3C)	Moderate (3C)	The risk of spread or introduction of disease increases with greater human and vehicle activity. The provision of a 30 or 50 m buffer will increase areas of revegetation and required management activities will occur over a larger area in proximity to the wetland, increasing the risk of disease introduction or spread into the adjacent wetland.
Increase in feral animals	Low (2C)	Moderate (3C)	Moderate (3C)	A 0 m buffer would involve installation of wetland boundary fencing, restricted movement of feral animals into the wetland area and therefore reducing the risk of native fauna predation. In constrast, a 30 or 50 m buffer with walking trails and boadwalks is unlikely to include a fence and therefore will provide less restriction to feral animal movement and increase the risk of native fauna predation.
Increased fire risk	Very Low (1A)	High (4D)	High (4D)	Larger buffers will result in increased bushfire fuels being present adjacent to wetlands (either in the form of revegetation and/or unmanaged vegetation). These fuels have a greater likelihood of resulting in more consequential bushfires that may impact wetlands. Where no buffer is applied, there is no increase in available bushfire fuels.
Unauthorised access (pedestrian)	Low (2B)	Low (3B)	Low (3B)	A 0 m buffer and associated hard fenceline would restrict access to the wetland core. A 30 or 50 m buffer incorporating revegetation and landscaping elements would provide controlled public access to the surrounding wetland area and is unlikely to utilise a fence at the wetland boundary. As such, there is an increase likelihood with larger buffer areas that pedestrian may try to access the wetland area via leaving the landscaped walking tracks, boadwalks or trails.
Unauthorised access (vehicle)	Low (2C)	Low (1C)	Low (1C)	All buffer widths will restrict unauthorised vehicle access to the site through either fencing or revegetation and landscaping elements. The risk has a slightly higher liklilehood with a 0 m buffer due to the potential for a vehicle to push through a fenceline and directly into a wetland, albeit this remains unlikely due to passive surveilance of immeadiately adjacent residential areas. Compared to unauthorised pedestrian access, the likelihood of vehicle access is lower, but the consequence is higher.

Based on the results of this comparative risk assessment, some risks to wetlands are better mitigated by provision of a physical separation element only (e.g. a fence) with no separation distance (i.e. a 0 m buffer), such as potential increases to fire risk, introduction/spread of disease and increase in feral animals. In contrast, others risks are better mitigated through provision of a separation distance and associated revegetation and landscaping treatment (i.e. a 30 or 50 m buffer), such as potential changes to hydrology, dust and light emissions and introduction/spread of weeds. Furthermore, the risk assessment did not identify a discernible differences between the risk mitigation afforded to retained wetlands by a 30 m buffer compared to a 50 m buffer.

As outlined in **Section 3.2.1**, the structure plan has provided 30 m buffer zones to retained REWs, in consideration of the results of this wetland buffer assessment.

3.2.3.4 Proposed wetland buffer treatment

The wetland buffer treatment will be consistent with the Foreshore Strategy in **Section 3.2.4**.

3.2.4 Foreshore Strategy

The EWDSP requires a Foreshore Strategy to be provided to support the Precinct 15 SP in order to detail the proposed functions, broad development layout and conservation areas within the foreshore; all of which is provided in the following sections.

A Foreshore Management Plan may be required in the future to support the subdivision process, which would facilitate implementation of this Foreshore Strategy.

3.2.4.1 Foreshore area

The Foreshore Strategy is applicable to foreshore areas within the site, which will ultimately be protected within a foreshore reserve to be established through the future subdivision process. For the purpose of this Foreshore Strategy, the foreshore area is defined as the combination of:

- The foreshore core, which includes:
  - The core wetland area of REW wetlands proposed for retention within the SP layout (REWs 15443, 14254, 14261 and 14244).
  - The surrounding wetland buffer areas adjacent to REW wetlands to be retained. As outlined in **Section 3.2.3**, the SP provides a 30 m buffer around retained wetlands.
- The foreshore transition area, which comprises:
  - POS areas (including regional sporting fields) that adjoin the wetland buffer areas, extending up to 100 m from the wetland core areas.[3]

The above components of the foreshore area are spatially defined on **Figure 17**.

[3] These portions of adjacent POS (including the regional sporting field areas) have been included given their public use and being a transitional zone from the foreshore core to nearby roads and residential areas. Due to a lack of policy guidance in relation to development a Foreshore Strategy for wetlands (as opposed to waterways or coastal areas), a 100 m transitional zone has been assumed. This may be subject to change if an alternate width or approach is determined to be more suitable.

3.2.4.2 Proposed functions of foreshore area

Table 15 provides a summary of the proposed approach and function for each component of the foreshore area.

Table 15: Proposed approach and function for the foreshore area

Foreshore area component	Foreshore area sub-component	Proposed functional intent	Permissible land uses and infrastructure	Management approach
Foreshore core	Wetland core	• To retain and maintain the existing ecological and hydrological function of the wetland, with low impact public activation in select areas. Existing intact vegetation will be retained.	• Conservation land management activities, such as invasive species management and revegetation works. • Low impact and environmentally sensitive (i.e. low footprint) infrastructure in select areas to provide controlled public access to environmental assets, such as boardwalks.	• To be managed as a conservation asset.
	Wetland buffer	• To provide separation and protection between the wetland core and adjacent active POS, residential development areas and regional sporting fields, whilst facilitating controlled and appropriate public engagement and enjoyment of the natural environment. Existing intact vegetation will be retained.	• Conservation land management activities, such as invasive species management and revegetation works. • Low-intensity public activation infrastructure compatible with conservation land management, for example bushwalking tracks, interpretative signage, lookouts, firebreaks, dual use paths, management tracks and fencing.	• To be managed as a conservation asset, with controlled low-intensity public access that is compatible with conservation land management.
Foreshore transition area	Adjacent active public open space, within 100 m of wetland core	• To provide landscaped POS to enable active use for recreational purposes, providing a transition zone between the wetland (and wetland buffer areas) and adjacent residential land uses. Mature trees will be retained where feasible.	• Active open space and associated landscape elements, such as turfed areas, landscape feature planting, picnic shelters, barbeques, play equipment, seating, exercise equipment, stormwater management areas, access roads, carparks, sporting fields.	• To be managed as active recreational parkland.

3.2.4.3 Broad development layout of foreshore area

A Landscape Masterplan (Emerge Associates 2023) has been prepared to provide a conceptual landscape design across the site (**Appendix F**), including within the foreshore areas consistent with the approach outlined in **Table 15**.

3.2.4.4 Conservation areas within foreshore area

As outlined in **Table 16**, the 'foreshore core' components of the foreshore area will be managed as conservation areas, being the wetland core and wetland buffer areas.

3.3 Future planning and environmental approvals process

3.3.1 Metropolitan Region Scheme

3.3.1.1 Amendment/s for public land reservations

The majority of the site is currently zoned 'Urban Deferred' pursuant to the MRS and as such a request will need to be lodged with the WAPC to lift urban deferment prior to urban development commencing. The EWDSP outlines that prior to urban deferment being lifted, the MRS is required to be amended to reserve land for future primary distributor roads, integrator arterial roads, parks and recreation reserves, transit corridors and special purpose areas for the proposed public school.

As outlined in the overarching EWDSP, the WAPC will be the responsible authority for preparing and initiating the required amendments to the MRS in relation to integrator arterial roads and parks and recreation reserves. MRS land reservations necessary for any transit corridors within the site and the surrounding 500 m will be referred to the Public Transport Authority for comment, whilst reservation for school sites under the MRS will be initiated by developers.

3.3.1.2 Lifting of urban deferment

As outlined above, the existing urban deferred zoning across the majority of the site will need to be lifted to enable implementation of the proposed SP. Lifting of urban development does not constitute a formal amendment to the MRS.

The WAPC's *Lifting of Urban Deferment Guidelines* (DPLH 2019) set out the information requirements necessary to support the request for lifting of urban deferment, which includes the requirement for a draft SP in addition to the following items related to environmental matters:

- Description of the physical condition of the land.
- Identification of the means by which natural features such as foreshores, wetlands and remnant vegetation will be protected.
- Identification of any environmental issues which may impact on future development such as water catchment and groundwater protection areas and how these will be addressed.

Furthermore, the EWDSP requires the following information to be submitted with any request to lift urban deferment:

- A conceptual SP for the applicable precinct
- Confirmation from servicing agencies on the position of water and wastewater services
- Any other requirements which may be specific to an area
- A district development contribution scheme has been initiated by local government.

3.3.1.3 Amendment to 'Rural - Water Protection' zone

The eastern portion of the site zoned 'rural – water protection' will require an MRS amendment to establish an 'urban' zone in order to facilitate the proposed urban land use identified in the EWDSP and the Precinct 15 SP. As discussed in **Section 2.5.6**, it is envisaged that this land will also trigger reclassification of the corresponding PDWSA from P2 to P3*.

3.3.2 District Planning Scheme No.2 amendments

Given the site is zoned 'General Rural' and 'Rural Resource' under the CoW DPS No. 2, rezoning to an urban development zone (or equivalent) will be required to enable the proposed urban land use.

Where the WAPC amends the MRS to include land in the 'Urban' zone or progresses 'lifting of urban deferment', the WAPC may concurrently amend the zoning of the land under a local planning scheme to a development zone (or equivalent), as provided for by Section 126(3) of the *Planning and Development Act 2005*. As such, a concurrent amendment approach may be progressed for the site (or portions of the site), noting that lifting of urban deferment and/or the 'rural – water protection' MRS amendment may be progressed in stages (i.e. parts of the site at a time).

3.3.3 *Environmental Protection Act 1986* – Section 48 scheme amendment referral

Any amendment to a planning scheme (regional or local) is required to be referred to the EPA to determine whether environmental assessment is required, pursuant to Section 48 of the *Environmental Protection Act 1986* (EP Act).

On this basis, future amendments to the MRS or CoW DPS No. 2 required for the site (as outlined above) will trigger this Section 48 EPA referral process. However, lifting of urban deferment does not constitute a formal MRS amendment and therefore would not trigger Section 48 EPA referral. Consequently, any concurrent amendments to the CoW DPS No. 2 that are linked to a lifting of urban deferment process would also not trigger Section 48 referral to the EPA.

Whilst this EAR primarily supports the Precinct 15 SP process, a preliminary assessment of the anticipated environmental outcomes as a result of the anticipated future urban development (based on the SP layout) has been undertaken against relevant EPA factors and objectives, which is outlined in **Section 4**.

3.3.4 Subdivision and development

Following resolution of the required MRS and DSP No.2 amendments, and subject to the approval of the SP by the WAPC, urban development of the site will be progressed through future subdivision and/or development approvals.

It is anticipated that future subdivision approvals for the staged development of the site will include a range of conditions, some of which may relate to environmental matters. These conditions will need to be implemented before titles for lots are issued. Other components of development may be progressed through development approval, for example, forward bulk earthworks or other non-subdivisional works.

It is anticipated that all environmental impacts associated with the implementation of urban subdivision and development works across the site will be considered by the EPA under Section 48A of the EP Act, either through consideration of previous MRS amendment 1308/41 (to establish the current 'Urban Deferred' zoning), future MRS amendments (to establish reservations or to rezone the 'Rural-Water Protection' area) or future CoW DPS No.2 amendments.

3.3.5 *Environmental Protection Act 1986* – Section 38 proposals

Section 38 of the EP Act enables any person to refer a 'proposal' (as opposed to a planning scheme, as per Section 48) likely to have a significant impact on the environment to the EPA, who then decide whether or not to assess the proposal.

Section 48I outlines that any proposal likely to have a significant impact on the environment, but which is within an area and for a land use that is subject to an assessed scheme (i.e. a scheme for which a determination has been made by the EPA under Section 48A), is not required to be referred to the EPA under Section 38 of the EP Act.

Given the environmental impacts associated with implementation of urban subdivision and development works across the site will be considered by the EPA under Section 48A of the EP Act (as discussed in **Section 3.3.4**), it is not anticipated that the implementation of urban development works within the site would be referred under Section 38 of the EP Act. However, this only applies to proposed works which are consistent with those considered through the Section 48A process and where the potential environmental impacts were considered by the EPA. The EPA may choose to defer assessment of environmental factors to subsequent stages of the planning process, which would mean Section 48I would not apply in such instances.

3.3.6 Environment Protection and Biodiversity Conservation Act 1999

The EPBC act provides statutory protection for listed Matters of National Environmental Significance (MNES). The most relevant MNES considerations within the site are the Banksia Woodlands TEC and threatened species of black cockatoo (CBC and FRTBC).

Individual proponents of future development within the site will need to consider their obligations under the EPBC Act and the potential need to refer any proposed action that may have a significant impact on MNES.

4 Assessment of Predicted Environmental Outcomes

The predicted environmental outcomes that would be realised as a result of implementation of the proposed SP, through future subdivision and development, have been assessed against the EPA objectives for each environmental factor relevant to the site (as listed in **Section 2**).

This is provided in **Table 15**, which considers the spatial layout responses of the SP and provision of future regional or local reserves (POS) intended to provide for the protection and conservation of existing environmental assets within the site. In addition, **Table 15** outlines the future management considerations of environmental values that will require further specific consideration as part of the future development of the site.

A range of environmental impact mitigation measures (primarily impact avoidance and minimisation) are proposed within the SP layout and through the future environmental management framework. In this context, it is anticipated that implementation of the proposed SP can be suitably managed through future stages of the land use planning processes (including subdivision and development) such that the EPA objectives for the relevant environmental factors can be achieved.

A key element of the potential future environmental management framework is the implementation of a Construction Environmental Management Plan (CEMP), which is likely to be a future conditional requirement at the subdivision planning approval stage and would likely address the following construction elements:

- Vegetation clearing protocols
- Measures to minimise and manage impacts on flora and fauna
- Fauna management prior to potential removal of habitat
- Hygiene measures to stop the spread of flora and fauna disease during construction
- Dust management
- Fire management
- Access management
- Fencing.

Table 16: Summary of EPA environmental factors and objectives relevant to the proposed future land use

Environmental factor	EPA objective	Precinct 15 Structure Plan spatial response	Future management considerations	Predicted environmental outcome
Landforms	To maintain the variety and integrity of distinctive physical landforms so that environmental values are protected.	The proposed SP and indicative Master Plan (**Appendix A**) strategically provides three key POS areas along the dunal ridgeline in the western portion of the site, that will faciliate retention of existing surface levels and the associated landform (i.e. high points of the ridgeline). This will also facilitate tree retention outcomes in these POS areas. The conceptual bulk earthworks were redesigned to enable this outcome, whilst still achieving feasible and logical levels for adjacent urban development areas.	No future management considerations.	Although no restricted landforms or unique geological features occur within the site, the SP responds to the natural landform values of the dunal ridgline in the western portion of the site. Retention of the existing surface levels and the associated landform will also faciliate tree retention outcomes within POS areas.
Terrestrial environmental quality	To maintain the quality of land and soils so that environmental values are protected.	There are no SP spatial responses to terrestrial environmental quality considerations, which primarily relate to ASS risk.	To facilitate urban development within the site, ASS investigations and management considerations for the site will likely be required (as a portion of the site is mapped as Class 1 'high to moderate' risk of ASS occurring within 3 m of the natural soil surface), particularly for the installation of deep sewer. Given the relatively low depths to groundwater within portions of the site, dewatering may be required to faciliate future subdivision and development works, which would likely trigger the need for a dewatering and an ASS management plan. If required, any future ASS considerations will be identified and suitably managed as part of the future subdivision and development process in accordance with the WAPC's *Acid Sulfate Soils Planning Guidelines* (2008).	Any potential impacts on ASS can be sutibly minimised at future subdivision and development stages within the site. if determined to be required, an ASS management plan and dewatering management plan would be prepared and implemented as part of subdivision and development works. If required, this would be included as a condition of future subdivision or development approval.

Table 16: Summary of EPA environmental factors and objectives relevant to the proposed future land use (continued)

Environmental factor	EPA objective	Precinct 15 Structure Plan spatial response	Future management considerations	Predicted environmental outcome
Flora and vegetation	To protect flora and vegetation so that biological diversity and ecological integrity are maintained.	The SP layout has been strategically designed to locate POS areas in locations that will provide for the future retention of the following flora and vegetation values: • Up to 200 mature native trees trees with a DBH > 50 cm, noting there are also likely to be additional native trees with a smaller DBH also retained. This includes 148 trees within POS areas and 52 within the proposed regional sporting fields (where retention feasibility is subject to final sport field layouts and locations). • Up to 48 individuals of P4 flora species *Jacksonia sericea.* • Up to 29.6 ha of native vegetation in 'good' or better condition. It is anticipated that retained intact native vegetation will likely occur within retained REWs and associated buffers.	Implementation of a future CEMP would further minimise potential impacts to retained flora and vegetation values during construction, which will be confirmed at the future subdivision and development stage. Where future subdivision and development works will result in residual impacts to MNES (including the Banksia Woodlands TEC), proponents will need to consider their EPBC Act obligations and need for referral, based on the specific impacts of their proposed action. Individual proposed actions can be addressed through preliminary self-assessment against the *Matters of National Environmental Significance Significant Impact Guidelines* (DotE 2013) in relation to any potential impacts on MNES.	Overall, the SP layout responds to significant flora and vegetation values where possible, primarily associated with provision for future retention of mature trees and intact wetland native vegetation. Opportunistic retention of P4 species *Jacksonia sericea* is also provided for. Notwithstanding, residual impacts to Banksia Woodland TEC are anticipated and EPBC Act obligations will need to be considered by proponents of development.
Terrestrial fauna	To protect terrestrial fauna so that biological diversity and ecological integrity are maintained.	The SP layout has been strategically designed to locate POS areas in locations that will provide for the future retention of the following terrestrial fauna values: • Up to 200 mature native trees trees with a DBH > 50 cm that represent potential breeding habitat trees for CBC and FRTBC, as well as providing foraging and roosting habitat. As outlined above, there are likely to be additional native trees with a smaller DBH also retained. This includes 148 trees within POS areas and 52 within the proposed regional sporting fields (where retention feasibility is subject to final sport field layouts and locations). • Up to 6.7 ha of foraging habitat for CBC and FRTBC. • Up to 9.8 ha of potential habitat for black striped burrowing snake. • Up to 27.5 ha of potential habitat for quenda.	Implementation of a future CEMP would further minimise potential impacts to terrestrial fauna during construction, the which will be confirmed at the future subdivision and development stage. Where future subdivision and development works will result in residual impacts to MNES (including CBC and FRTBC), proponents will need to consider their EPBC Act obligations and need for referral, based on the specific impacts of their proposed action.	Overall, the SP layout responds to significant terrestrial fauna values where possible, primarily associated with provision for future retention of mature trees providing black cockatoo habitat, as well as intact native vegetation (where possible) providing potential habitat for quenda and the black striped burrowing snake. Notwithstanding, residual impacts to MNES such as black cockatoo are anticipated and EPBC Act obligations will need to be considered by proponents of development.

Table 16: Summary of EPA environmental factors and objectives relevant to the proposed future land use (continued)

Environmental factor	EPA objective	Precinct 15 Structure Plan spatial response	Future management considerations	Predicted environmental outcome
Inland waters	To maintain the hydrological regimes of groundwater and surface water so that environmental values are protected.	The SP layout has been strategically designed to locate POS areas in locations that will provide for the future retention of the following inland water values: • REW 15443, 14254 and 14261. • REW 14244. • 30 m wetland buffer zone to all retained REWs. Whilst not a spatial response, a Local Water Management Strategy (LWMS) has also been prepared for the site to support the proposed SP (Pentium 2023). The principal management objective for hydrology within the site is to ensure that post-development environmental flows and/or hydrological cycles are maintained or improved upon pre-development conditions, especially regarding natural wetland features retained within the site. Surface water runoff will be managed in accordance with the *Better Urban Water Management Framework*, which includes maintenance of the post-development environment in accordance with the pre-development environment. A Foreshore Strategy has also been developed to define how retained wetlands, buffers and adjacent POS and development interfaces will be designed, landscaped and managed.	As part of future stages of the future subdivision process, the following management plans will likely be required to be prepared and implemented: • Urban Water Management Plan (UWMP) to implement the LWMS. • Foreshore Management Plan (FMP) to implement the Foreshore Strategy.	Overall, the SP layout responds to significant inland water values where possible, primarily associated with provision for future retention of various REW wetlands and spatial provision for wetland buffer zones. Notwithstanding, some residual impacts to REWs are predicted, however the overall outcome balances wetland retention with satisfying the design and design requirements of the approved EWDSP, noting many existing wetlands are proposed to be dissected by proposed district roads and rail corridors identified in the EWDSP. The LWMS and Foreshore Strategy define the intended hydrological and foreshore management approach, which will be implemented through future UWMPs and FMPs.

Table 16: Summary of EPA environmental factors and objectives relevant to the proposed future land use (continued)

Environmental factor	EPA objective	Precinct 15 Structure Plan spatial response	Future management considerations	Environmental outcome
Social Surroundings	To protect social surroundings from significant harm.	Aboriginal Cultural Heritage (ACH) Directory Place 22160 Marrynginup was determined to be a significant and sensitive area. The location where ACH Directory Place 22160 intersects into the site has been historically severely disturbed and it is unlikely any undiscovered artefacts remain within this portion of the site. ACH Directory Place 22160 is likely to be more associated with CCW 14241 to the north of the site, which is not identified for development in the SP. Notwithstanding this, future management measures need to be considered.	Preparation and implementation of an Aboriginal Cultural Heritage Management Plan in addition to early consultation with the Whadjuk People and site custodian prior to any ground disturbance works has been recommended for the protection of ACH Directory Place 22160. This will provide a management framework to implement if any Aboriginal artefacts or sites (although unlikely) are uncovered and whether future development within the site may result in potential harm to ACH. The proponent will need to adhere to any statutory requirements under the *Aboriginal Cultural Heritage Act 2021* (or AH Act, subject to the proposed repealing of the ACH Act). With respect to potential surrounding land use conflicts: • Staging of future subdivision and development may have to consider and respond to existing and active market gardening land uses in proximity to the site, as there is potential for the amenity of future residential land uses to be impacted as a result of mark garden emissions (e.g. dust, noise, odour or gaseous). However, many of these operations appear to be of low intensity and/or of small scale and therefore may not inhibit progressing of adjacent residential development. • Similarly with respect to BRM, whilst there are no active quarrying activities close to the site, a mapped BRM 'excavation site' policy area is mapped directly to the east which has the potential to support future sand and/or limestone quarrying. Any such quarrying operations have the potential to impact the amenity of nearby future residential land uses as a result of emissions (e.g. noise and dust). This has the potential to impact staging of future subdivision and development within the site. As these relate to development staging and timing considerations, it is anticipated that they will be addressed through the future scheme amendment and/or lifting of urban deferment processes.	Any potential impacts to social surroundings can be suitably mitigated through a range of impact avoidance and minimisation measures such that it is unlikely any significant residual impacts will occur.

5 Conclusion

The primary structural basis of the SP layout has been guided informed by the location and extent of the various district-scale land uses shown in the EWDSP. This has provided a level of restriction to the ability for the SP layout to strategically respond to environmental values within the site. Notwithstanding, the proponent has taken a range of measures to provide for the future retention of significant environmental values where possible (i.e. where there remains flexibility in the layout design process outside of the key structural elements defined by the EWDSP). This is primarily achieved through the strategic location and sizing of the future local public open space (POS) areas, which are not stipulated in the EWDSP layout.

In this context, the SP layout has been specifically designed to respond to the identified environmental values within the site where possible including the proposed future retention of:

- Two resource enhancement wetlands (unique feature identifiers #15433, #14254, #14261 and #14244), covering an area of 21.4 ha in size in addition to provision of 30 m buffer areas.
- Up to 200 mature native trees with a diameter at breast height of greater than 50 cm (which also represent potential nesting trees for conservation significant black cockatoo species; namely Carnaby's black cockatoo and forest red-tailed black cockatoo).
- Up to 6.7 ha of potential suitable black cockatoo foraging habitat.

In addition to targeted REW and mature retention outcomes discussed above; other native trees, shrubs and flora (including priority flora species *Jacksonia sericea*) may also be opportunistically retained where possible and appropriate within intersecting POS areas, through incorporation as part of the urban development landscaping process. These values may therefore continue to also provide habitat for conservation significant native fauna recorded within the site, including black cockatoos, quenda and the black-striped burrowing snake. As such, it is likely that heightened retention outcomes beyond those discussed above will ultimately be realised.

As part of the future subdivision and development process, the following management plans may be necessary, the implementation of which would further minimise potential environmental impacts that have the potential to arise through implementation of the SP:

- Acid Sulfate Soil and Dewatering Management Plan
- Construction Environmental Management Plan
- Urban Water Management Plan/s
- Foreshore Management Plan
- Aboriginal Cultural Heritage Management Plan
- Bushfire Management Plan.

Overall, a range of environmental impact mitigation measures (primarily impact avoidance and minimisation) are proposed within the SP layout and through the future environmental management framework. In this context, it is anticipated that implementation of the proposed SP can be suitably managed through future stages of the land use planning processes (including subdivision and development) such that the EPA objectives for the relevant environmental factors can be achieved.

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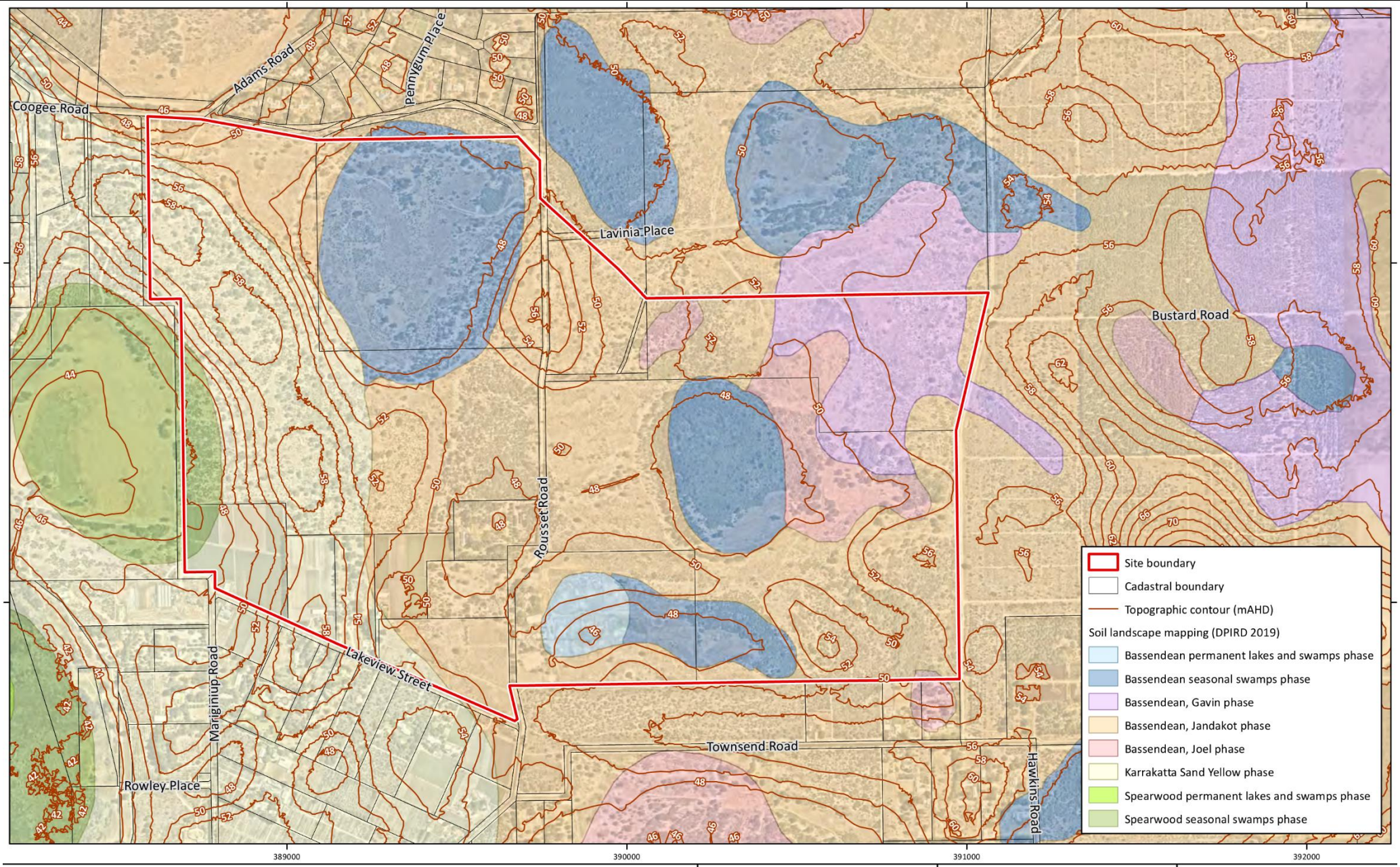

igure 2: Soils and Topography

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Precinct 15 Structure Plan

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Date: 23/02/2023
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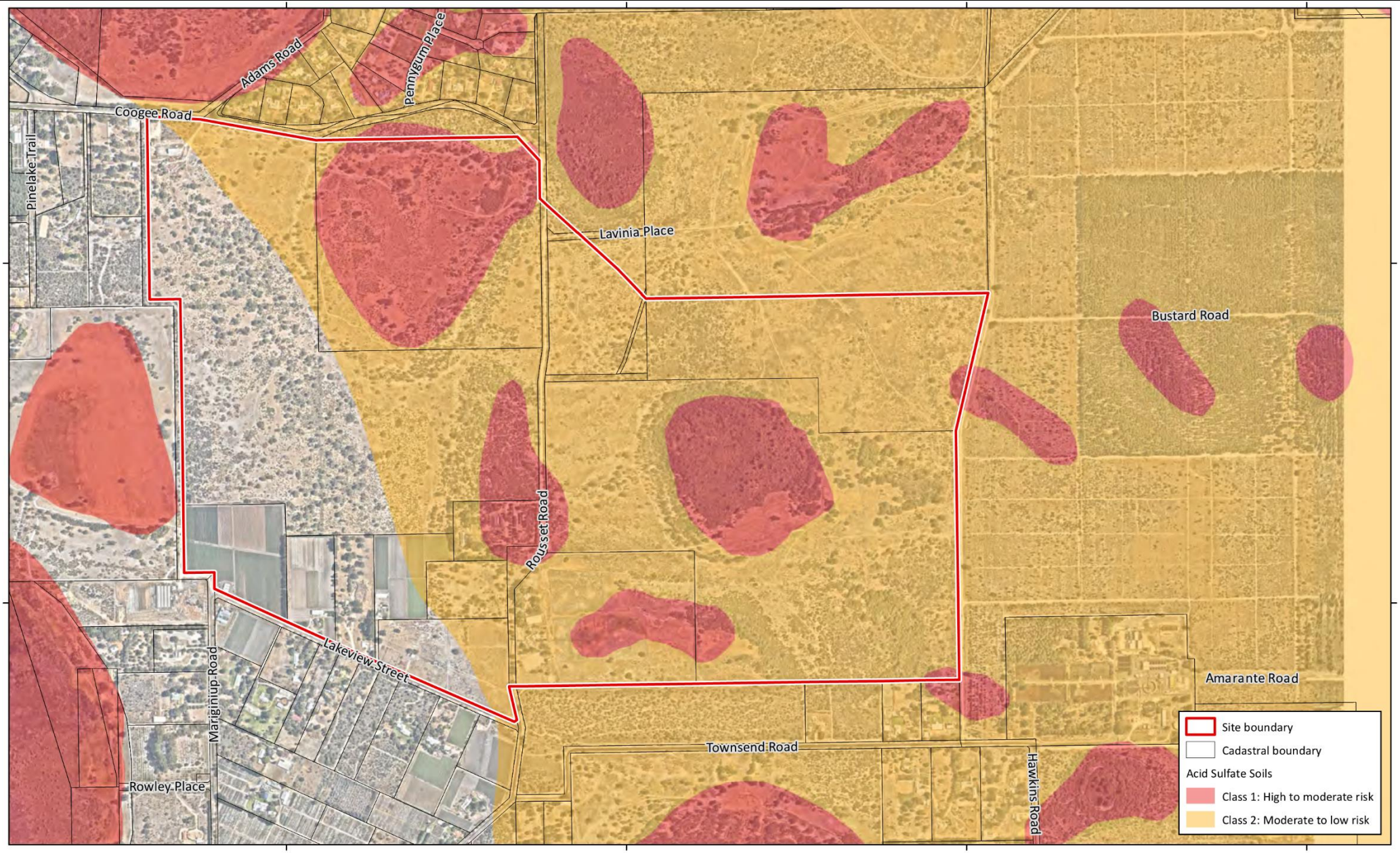

igure 3: Acid Sulfate Soil Risk Map

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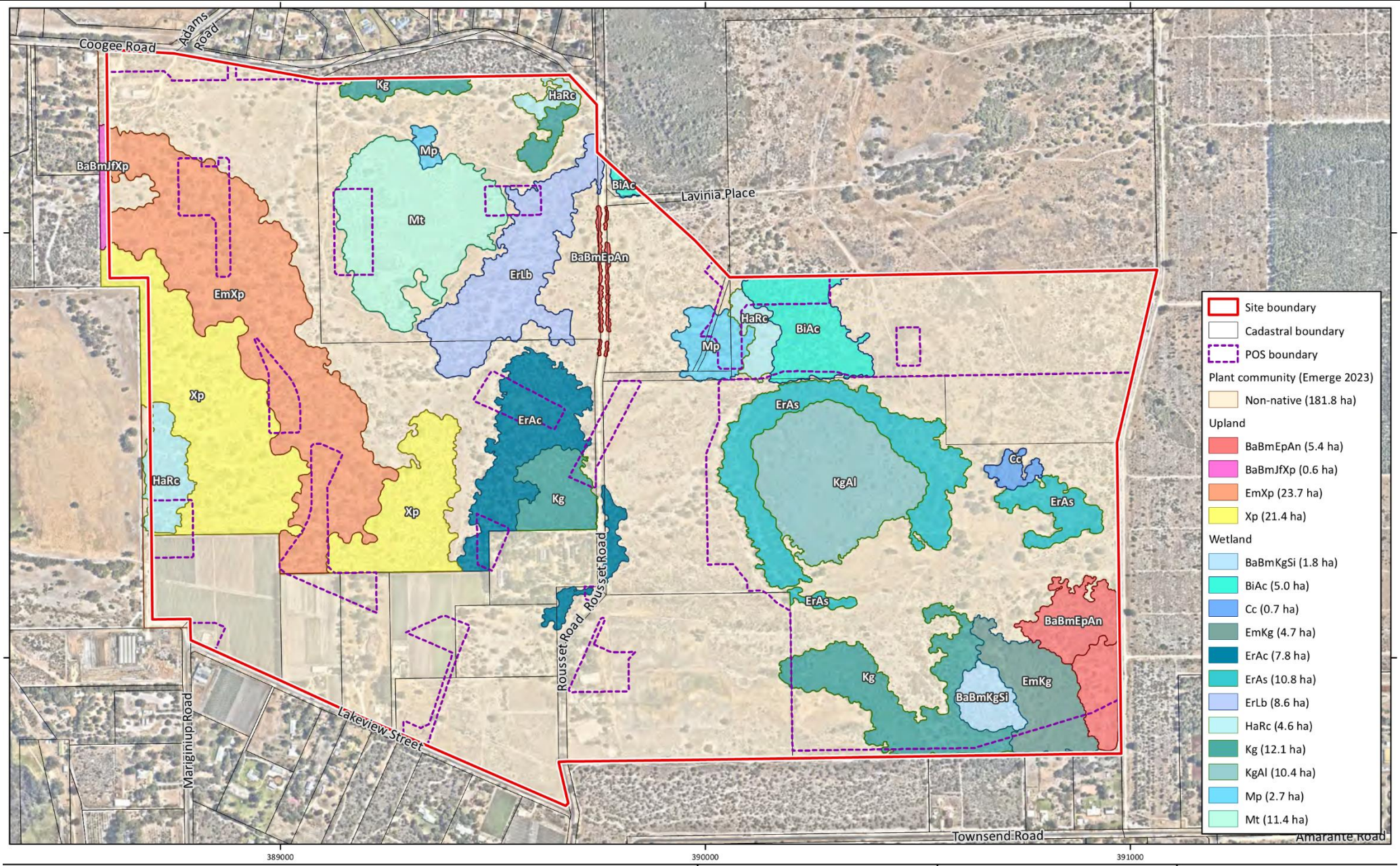

igure 4: Vegetation Types

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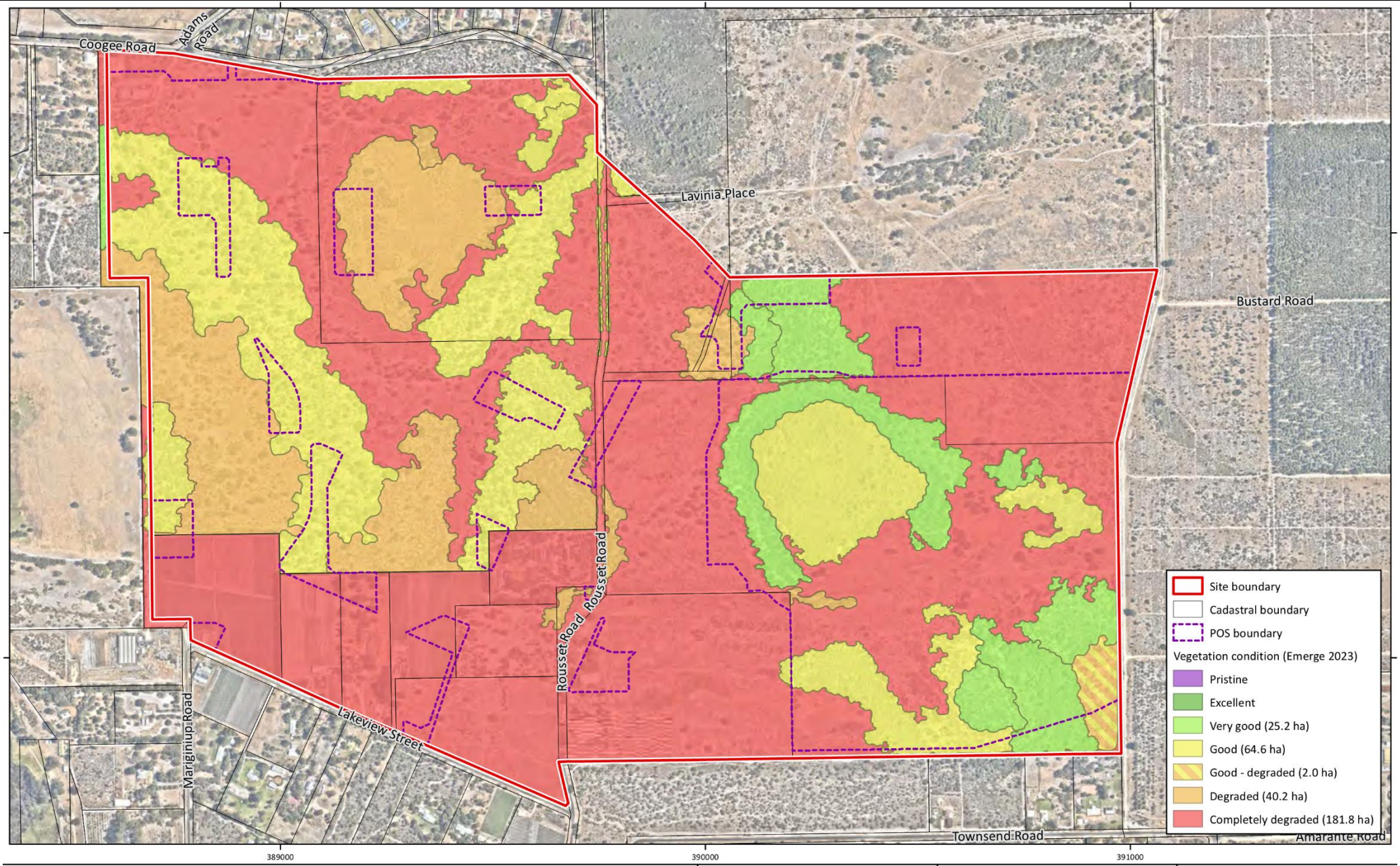

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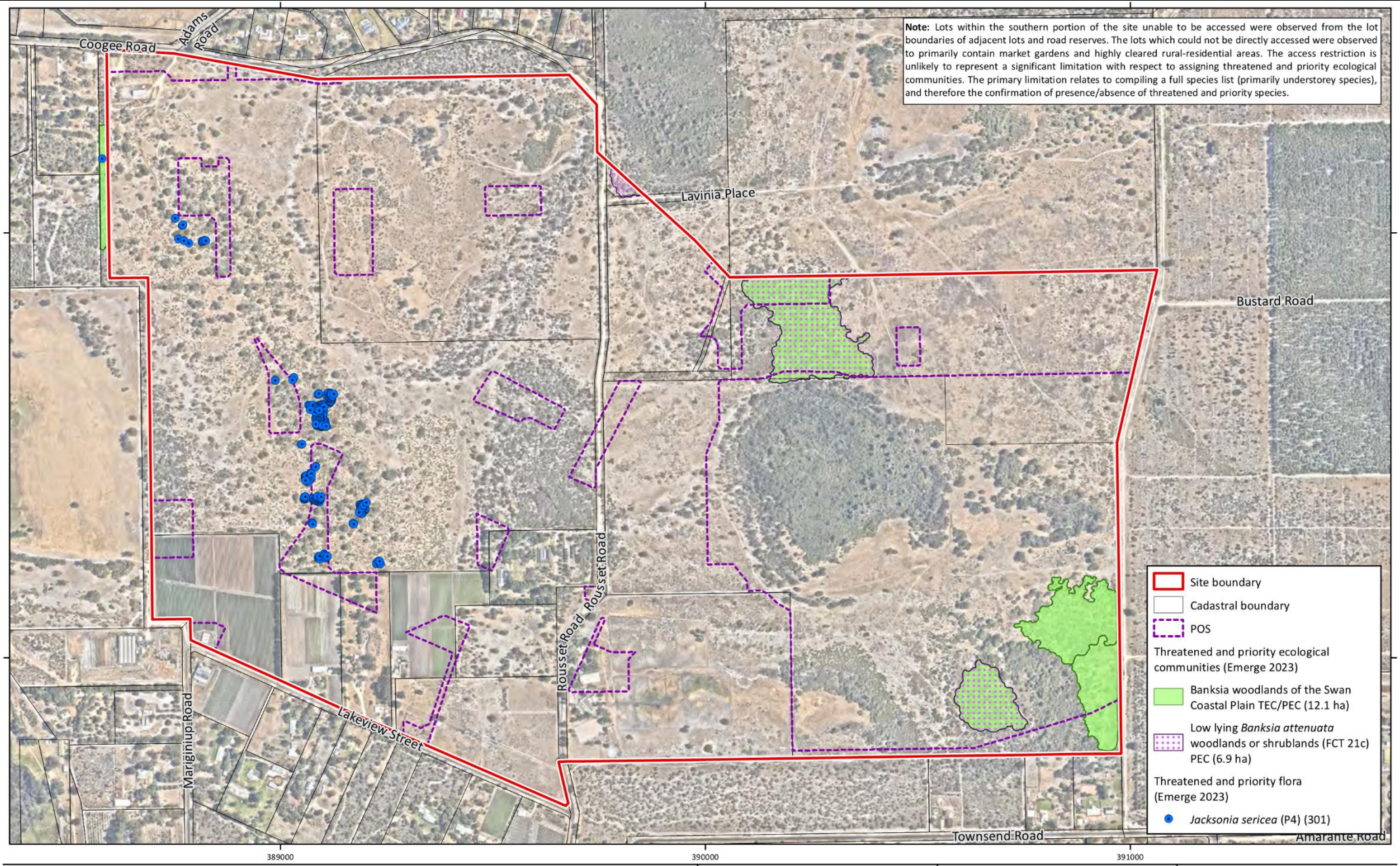

igure 6: Conservation Significant Flora and Vegetation

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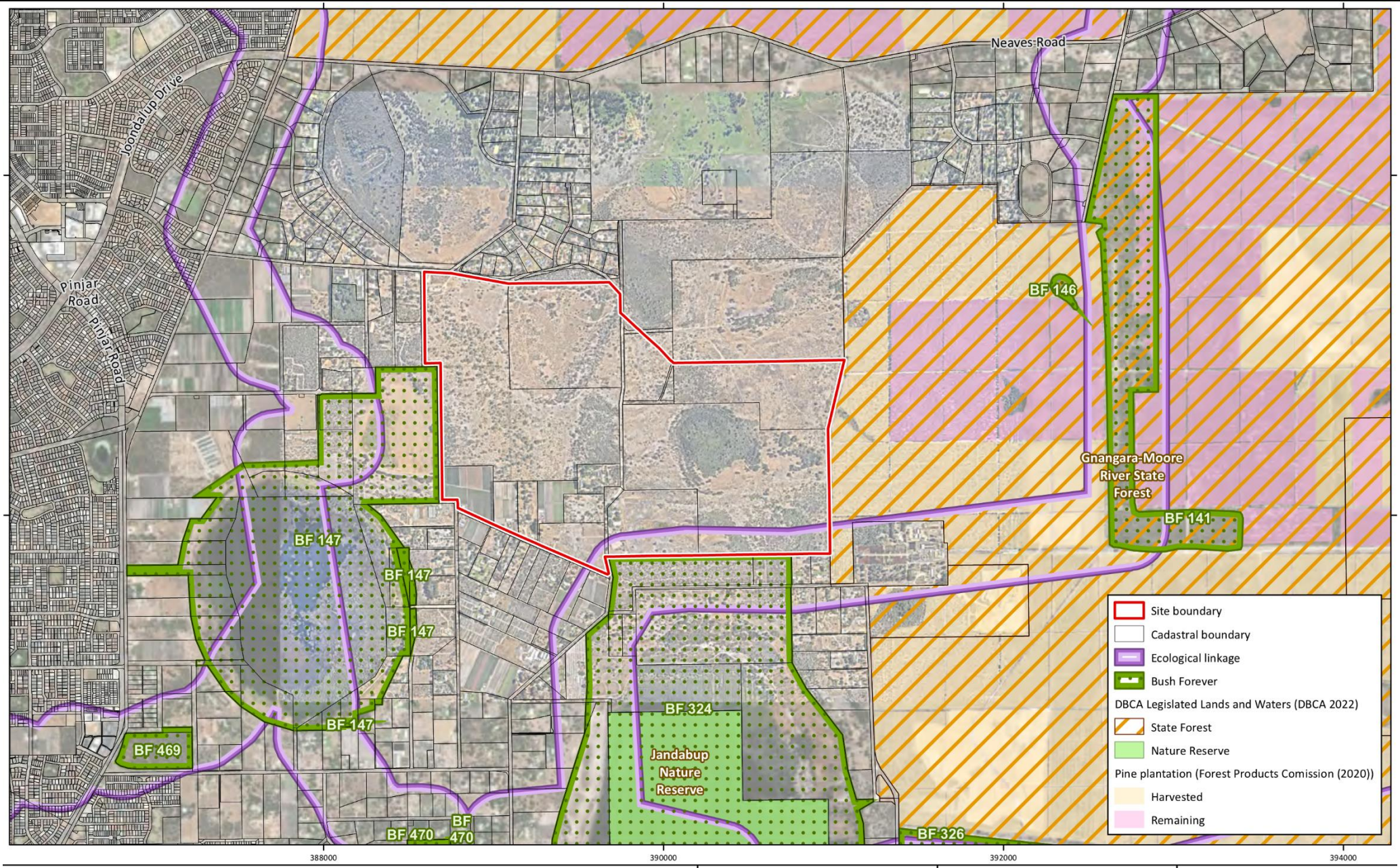

igure 7: Environmental Features

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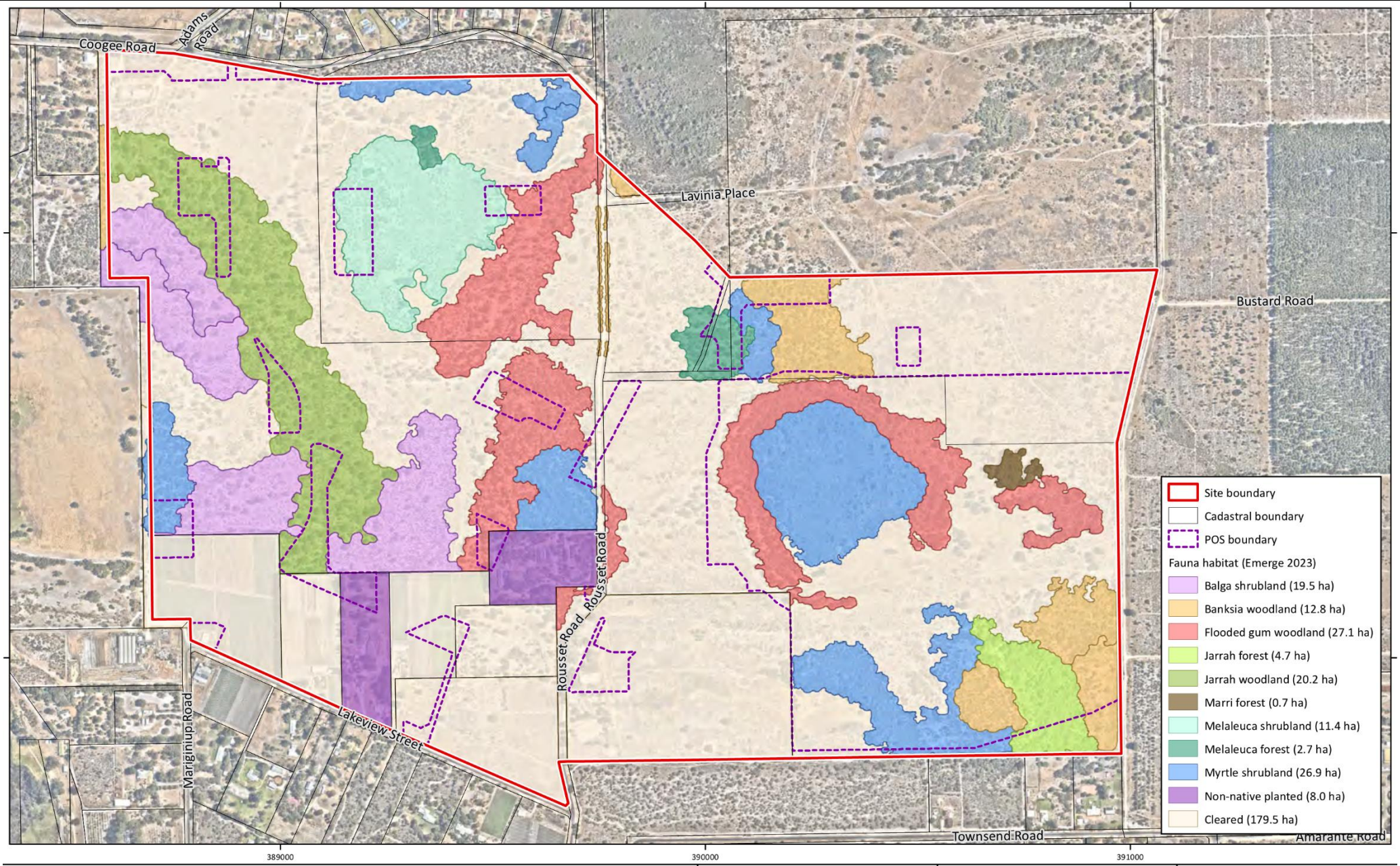

igure 8: Fauna Habitat

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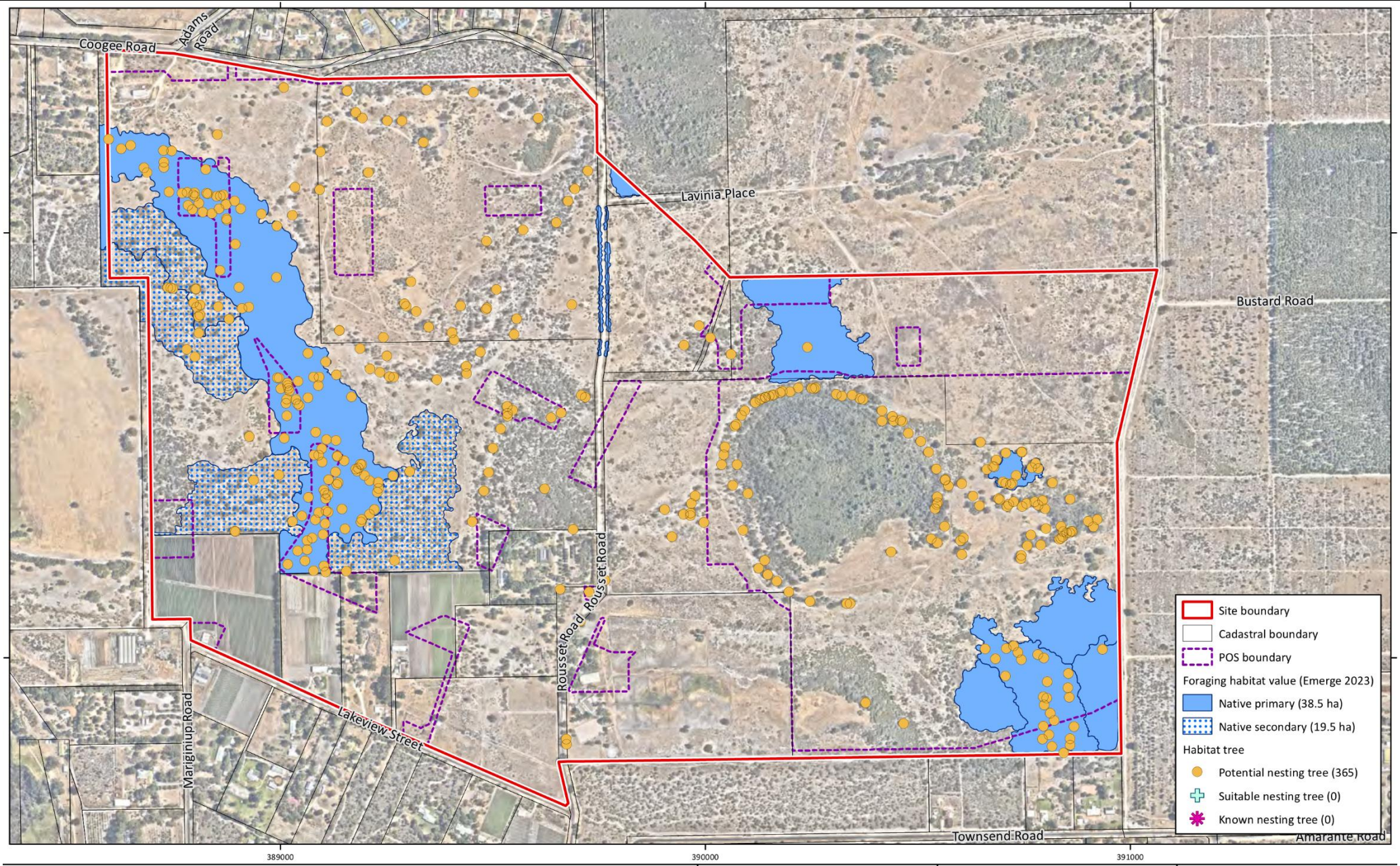

igure 9: Conservation Significant Fauna Habitat - Carnaby's Cockatoo

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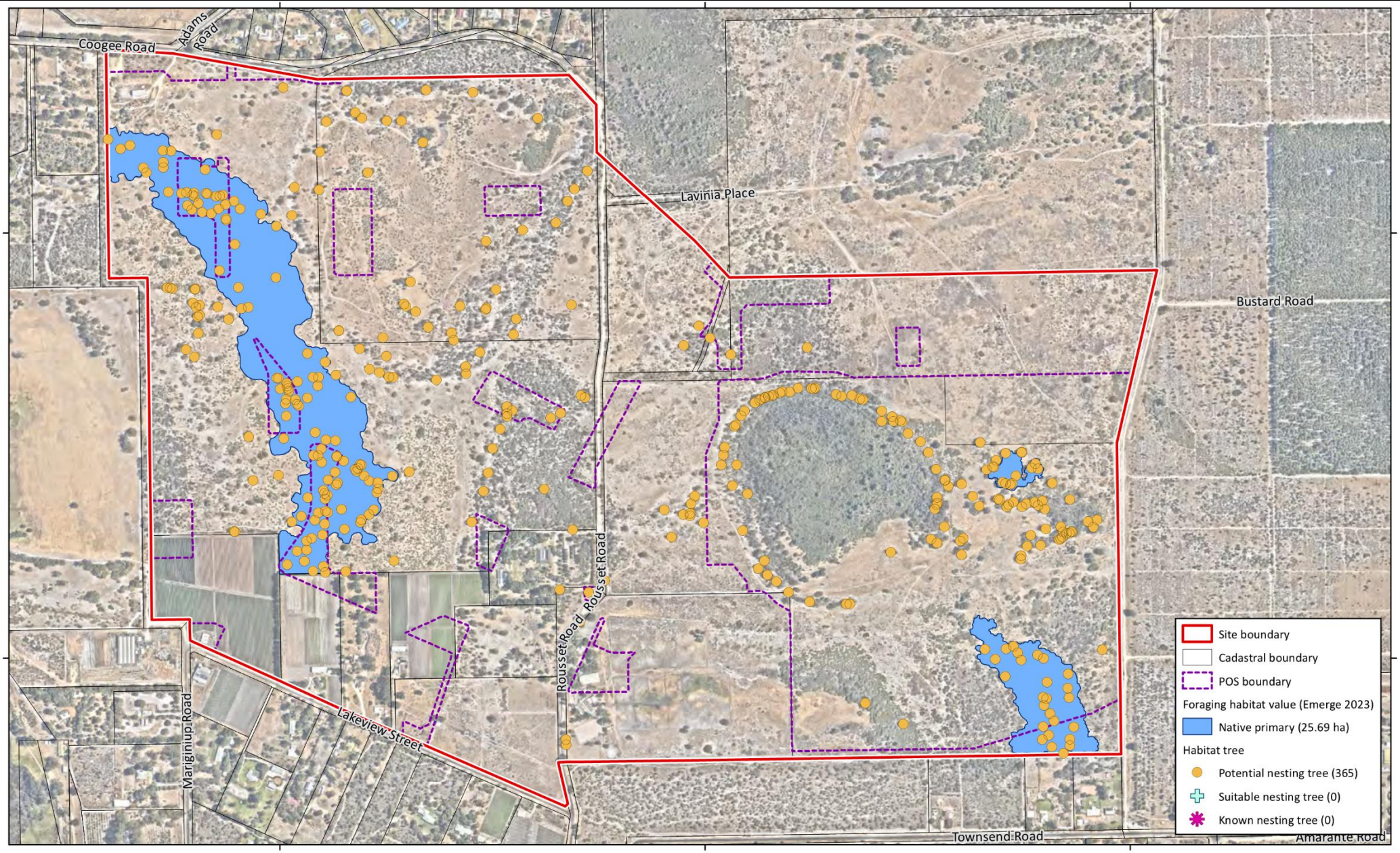

igure 10: Conservation Significant Fauna Habitat - Forest Red-tailed Black Cockatoo

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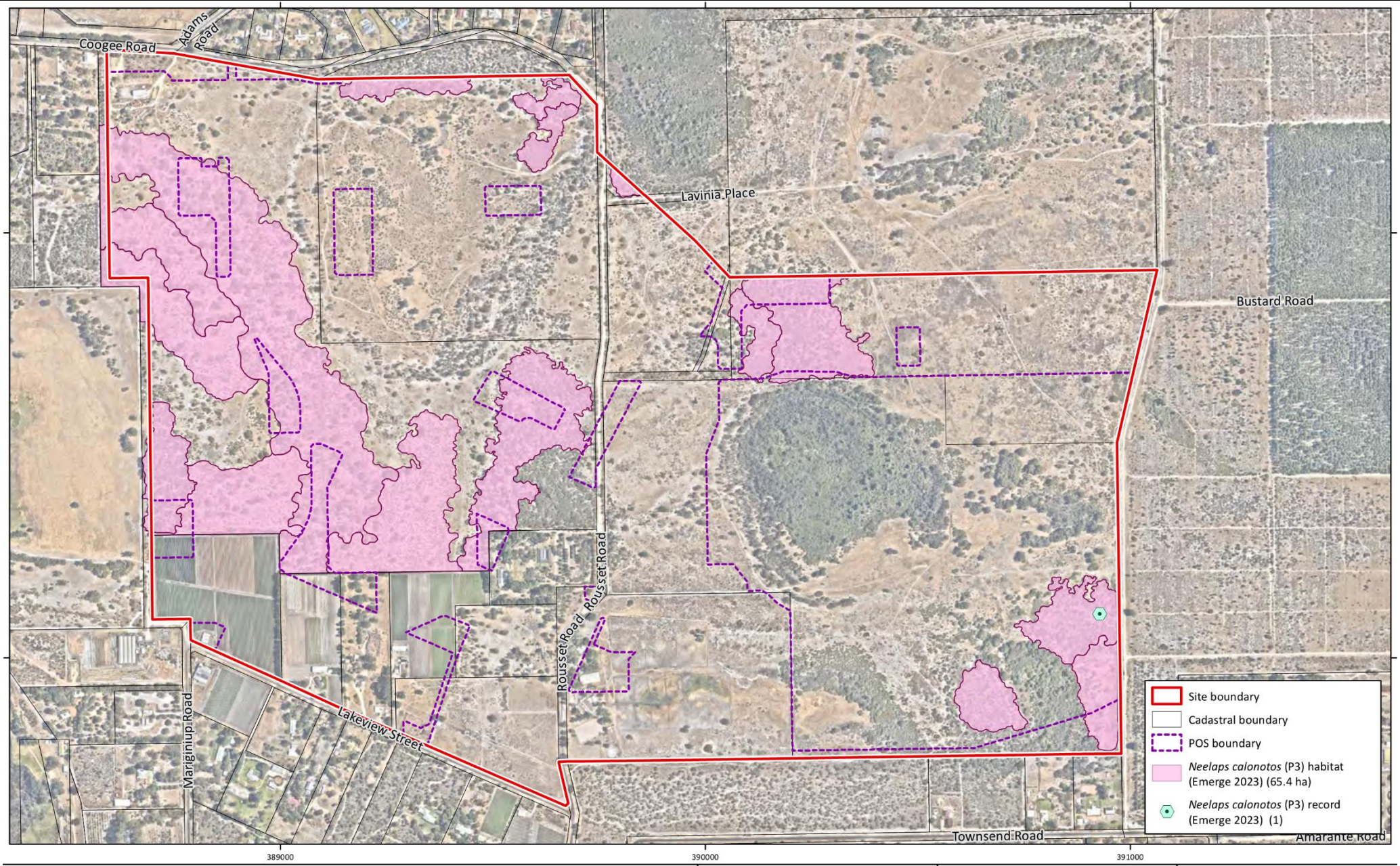

igure 11: Conservation Significant Fauna Habitat - Black Striped Burrowing Snake

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Precinct 15 Structure Plan

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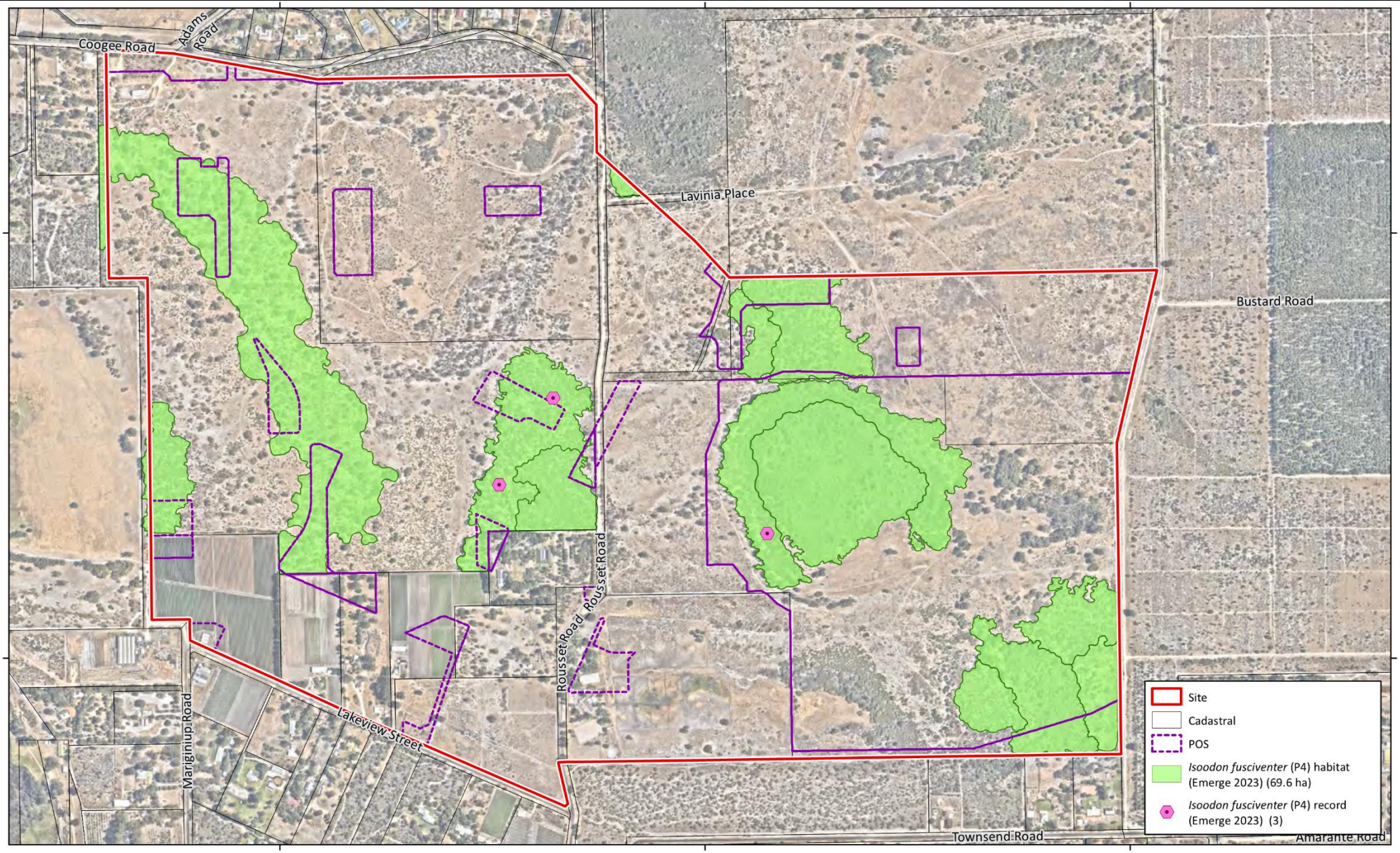

igure 12: Conservation Significant Fauna Habitat – Quenda

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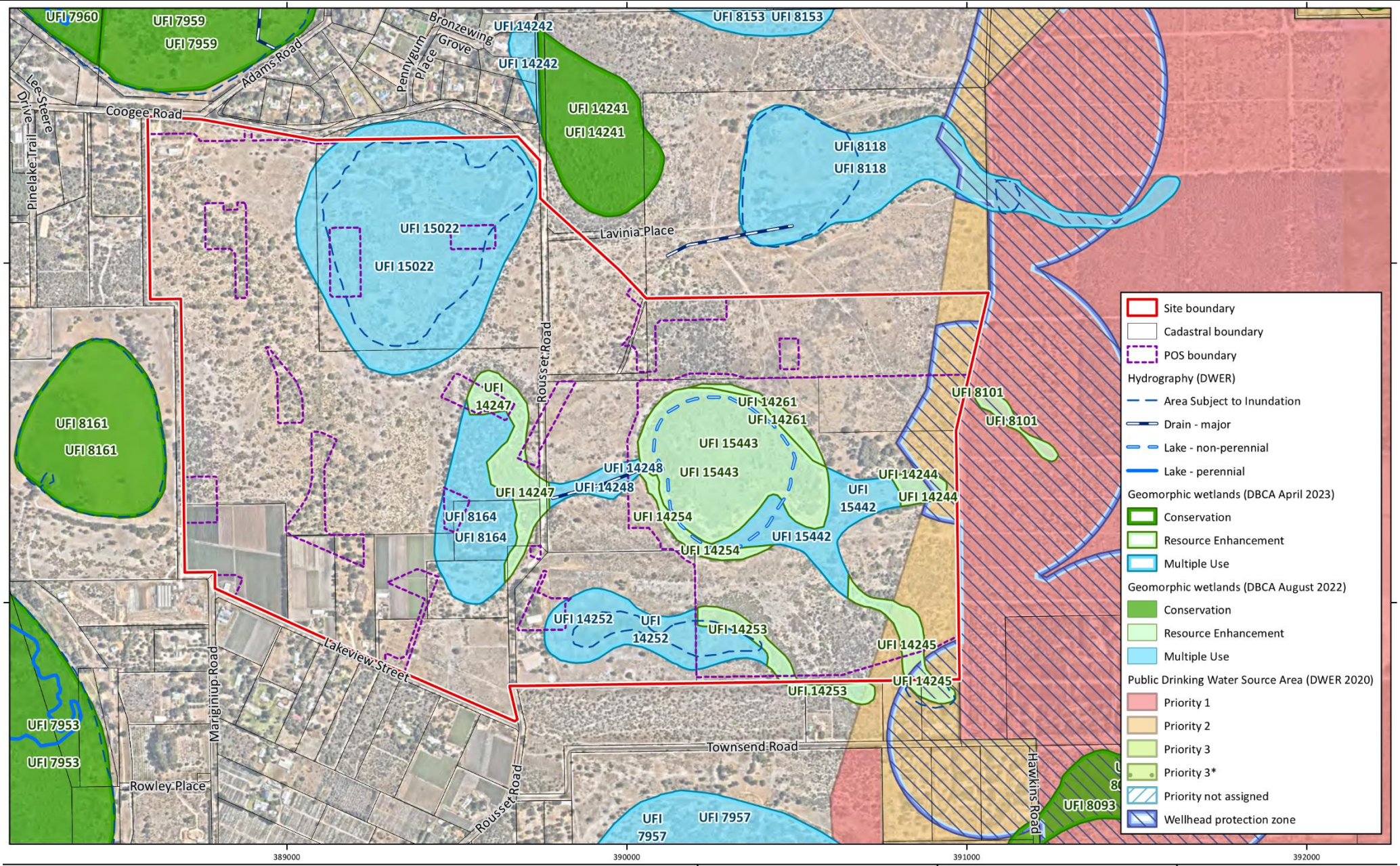

igure 13: Wetlands and Hydrological Features

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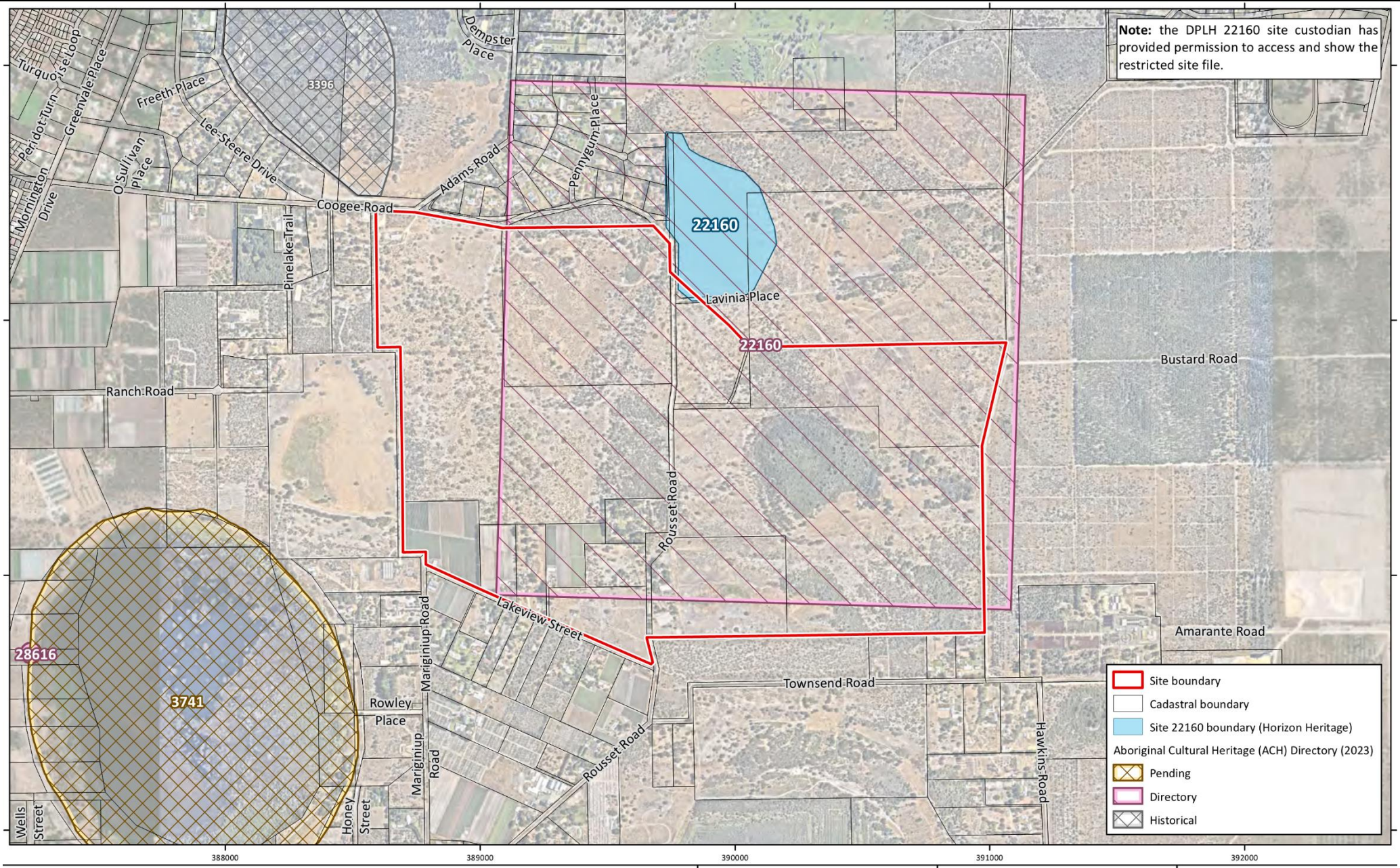

igure 14: Aboriginal Heritage

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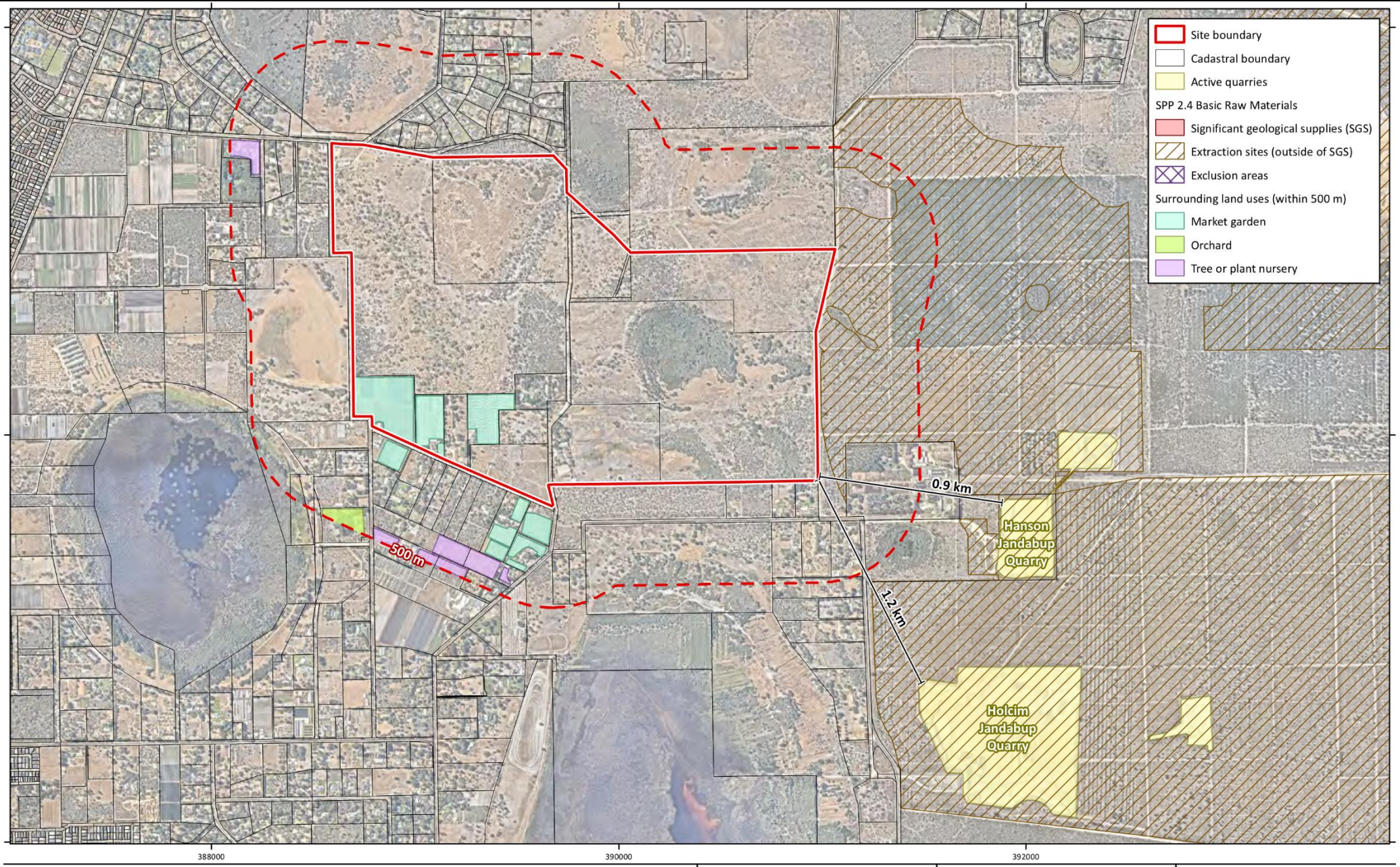

Figure 15: Surrounding Land Uses

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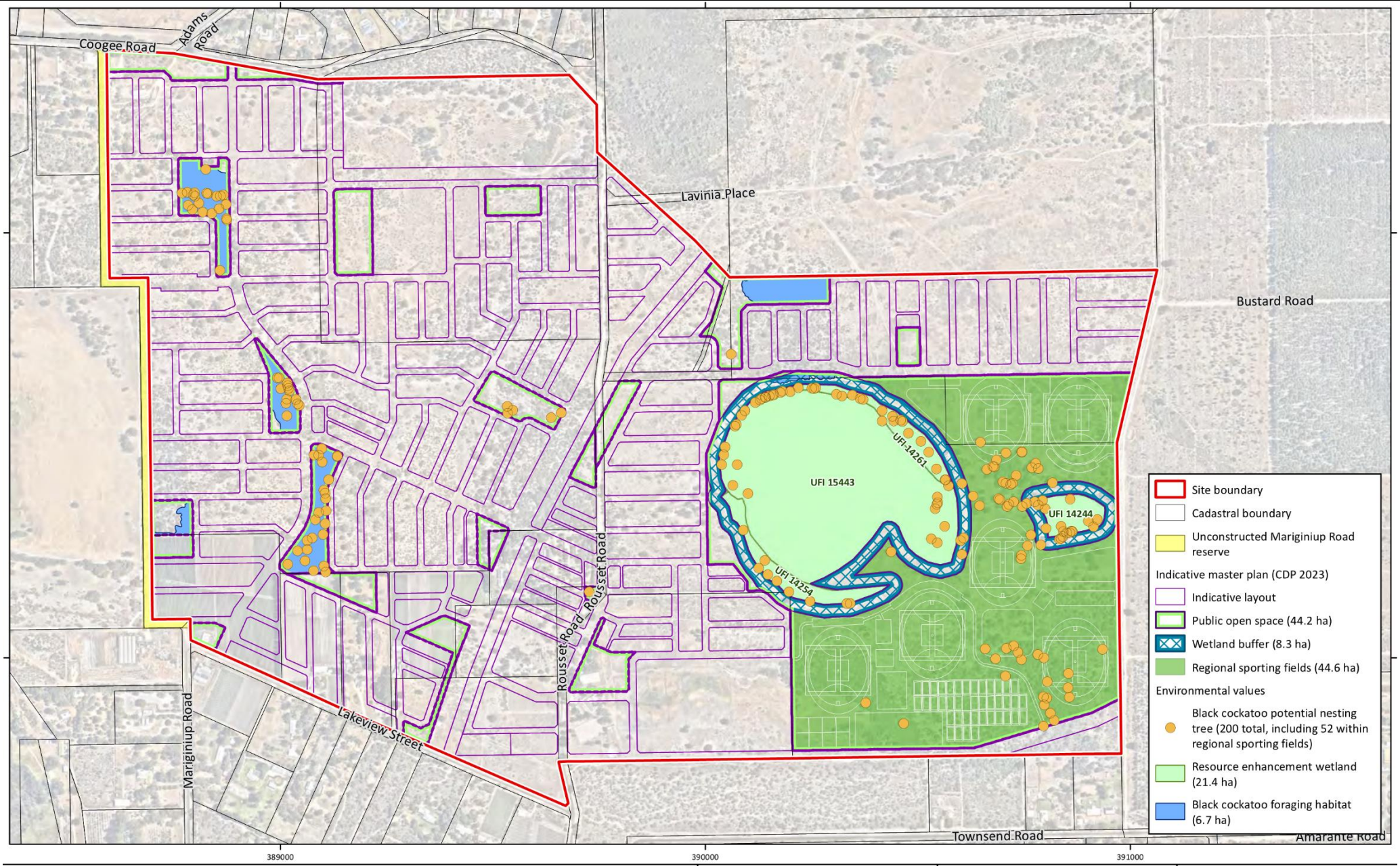

igure 16: Significant Environmental Values - Local Structure Plan Considerations

roject: Environmental Assessment Report
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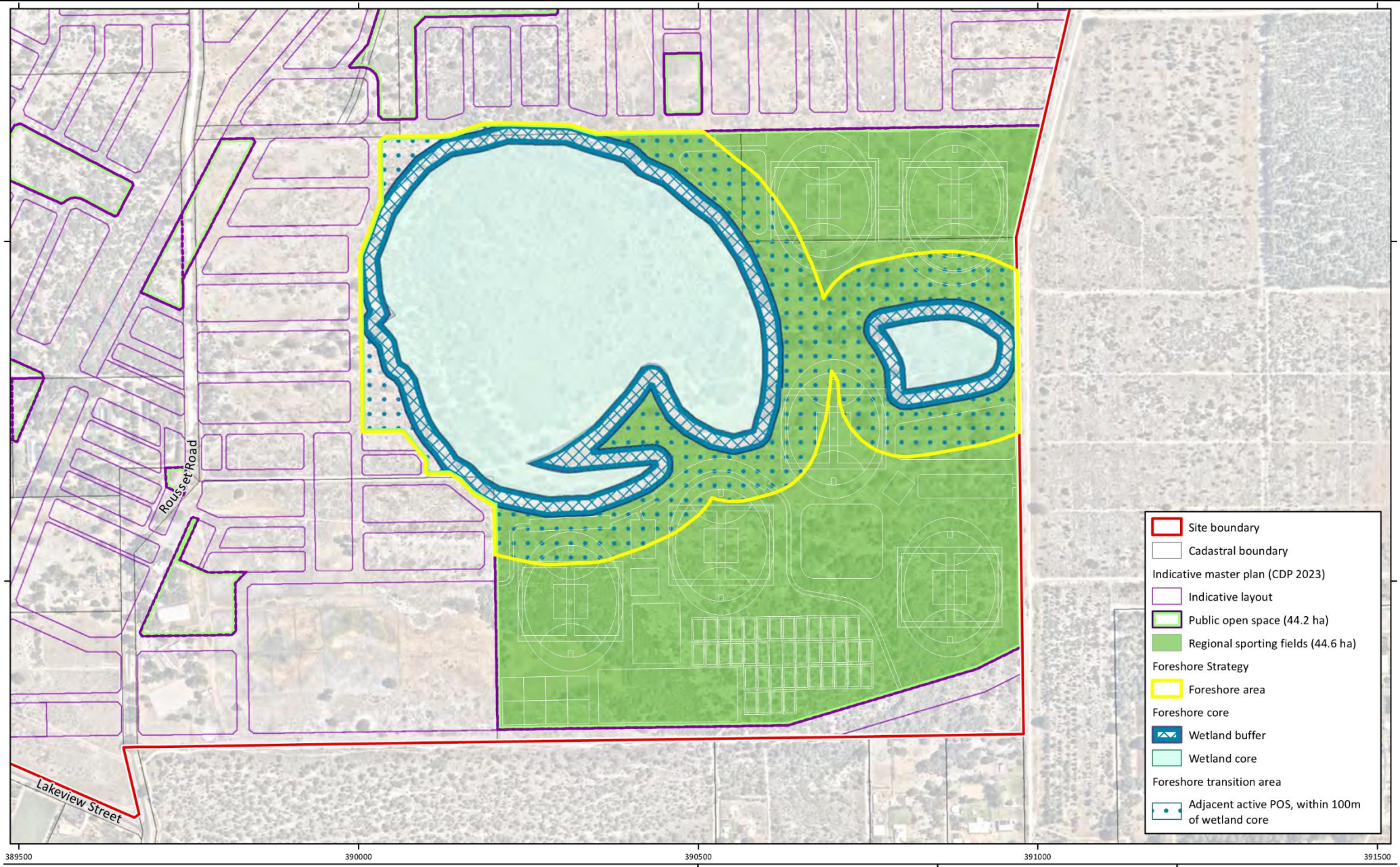

igure 17: Foreshore Area

oject: Environmental Assessment Report
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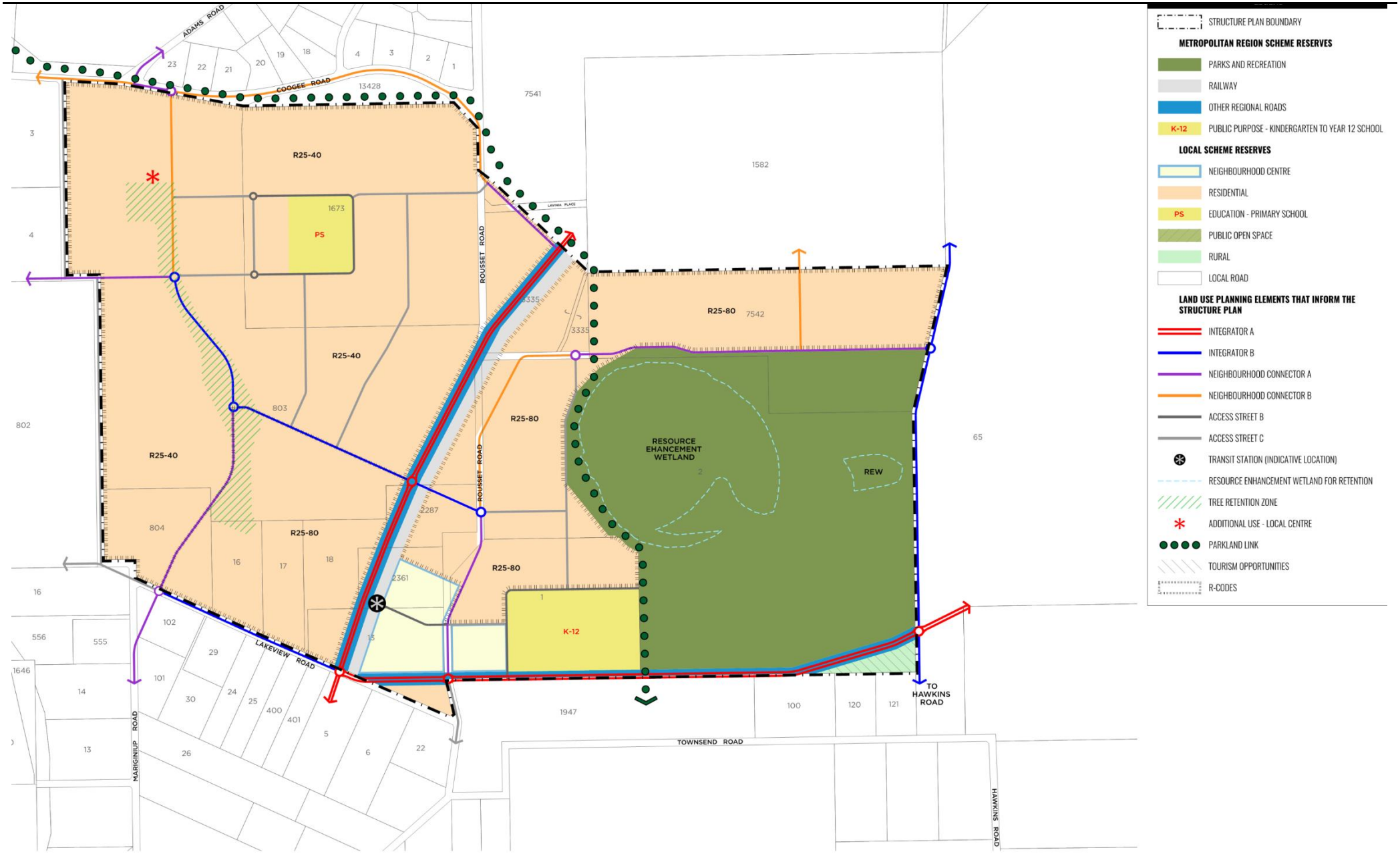
Appendix A

Precinct 15 Structure Plan and Indicative Master Plan (CDP 2023)



RECINCT 15 STRUCTURE PLAN

arious Lots, MARIGINIUP

DRAFT

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0 100 200 300m

PLAN: STOMA-2-001 REVISION:

DATE: 24/07/2023 DRAWN: JP

Unit 2, 464 Murray Street
Perth WA 6000
(08) 6333 1888
info@cdpaus.com.au
www.cdpaus.com.au

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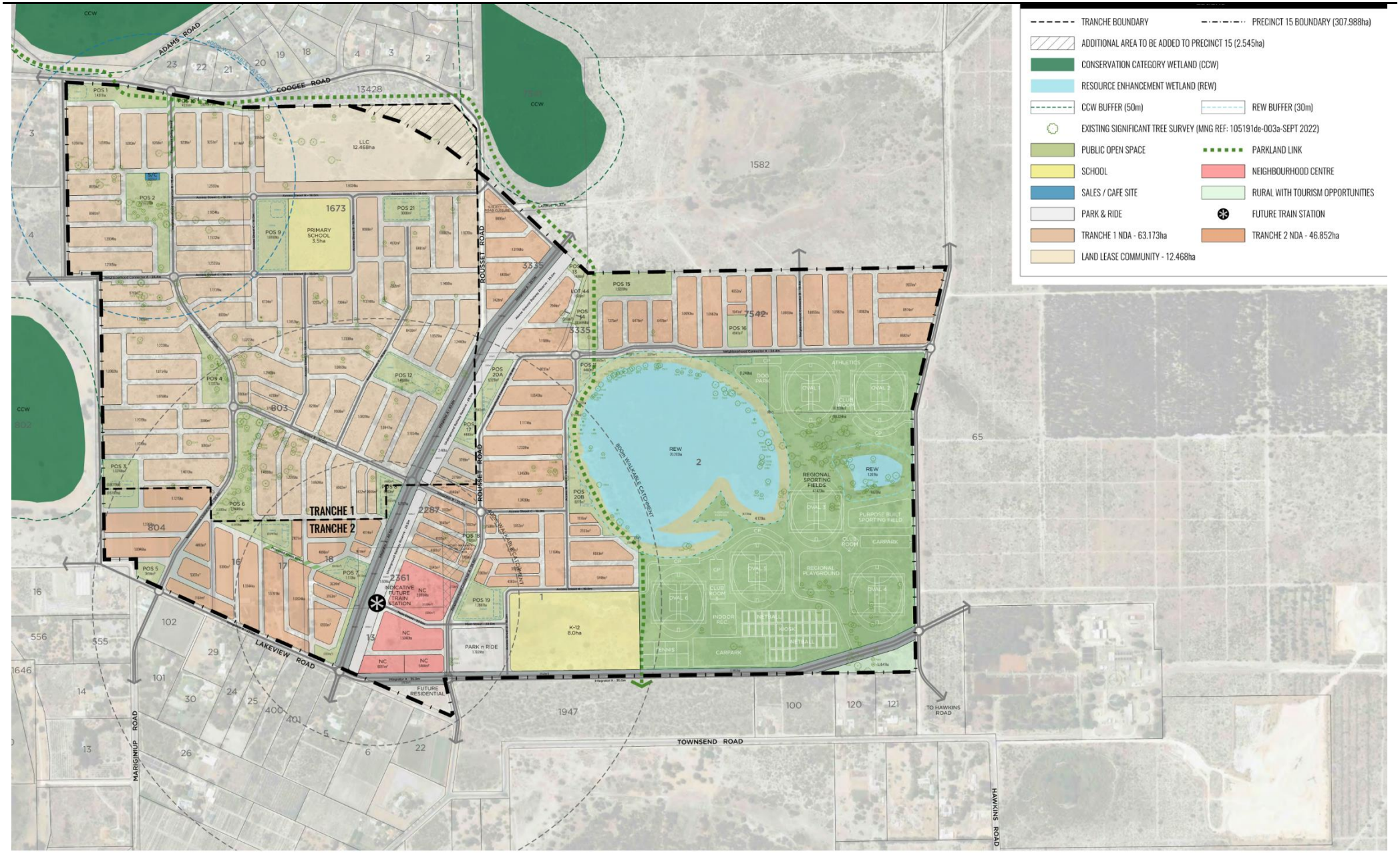

NDICATIVE MASTER PLAN

ecinct 15

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PLAN: STOMA-1-010 REVISION: M

DATE: 15/06/2023 DRAWN: JP

Unit 2, 464 Murray Street
Perth WA 6000
(08) 6333 1888
info@cdpaus.com.au
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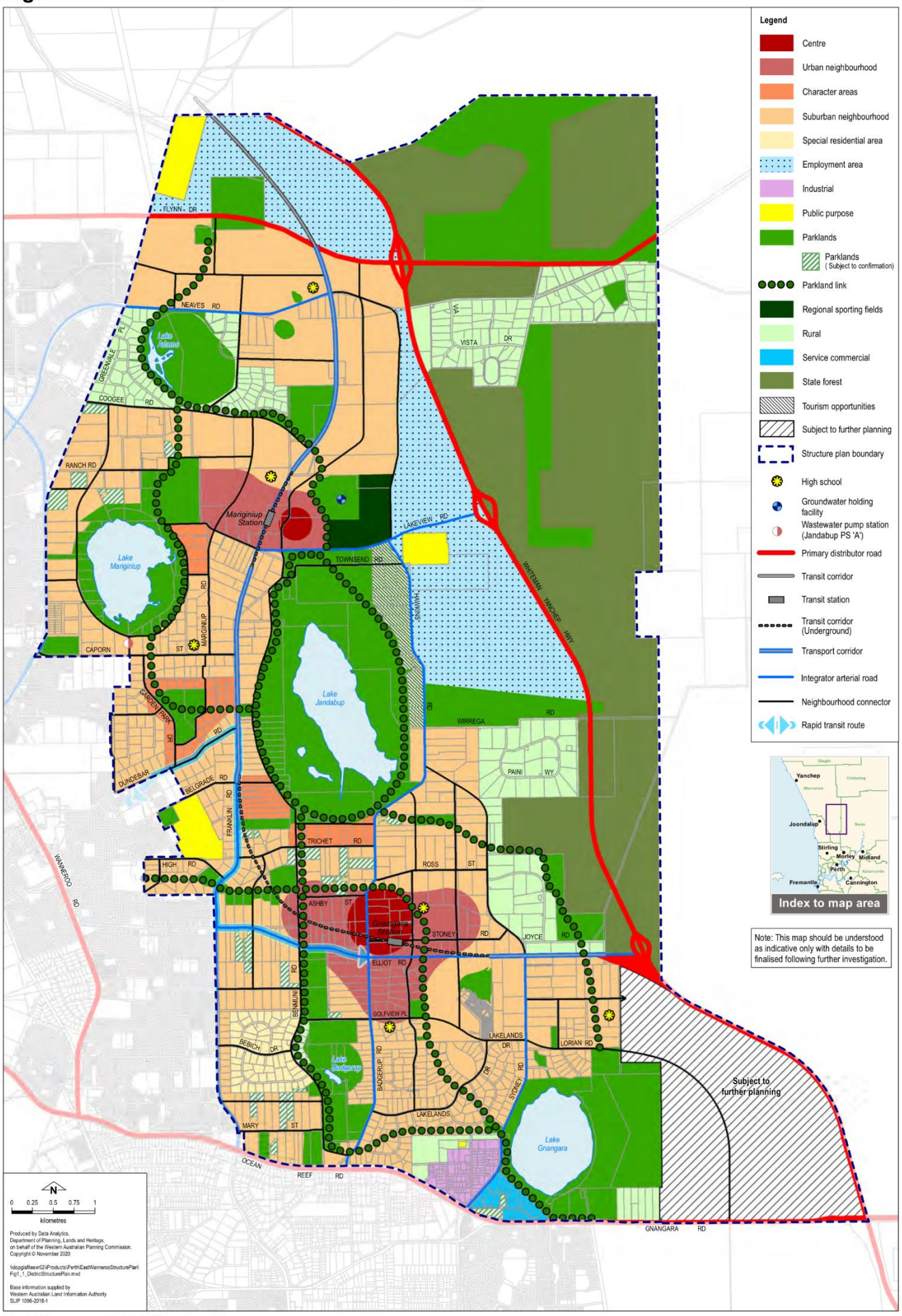
Appendix B

East Wanneroo District Structure Plan (DPLH 2022)

Figure 1.1 East Wanneroo District Structure Plan



East Wanneroo District Structure Plan

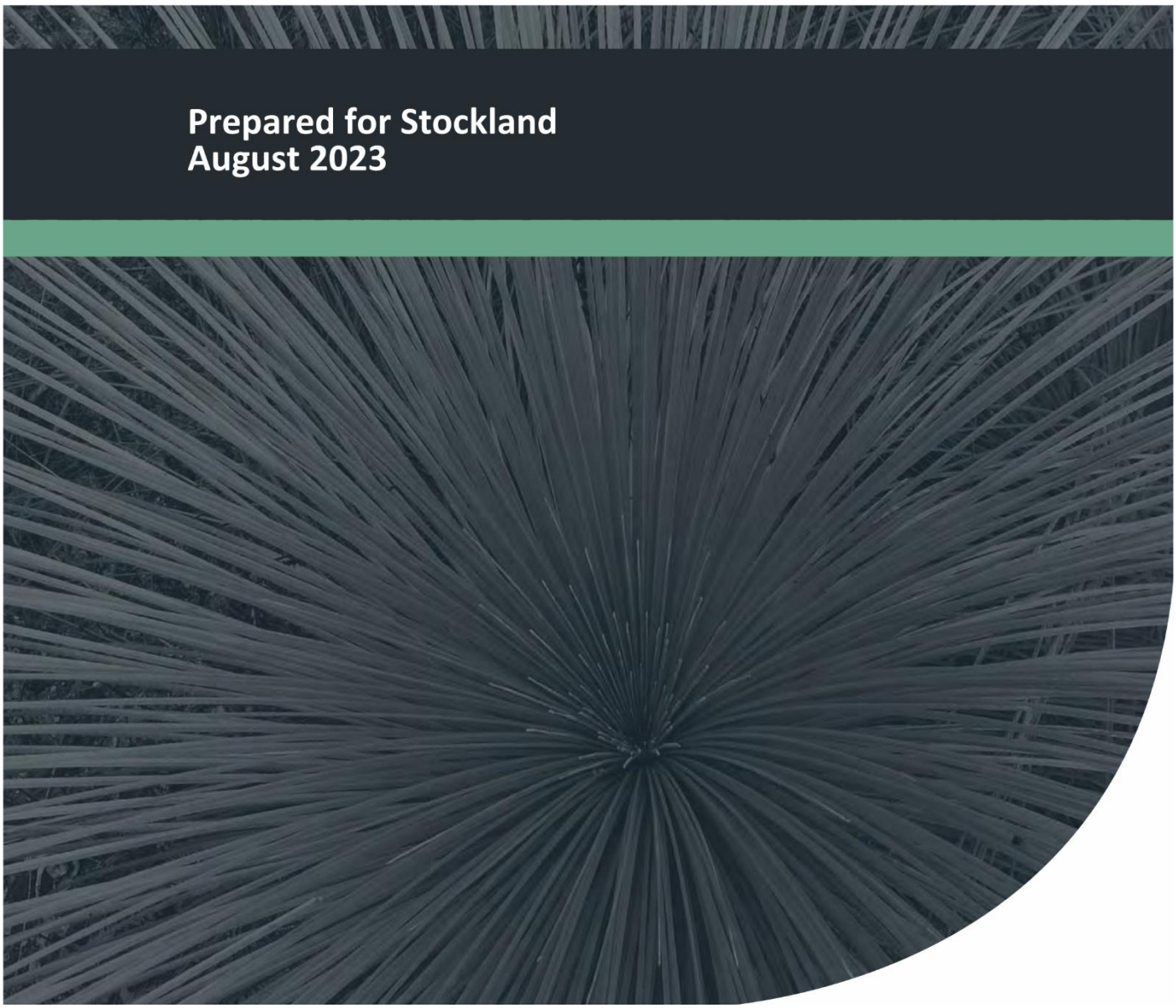
Appendix C

Detailed Flora and Vegetation Assessment (Emerge Associates 2023)

Detailed Flora and Vegetation Assessment

Various Lots, Mariginiup

Project No: EP22-019(01)



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Executive Summary

Stockland engaged Emerge Associates to conduct a detailed flora and vegetation assessment to characterise the flora and vegetation values within various lots in Mariginiup (referred to herein as the 'site').

A desktop review of relevant background information was completed and field surveys were undertaken across multiple dates between August 2022 – February 2023, including during the spring flowering season. During the field surveys an assessment was made on the type, condition and values of vegetation across the site.

Outcomes of the assessment include the following:

- Remnant native vegetation is present across 131.94 ha of the site in varying levels of condition. Non-native vegetation occurs across the remaining 181.84 ha of the site.
- A total of 198 native and 51 non-native (weed) species were recorded in the site.
- No threatened flora species were recorded or are considered likely to occur. A total of 301 individuals of priority 4 species *Jacksonia sericea* were recorded within the site. No other priority species were considered likely to occur. The presence or absence of threatened and priority flora within the lots in which access was not possible could not be confirmed.
- Seventeen plant communities were identified that are present in 'very good', 'good', 'good - degraded', 'degraded' and 'completely degraded' condition.
    - Plant community **BaBmEpAn** was determined to represent FCT 23a 'central *Banksia attenuata – B. menziesii* woodlands'.
    - Plant community **BaBmJfXp** was determined to represent FCT 28 'Spearwood Banksia attenuata or *Banksia attenuata – Eucalyptus* woodlands'.
    - Plant community **BaBmKgSi** and **BiAc** was determined to represent FCT 21c 'low lying *Banksia attenuata* woodlands of shrublands'.
    - Plant community **EmXp** was determined to represent FCT 28.
    - Plant community **EmKg** was determined to represent FCT 21c.
    - Plant communities **Cc** and **ErAs** were determined to represent FCT 11 'wet forests and woodlands'.
    - Plant communities **EmAc** and **KgAl** were determined to represent FCT 14 'deeper wetlands on sandy soils'.
    - Plant community **HaRc** was determined to represent FCT 4 'Melaleuca preissiana damplands'.
    - Plant communities **ErLb** and **Kg** were determined to represent FCT 6 'weed dominated wetlands on heavy soils'.
    - Plant communities **Mp**, **Mt** and **Xp** were too degraded to undertake an FCT analysis.
    - Non-native vegetation is present over the majority of the site and contains non-native vegetation, market gardens and bare areas.
- A total of 12.10 ha of **BaBmEpAn**, **BaBmJfXp**, **BaBmKgSi** and **BiAc** vegetation is considered to represent the Commonwealth listed 'threatened ecological community' (TEC) 'banksia woodlands of the Swan Coastal Plain' and associated State listed 'priority ecological community' (PEC).

- A total of 6.89 ha of **BaBmKgSi** and **BiAc** vegetation is considered to represent the State listed PEC 'low lying *Banksia attenuata* woodlands of shrublands' (P3).
- Plant communities **BaBmKgSi**, **BiAc**, **Cc**, **EmKg**, **ErAc**, **ErAs**, **ErLb**, **HaRc**, **Kg**, **KgAl**, **Mp** and **Mt** are associated with wetland features and contain facultative and/or obligate wetland species.
- Vegetation within the site may provide habitat for conservation significant fauna, including black cockatoo species, quenda and black-striped burrowing snake.

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Abbreviation Tables

Table A1: Abbreviations – Organisations

Organisations	
DBCA	Department of Biodiversity, Conservation and Attractions
DCCEEW	Department of Climate Change, Energy, the Environment and Water
DPIRD	Department of Primary Industries and Regional Development
DWER	Department of Water and Environmental Regulation
EPA	Environmental Protection Authority
WALGA	Western Australia Local Government Association

Table A2: Abbreviations – General terms

General terms	
FCT	Floristic community type
IBRA	Interim Biogeographic Regionalisation of Australia
NVIS	National Vegetation Inventory System (ESCAVI 2003)
P1	Priority 1
P2	Priority 2
P3	Priority 3
P4	Priority 4
P5	Priority 5
PEC	Priority ecological community
T	Threatened
TEC	Threatened ecological communities
UFI	Unique feature identifier
WoNS	Weed of National Significance

Table A3: Abbreviations – Legislation

Legislation	
BAM Act	*Biosecurity and Agriculture Management Act 2007*
BC Act	*Biodiversity Conservation Act 2016*
EP Act	*Environmental Protection Act 1986*
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*

Table A4: Abbreviations – Units of measurement

Units of measurement	
cm	Centimetre
ha	Hectare
m	Metre
m AHD	m in relation to the Australian height datum
mm	Millimetre

1 Introduction

1.1 Project background

Emerge Associates (Emerge) were engaged by Stockland to characterise the flora and vegetation values across the following lots associated with Precinct 15 of the East Wanneroo District Structure Plan area in Mariginiup (referred to herein as the 'site'):

- Lot 803 (no. 200) Mariginiup Road
- Lot 1673 (no. 285) Rousset Road
- Lot 804 (no. 90) Lakeview Street
- Lot 16 (no. 62) Lakeview Street
- Lot 17 (no. 54) Lakeview Street
- Lot 18 (no. 46) Lakeview Street
- Lot 13 (no. 13) Lakeview Street
- Lot 2361 (no. 175) Rousset Road
- Lot 2287 (no. 201) Rousset Road
- Lot 1 (no. 170) Rousset Road
- Lot 2 (no. 220) Rousset Road
- Lot 7542 (no. 30) McCaffrey Road
- Lot 44 McCaffery Road
- part Lot 3335 (no. 264) Rousset Road
- part Lot 7541 (no. 310) Rousset Road
- part Rousset Road reserve
- McCaffery Road reserve (unconstructed)
- part Lavinia Place reserve (unconstructed).

In addition to the landholdings within the Precinct 15 of the East Wanneroo District Structure Plan area, part of the unconstructed Mariginiup Road reserve was also surveyed.

The site is located approximately 25 kilometres (km) north of the Perth Central Business District within the City of Wanneroo and is approximately 313.78 hectares (ha) in size. The site is bounded by state forest plantations to the east, remnant bushland and rural-residential areas to the north, rural-residential land and Mariginiup Lake to the west and Lakeview Street and remnant vegetation to the south. The location and extent of the site is shown in **Figure 1**.

Not all lots were accessible at the time of the site visit, with the lot access within the site shown in **Figure 2**. Those lots not accessed were assessed from adjacent lots and public road reserves, as discussed in **Section 3.2**.

1.2 Purpose and scope of work

The scope of work was specifically to undertake a flora and vegetation assessment to the standard required of a detailed survey with reference to the Environmental Protection Authority's (EPA's) technical guidance (EPA 2016).

As part of this scope of work, the following tasks were undertaken:

- Desktop review of relevant background information pertaining to the site and surrounds, including database searches for threatened flora species and ecological communities.
- A field survey to record a comprehensive list of flora species and assess vegetation type and condition.
- Mapping of plant communities, vegetation condition and conservation significant flora and vegetation.
- Identification of potential habitat for conservation significant flora and vegetation and an assessment of likelihood of occurrence.
- Documentation of the desktop assessment, methodology, field survey and results into a report.

2 Environmental Context

2.1 Climate

Climate influences the types of vegetation that grow in a region and the life cycles of the flora present. Therefore, it is critical for a flora and vegetation survey to respond appropriately to climatic conditions to ensure that surveys are conducted during times when flora species are easiest to detect and identify.

The south-west of Western Australia experiences a Mediterranean climate of hot dry summers and cool wet winters. In Mediterranean type climates some flora species will typically spend part of their lifecycle as either underground storage organs or as seed. This is an adaptation to unfavourable environmental conditions such as excessive heat and drought that occur over the summer period. These species, known as 'geophytes' or 'annuals', tend to re-emerge during winter when favourable conditions return and are most visible during spring, which is the flowering period for a majority of plant species. Therefore, spring is the optimal time to complete flora and vegetation surveys in the south-west of WA.

An average of 794.3 millimetres (mm) of rainfall is recorded annually from the Wanneroo weather station (no. 9105), which is the closest weather station, located approximately 1 km from the site. The majority of this rainfall is received between the months of May and September. Mean maximum temperatures at the Pearce RAAF weather station (no. 9053), which is the nearest temperature recording station approximately 16.7 km north-east of the site, range from 17.9°C in July to 33.6°C in January, while mean minimum temperatures range from 8.2°C in August to 17.6°C in February (BoM 2023).

A total of 624.7 mm of rain was recorded from May to September 2022 prior to the survey, which is slightly lower than the mean of 636.4 mm for this period (BoM 2023). This amount of rainfall was considered to have been sufficient to promote the flowering and emergence of native flora.

2.2 Geomorphology and soils

Landform and soils influence vegetation types at regional and local scales. The site occurs on the Swan Coastal Plain, which is the geomorphic unit that characterises much of the Perth metropolitan area. The Swan Coastal Plain is approximately 500 km long and 20 to 30 km wide and is roughly bound by the Indian Ocean to the west and the Darling Scarp to the east. Broadly the Swan Coastal Plain consists of two sedimentary belts of different origin. Its eastern side comprises the Pinjarra Plain which formed from the deposition of alluvial material washed down from the Darling Scarp, while its western side comprises three dune systems that run roughly parallel to the Indian Ocean coastline (Seddon 2004). These dune systems, referred to as Quindalup, Spearwood and Bassendean associations, represent a succession of coastal deposition that has occurred since the late Quaternary period (approximately two million years ago) (Kendrick *et al.* 1991) and, as a result, they contain soils at different stages of leaching and formation.

Physiographic mapping places the western portion of the site within the Spearwood system, described as sand dunes and sandplains with pale deep sand, semi-wet and wet soil. The remainder

of the site is located within the Bassendean system, described as sand dunes and plains with yellow deep sands, pale deep sands and yellow/brown shallow sands (DPIRD 2018).

Examination of broad scale soil mapping places the site within the Bassendean association (Churchward and McArthur 1980). The Bassendean association comprises sand plains with low dunes and occasional swamps, iron or humus podzols and areas of complex steep dunes.

Fine scale soil landscape mapping by the Department of Primary Industries and Regional Development (DPIRD 2019) shows seven units as occurring within the site, as described in **Table 1** and shown in **Figure 3**.

Table 1: Soil landscape mapping units within the site (DPIRD 2019)

Soil landscape unit	Location within site	Description
Spearwood seasonal swamps phase	Western portion	Depressions with free water in winter. Humus podzols and peat.
Karrakatta sand yellow phase	Western portion	Low hilly to gently undulating terrain. Yellow sand over limestone at 1-2 m.
Bassendean seasonal swamps phase	Northern, central and southern portions	Depressions with free water in winter. Humus podzols and peat.
Bassendean permanent lakes and swamps phase	Southern portion	Depressions. Humus podzols and peats around the edges often with some diatomite zoned vegetation with heath on upper slopes.
Bassendean, Jandakot phase	Central and eastern portions	Jandakot low dunes. Slopes <10% and generally more than 5m relief. Grey sand over pale yellow sands generally underlain by humic and iron podsols.
Bassendean, Joel phase	Eastern portion	Poorly drained depressions. Humus podzols.
Bassendean, Gavin phase	North-eastern portion	Flat or gently undulating landscape. Iron-humus podzols and some diatomite deposits.

The site is not known to contain any restricted landforms or unique geological features.

2.3 Topography

The elevation of the site ranges from 46 m in relation to the Australian height datum (mAHD) on the western and central portions of the site to 59 mAHD on the western side of the site which supports a dunal ridge (MNG 2021) (**Figure 3**).

2.4 Hydrology and wetlands

Wetlands are areas of seasonally, intermittently or permanently waterlogged land such as poorly drained soils, ponds, billabongs, lakes, swamps, tidal flats, estuaries, rivers and their tributaries (Wetlands Advisory Committee 1977). Wetlands can be recognised by the presence of vegetation associated with waterlogging or the presence of hydric soils such as peat, peaty sand or carbonate mud (Hill *et al.* 1996).

Wetlands of national or international significance may be afforded special protection under Commonwealth or international agreements. The following lists of important wetlands were checked as part of this assessment:

- *Ramsar List of Wetlands of International Importance* (DBCA 2017c)
- *A Directory of Important Wetlands in Australia* (DBCA 2018)

No Ramsar or listed 'important wetlands' are located within or near the site.

Examination of the Department of Water and Environmental Regulation (DWER) hydrography dataset (DWER 2018) shows the following six wetland or water related features occur within the site:

- two 'earth dams' within the northern and central portions;
- two 'areas subject to inundation' within the north-western and southern portions;
- a 'lake – non-perennial' in the eastern portion; and,
- a 'drain – major' in the central portion.

The Department of Biodiversity, Conservation and Attractions (DBCA) has developed the *Geomorphic Wetlands of the Swan Coastal Plain* dataset (DBCA 2021). This dataset maps geomorphic wetland features and classifies them based on their landform shape and water permanence, and is assigned a unique feature identifier (UFI). Each feature is assigned to one of three management categories which guides land use and conservation.

A review of the *Geomorphic Wetlands, Swan Coastal Plain* dataset indicated that seven 'resource enhancement' category wetland features (UFIs 14244, 14245, 14247, 14253, 14254, 14261 and 15443) occur within the central, eastern and south-eastern portions of the site (DBCA 2022a). Five 'multiple use' category wetland feature (UFIs 8164, 14248, 14252, 15022 and 15442) occurs within the northern, central and south-eastern portions of the site. The locations of the geomorphic wetlands in the site is shown in **Figure 3**.

2.5 Regional vegetation

Native vegetation is described and mapped at different scales in order to illustrate patterns in its distribution. At a continental scale the *Interim Biogeographic Regionalisation of Australia* (IBRA) divides Australia into floristic subregions (Environment Australia 2000).

The site is contained within the Swan Coastal Plain IBRA region and within the 'SWA02' or Perth subregion. The Perth subregion is characterised by mainly banksia low woodland on leached sands with melaleuca swamps where ill-drained; and woodland of *Eucalyptus gomphocephala* (tuart), *E. marginata* (jarrah) and *Corymbia calophylla* (marri) on less leached soils (Beard 1990). This subregion is recognised as a biodiversity hotspot and contains a wide variety of endemic flora and vegetation types.

Variations in native vegetation can be further classified based on regional vegetation mapping.

Heddle *et al.* (1980) mapping shows the site as comprising the 'Pinjar complex', which is described as vegetation ranging from woodland of *Eucalyptus marginata - Banksia* spp. to a fringing woodland of *Eucalyptus rudis - Melaleuca preissiana* and sedgelands. The north-eastern portion of the site

intersects the 'Bassendean complex - north' association. However, given the broad-scale mapping indicates that this complex extends into the site by 4 m, it is not considered to be relevant to the composition of vegetation within the site.

The Pinjar complex was determined to have 35.47% of its pre-European extent remaining, of which 4.57% is protected for conservation purposes (Government of Western Australia 2019).

2.6 Historical land use

Review of historical images available from 1965 onwards shows that the majority of the site was cleared of native vegetation prior to 1970, likely for grazing. Native vegetation was retained in a larger patch in the south-eastern portion of the site and scattered paddock trees across the remainder of the site (WALIA 2023). The south-western portion of the site appears to have been cultivated for horticultural purposes since 1977, with market gardens still evident in 2022. Native vegetation regrowth has occurred over time, most extensively within the central portion of the site.

2.7 Conservation significant values

2.7.1 Threatened and priority flora

Certain flora taxa that are considered to be rare or under threat warrant special protection under Commonwealth and/or State legislation. At a Commonwealth level, flora taxa may be listed as 'threatened' under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Threatened flora species listed under the EPBC Act are assigned a conservation status according to attributes such as population size and geographic distribution. Any action likely to have a significant impact on a taxon listed under the EPBC Act requires Ministerial approval.

In Western Australia flora species may also be classed as 'threatened' under *the Biodiversity Conservation Act 2016* (BC Act). Similarly, it is an offence to 'take' or 'disturb' threatened flora listed under the BC Act without Ministerial approval.

Flora species that do not currently meet the criteria for listing as threatened but are potentially rare or threatened may be added to the DBCA's *Priority Flora List*. These species are classified into 'priority' levels based on threat. Whilst priority species are not under direct statutory protection, they are considered during State approval processes.

Further information on threatened and priority species and their categories is provided in **Appendix A**. An assessment of the likelihood of occurrence of threatened and priority flora within the site was undertaken (refer to **Sections 3.1** and **4.2.1**).

2.7.2 Threatened and priority ecological communities

An ecological community is a naturally occurring group of native plants, animals and other organisms that are interacting in a unique habitat. An ecological community's structure, composition and distribution are influenced by environmental factors such as soil type, position in the landscape, altitude, climate and water availability (DCCEEW 2021). 'Threatened ecological communities' (TECs)

are ecological communities that are recognised as rare or under threat and therefore warrant special protection.

Selected TECs are afforded statutory protection at a Commonwealth level under the EPBC Act. Similar to flora species, TECs listed under the EPBC Act are assigned a conservation status. Any action likely to have a significant impact on a community listed under the EPBC Act requires Ministerial approval.

TECs are also listed within Western Australia under the BC Act and the BC Regulations. Their significance is also acknowledged through other state environmental approval processes such as 'environmental impact assessment' pursuant to Part IV of *the Environmental Protection Act 1986* (EP Act) and the *Environmental Protection* (Clearing of Native Vegetation) *Regulations 2004*.

An ecological community that is under consideration for listing as a TEC in Western Australia but does not yet meet survey criteria or has not been adequately defined may be listed as a 'priority ecological community' (PEC). Listing as a PEC is similarly considered during State approval processes.

Further information on categories of TECs and PECs is provided in **Appendix A**. An assessment of the likelihood of occurrence of threatened and priority flora within the site was undertaken (refer to **Sections 3.1** and **4.3.1**).

2.8 Weeds and pests

The term 'weed' can refer to any plant that requires some form of action to reduce its effect on the economy, the environment, human health and amenity. Many non-native flora species and some native species are considered to be weeds. The likelihood of weeds occurring is higher in areas disturbed areas, especially areas that have been agricultural or urban landuse.

A particularly invasive or detrimental weed species may be listed as a 'declared pest' pursuant to *Western Australia's Biosecurity and Agriculture Management Act 2007* (BAM Act), indicating that it warrants special management to limit its spread.

The Commonwealth government has further compiled a list of 32 *Weeds of National Significance* (WoNS) (Weeds Australia 2021). Whilst the WoNS list is non-statutory, many WoNS are also listed under the BAM Act. Further information on weeds and declared pests is provided in **Appendix A**.

2.9 Bush Forever

The Government of Western Australia's *Bush Forever* policy is a strategic plan for conserving regionally significant bushland within the Swan Coastal Plain portion of the Perth Metropolitan Region. The objective of *Bush Forever* is to protect comprehensive representations of all original ecological communities by targeting a minimum of 10% of each vegetation complex for protection (Government of WA 2000a). *Bush Forever* sites are representative of regional ecosystems and habitat and have a key role in the conservation of Perth's biodiversity. Flora considered to be 'significant', irrespective of Commonwealth and state conservation significance status, are listed in *Bush Forever* documentation.

No *Bush Forever* sites occur within the site. Bush Forever Site 147 (Mariginiup Lake and Adjacent Bushland, Mariginiup) lies adjacent to the south-western corner of the site, and Bush Forever Site 324 (Jandabup Lake and Adjacent Bushland, Jandabup/Mariginiup) lies adjacent to the southern boundary. Bush Forever Site 324 extends to the south, and significant flora species are known to occur in this site. Bush Forever Site 147 extends to the south-east of the site, and the location of both Bush Forever sites associated with the site is shown in **Figure 3**.

2.10 DBCA managed or legislated land

DBCA has tenure of or interests in numerous areas of land across the state for a range of purposes. Tenure categories include national parks, nature reserves, conservation parks, marine parks, marine nature reserves, marine management areas, section 5(1)(g) reserves, state forest and timber reserves. These areas are mapped within the *Legislated Lands and Waters* (DBCA 2017a) and *Lands of Interest* (DBCA 2017b) datasets. The *Legislated Lands and Waters* (DBCA 2017a) dataset includes lands subject to the following legislation; the *Conservation and Land Management Act 1984* (CALM Act 1984), *Swan and Canning Rivers Management Act 2006* (SCRM Act) and lands identified under the *Land Administration Act 1997* (LA Act). The *Lands of Interest* (DBCA 2017b) dataset includes all other lands of which DBCA is recognised as the manager but is not vested under any act. These lands comprise of crown land and freehold land which DBCA has been acknowledged by the Department of Lands as the responsible agency.

Land adjacent to the eastern boundary is mapped as state forest, which is also located approximately 1.2 km to the north, whilst Jandabup Nature Reserve is located approximately 900 m to the south of the site (DBCA 2017a).

2.11 Ecological linkages

Ecological linkages are linear landscape elements that allow the movement of fauna, flora and genetic material between areas of remnant habitat. This exchange of genetic material between vegetation remnants improves the viability of those remnants by allowing greater access to breeding partners and food sources, refuge from disturbances such as fire and maintenance of genetic diversity of plant communities and populations. Ecological linkages are ideally continuous or near-continuous as the more fractured a linkage is, the less ease flora and fauna have in moving within the corridor (Alan Tingay and Associates 1998).

The Perth Biodiversity Project, supported by the Western Australia Local Government Association (WALGA), have identified and mapped regional ecological linkages within the Perth Metropolitan Region (WALGA and PBP 2004).

One regional ecological linkage (No. 16) is mapped within the south-eastern portion of the site, extending to the south and east, which intersects with another ecological linkage (No. 12), which runs north-south adjacent to the western boundary, as shown in **Figure 4**.

Review of aerial imagery indicates that native vegetation within the site is connected to small patches of native vegetation to the north-west, north and south of the site, but is otherwise disconnected from vegetation in the broader area.

2.12 Previous surveys

AECOM undertook a *Flora, Vegetation and Fauna Assessment* as part of environmental investigations within a corridor between Yanchep and the Wanneroo reservoir in November 2017 and January 2018 (AECOM 2018). This survey extended over a broad area to the north and south, and intersected the central portion of the site along the Rousset Road reserve and adjacent areas. This assessment did not identify any conservation significant species or communities within the portion of the corridor survey area that intersected the site.

3 Methods

3.1 Database searches

A search was conducted for threatened and priority flora that may occur or have been recorded within a 10 km radius of the site using the *Protected Matters Search Tool* (DAWE 2022), *NatureMap* (DBCA 2022b) and DBCA's threatened and priority flora database (reference no. 03-0322FL).

A search was also conducted for TECs and PECs that may occur or have been recorded within a 10 km radius of the site using the *Protected Matters Search Tool* (DAWE 2022), the *weed and native flora dataset* (Keighery *et al.* 2012) and DBCA's threatened and priority ecological communities' database (reference no. 03-0322EC).

Prior to undertaking the field survey, information on the habitat preferences of threatened and priority flora species and communities identified from database searches was reviewed. This was compared to existing environmental information available for the site, such as geomorphology, soils, regional vegetation and historic land use, to identify species and communities for which habitat may occur in the site.

3.2 Field survey

Botanists and ecologists from Emerge visited the site on multiple dates in 2022 and 2023:

- 11th August 2022
- 7th, 16th and 30th September 2022
- 7th and 18th October 2022
- 8th November 2022
- 9th February 2023.

The site was traversed on foot and the composition and condition of vegetation was recorded. Photographs were taken throughout the field visit to show particular site conditions.

Several lots within the southern portion of the site were unable to be accessed during the survey dates. Observations of flora and vegetation was completed from the boundary of adjacent lots and road reserves. The location of these lots are shown in **Figure 2**.

Plant specimens collected during the field survey were dried, pressed and named in accordance with requirements of the Western Australian Herbarium (2022). Identification of specimens occurred through comparison with named material and through the use of taxonomic keys. Flora species not native to Western Australia are denoted by an asterisk ('*') in text and raw data.

3.2.1 Sampling

Detailed sampling of the vegetation was undertaken using a combination of non-permanent 10 x 10 m quadrats and relevés. A total of 21 locations were sampled, comprised of 12 quadrats and nine relevés, as shown in **Figure 5**.

The quadrats were established using fence droppers bound by measuring tape. The relevés were completed over an equivalent 10 x 10 m area without the use of physical markers and were included to provide a more rapid sample of patches of vegetation in poorer condition and/or of smaller size. The position of each sample was recorded with a hand-held GPS unit.

The data recorded within each sample included:

- site details (site name, site number, observers, date, location)
- environmental information (slope, aspect, bare-ground, rock outcropping soil type and colour class, litter layer, topographical position, time since last fire event)
- biological information (vegetation structure and condition, 'foliage projective cover' (FPC), degree of disturbance and species present).

Additional plant taxa not observed within samples were recorded opportunistically as the botanists traversed the site.

3.2.2 Targeted searches

The suitability of habitat within the site for conservation significant flora and communities identified in the desktop assessment was assessed (refer **Section 3.1**). Areas of suitable habitat were traversed along transects and searched for conservation significant species, as required.

3.2.3 Vegetation condition

Vegetation condition was assigned at each sample and changes in vegetation condition were also noted and mapped across the site. The condition of the vegetation was assessed using the Keighery (1994) scale (**Table 2**). For vegetation in the site containing *Banksia* spp., the condition scale provided in the conservation advice for the 'banksia woodlands of the Swan Coastal Plain TEC' (DoEE 2016a) was applied in addition to the Keighery scale, as shown in **Table 2**.

Table 2: Vegetation condition scale applied during the field assessment

Condition category	Definition (Keighery 1994)	Indicator (DoEE 2016a)	
		Typical native vegetation composition	Typical weed cover
Pristine	Pristine or nearly so, no obvious signs of disturbance.	Native plant species diversity fully retained or almost so	Zero or close to
Excellent	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species.	High native plant species diversity	Less than 10%
Very good	Vegetation structure altered, obvious signs of disturbance. For example, disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing.	Moderate native plant species diversity	5-20%

Table 2: Vegetation condition scale applied during the field assessment (continued)

Condition category	Definition (Keighery 1994)	Indicator (DoEE 2016a)	
		Typical native vegetation composition	Typical weed cover
Good	Vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate it. For example, disturbance to vegetation structure caused by very frequent fires, the presence of some very aggressive weeds at high density, partial clearing, dieback and grazing.	Low native plant species diversity	5-50%
Degraded	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. For example, disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing.	Very low native plant species diversity	20-70%
Completely degraded	The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These areas are often described as 'parkland cleared' with the flora comprising weed or crop species with isolated native trees or shrubs.	Very low to no native species diversity	Greater than 70%

3.3 Mapping and analysis

3.3.1 Conservation significant flora and communities

Based on the database searches and information recorded during the field survey, an assessment of the likelihood of occurrence of threatened and priority flora species and communities within the site was undertaken using the categories outlined in **Table 3**.

Table 3: Likelihood of occurrence assessment categories and definitions

Likelihood	Definition
Recorded	The species was recorded during the current field survey.
Likely	The site contains suitable habitat for the species and it is likely the species may occur based on presence of a recent historical record within or close to the site.
Possible	The site contains suitable habitat for the species but there is no other information to suggest that the species may occur within or close to the site.
Unlikely	The site does not contain suitable habitat for the species or the site contains suitable habitat for the species within which thorough targeted searches were completed and conclusion has been made that the species is unlikely to be present.

3.3.2 Plant community identification and description

The plant communities within the site were identified from the sample data collected during the field survey. The vegetation was described according to the dominant species present using the structural formation descriptions of the *National Vegetation Inventory System* (NVIS) (NVIS Technical Working Group 2017). The identified plant communities were mapped on aerial photography from the sample

locations and boundaries were interpreted from aerial photography and notes taken in the field. Vegetation condition was mapped on aerial photography based on the samples and notes recorded during the field survey to define areas with differing condition.

3.3.3 Floristic community type assignment

The identified plant communities were then compared to the regional 'floristic community type' (FCT) dataset *A floristic survey of the southern Swan Coastal Plain* (Gibson *et al.* 1994). Each sample was compared to Gibson *et al.* (1994) separately to limit the influence of spatial correlation when assigning an FCT. FCT analysis was not undertaken for samples located within disturbed vegetation with low native species diversity as the vegetation was considered unlikely to currently represent an FCT.

Sample data (presence/absence) was first reconciled with Gibson *et al.* (1994) by standardising the names of taxa with those used in the earlier study. This was necessary due to changes in nomenclature in the intervening period. Taxa that were only identified to genus level were excluded, while some infra-species that have been identified since 1994 were reduced to species level. The combined dataset was then imported into the statistical analysis package PRIMER v6 (Clarke and Gorley 2006).

A resemblance matrix was generated using the Bray-Curtis distance measure which provided the percentage similarity between all pairs of samples. Subsequently, a cluster analysis was undertaken using the resemblance matrix and hierarchical agglomerative clustering, to produce a dendrogram.

Where a sample tended to cluster with a grouping of different FCTs, the resemblance matrix was examined. Ultimately a combination of cluster analysis, resemblance matrix and contextual information relating to the soils, landforms and known FCTs within the region was considered in the final determination of an FCT for vegetation within the site.

3.3.4 Threatened and priority ecological communities

Areas of native vegetation potentially representing a TEC or PEC were assessed against key diagnostic characteristics and, if available, size and/or vegetation condition thresholds.

3.3.5 Species accumulation curve

A species accumulation curve was plotted from sample data by generating a trendline (log) in Microsoft Excel. The trendline was forecast to locate the asymptote of the curve (the point at which the curve flattens), which provides an indication of amount of sampling that would be required before it can be assumed few species remain undetected. PRIMER v6 also offers a range of estimators to predict minimum species richness (Clarke and Gorley 2006). Both the Jacknife1 and Chao2 non-parametric estimators are reported, as these are known to perform well in comparison to simulated and real data sets and are also recommended for small sample sizes (Gotelli and Colwell 2011). Comparison between actual and estimated species accumulation assists in evaluating the adequacy of sampling effort.

3.4 Survey limitations

It is important to note the specific constraints imposed on surveys and the degree to which these may have limited survey outcomes. An evaluation of the survey methodology against standard constraints outlined in the EPA document *Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA 2016) is provided in **Table 4**.

Table 4: Evaluation of survey methodology against standard constraints outlined in EPA (2016)

Constraint	Degree of limitation	Details
Availability of contextual information	No limitation	The broad scale contextual information described in **Section 2** is adequate to place the site and vegetation in context.
	Minor limitation	Regarding assignment of FCTs, the authoritative Gibson *et al.* (1994) dataset was derived from a necessarily limited sample of vegetation from largely publicly owned land which is now more than 20 years out of date. Consequently, it is unknown to what degree official FCTs are appropriate reference to biodiverse vegetation across the Swan Coastal Plain. Furthermore, Gibson *et al.* (1994) collected data in the spring main flowering period and in many cases sampled plots multiple times to provide a complete species list. This detailed survey sampled the site twice during the main flowering period which was considered appropriate to compare FCT data to the Gibson et al. dataset.
Experience level of personnel	No limitation	This flora and vegetation assessment was undertaken by qualified botanists with five to 13 years of botanical experience in Western Australia. Technical review was undertaken by a senior environmental consultant with over 20 years' experience in environmental science in Western Australia.
Suitability of timing	No limitation	The main survey was conducted over multiple days between August and November and thus within the main flowering season. Sufficient rainfall was recorded from May to September 2022 in the months preceding the site visit. Therefore, it is likely that many plant species would have been in flower and/or visible at the time of survey. The degraded nature of the site limits the potential habitat for native geophytic plants such as orchids and the majority of threatened and priority flora species with potential to occur are perennial species. The survey timing was considered adequate to allow the detection of species for which seasonal timing is critical.
Temporal coverage	No limitation	Detailed flora and vegetation assessments can require multiple visits, at different times of year, and over a period of a number of years, to enable observation of all species present. The site was visited multiple times between August 2022 and February 2023. The November and February site visits provided an insight into the vegetation condition and composition at the end of the main flowering period.

Table 4: Evaluation of survey methodology against standard constraints outlined in EPA (2016) (continued)

Constraint	Degree of limitation	Details
Spatial coverage and access	Limitation	A number of lots in the southern portion of the site could not be accessed (**Section 1.1**). These lots were viewed from the road or adjacent lots wherever possible. The lots that could not be accessed are indicated in the figures and the results were extrapolated from high resolution aerial imagery and adjacent areas. The lots which could not be directly accessed were observed to primarily support market gardens and disturbed rural-residential lots. As such the access restriction is unlikely to represent a significant limitation with regard to assigning plant communities, vegetation condition and the presence/absence of TECs and PECs. Whilst the vegetation within the inaccessible lots was observed to be disturbed, and the suitability of habitat for threatened and priority flora species was limited, the primary limitation relates to compiling a full species list and the confirmation of presence/absence of threatened and priority flora species.
	No limitation	Site coverage (where accessible) was comprehensive (track logged).
Sampling intensity	No limitation	A total of 249 species were recorded, of which 214 were recorded from 21 sample locations and 35 were recorded opportunistically. Minimum species richness within site is estimated at between 302 (Jacknife1) and 363 (Chao2) species (as per the species accumulation curve shown in **Plate 20**). The number of species recorded in the site is less than predicted by the species accumulation curve. As a variety of different plant communities were recorded (wetland, transition and upland), which were often significantly disturbed ('degraded' or 'completely degraded'), it is understandable that species accumulation estimators forecast more species occur in the site than were recorded from sampling. Degraded areas of vegetation were generally not sampled, and given a small number of species were recorded opportunistically, the site was likely under-sampled at scale. However, the most intact vegetation was surveyed and sampled across multiple occasions and it is considered survey effort was adequate to prepare a near-comprehensive species inventory for the site.
Influence of disturbance	Minor limitation	Time since fire is greater than 60 years as interpreted from aerial imagery and therefore short-lived species more common after fire may not have been visible.
	No limitation	Historical ground disturbance was evident in parts of the site. The disturbance history of the site was considered when undertaking field sampling.
Adequacy of resources	No limitation	All resources required to perform the survey were available.

4 Results

4.1 General site conditions

The site encompasses a variety of landforms. A ridge running roughly north to south is located within the western portion of the site and a separate dune peak occurs in the south east. Between these areas the site generally flat or gently sloping and includes several sumpland wetland features. Soils are predominantly sandy, but areas of heavier soils tending to loam or clayey/silty sand occur in lower areas.

Patches of native vegetation occur over much of the site. The native vegetation is most intact on the eastern side of the site and otherwise generally occurs as native overstorey with limited understorey structure. The remainder of the site has been historically cleared and is cultivated (market gardens) or supports non-native pastures species.

4.2 Flora

4.2.1 Desktop assessment

The database search results identified a total of 18 threatened and 23 priority flora species occurring or potentially occurring within a 10 km radius of the site. Information on these species including their habitat preferences and flowering period is provided in **Appendix B**.

Based on background information available for the site, suitable habitat was considered to potentially occur within the site for 12 threatened and 22 priority flora species as shown in **Table 5**.

Table 5: Conservation significant flora species considered to have potential to occur in the site based on known habitat preferences

Species	Level of significance		Life strategy	Habitat	Flowering period
	State	EPBC Act			
Darwinia foetida	EN	CR	P	Grey-white sand on swampy, seasonally wet sites.	Oct-Nov
Caladenia huegelii	CR	EN	PG	Well-drained, deep sandy soils in lush undergrowth in a variety of moisture levels.	Sep-early Nov
Chamelaucium lullfitzii	VU	EN	P	White yellow sand in low woodland.	Oct-Nov
Diuris purdiei	EN	EN	PG	Sand to sandy clay soils in areas subject to winter inundation.	late September to mid-October, but only after a summer or early autumn fire
Drakaea elastica	CR	EN	PG	Bare patches of sand within otherwise dense vegetation in low-lying areas alongside winter-wet swamps. Typically in banksia woodland or thickets of Kunzea glabrescens.	late Sep-Oct/Nov, survey Jul-Aug

Table 5: Conservation significant flora species considered to have potential to occur in the site based on known habitat preferences (continued)

Species	Level of significance		Life strategy	Habitat	Flowering period
	State	EPBC Act			
Grevillea curviloba	EN	EN	P	Grey sand, sandy loam. Winter-wet heath.	Aug-Oct
Macarthuria keigheryi	EN	EN	P	Low-lying winter-wet damp grey/white sands in open patches.	Sep-Dec or Feb-Mar
Melaleuca sp. Wanneroo (G.J. Keighery 16705)	EN	EN	P	Over sand on limestone slopes	Nov-Apr
Anigozanthos viridis subsp. *terraspectans*	VU	VU	P	Grey sand, clay loam. Winter-wet depressions.	Aug-Sep
Diuris micrantha	VU	VU	PG	Dark grey-black sandy clay-loam in winter wet depressions or swamps. Often in shallow standing water.	Aug/Sep- early Oct
Drakaea micrantha	EN	VU	PG	Open sandy patches often adjacent to winter-wet swamps.	Sept- early Oct
Eucalyptus argutifolia	VU	VU	P	Shallow soils over limestone. Slopes or gullies of limestone ridges, outcrops	Mar-Apr
Baeckea sp. Limestone (N. Gibson & M.N. Lyons 1425)	P1	-	P	Grey yellow sand over limestone.	Sep-Dec
Drosera patens	P1	-	P	Sandy soils on margins of winter-wet depressions, swamps and lakes.	Aug-Dec
Drosera x sidjamesii	P1	-	P	Along lake margins, close to winter high-water line	Nov-Dec or Jan-Mar
Grevillea sp. Ocean Reef (D. Pike Joon 4)	P1	-	P	Dry, bare, light yellow-brown/grey sand. Sand dunes.	Nov
Acacia benthamii	P2	-	P	Sand, typically on limestone breakaways	Aug-Sept
Calectasia elegans	P2	-	P	Grey yellow sand on plains.	Sep-Oct
Poranthera moorokatta	P2	-	A	Sandy or clay soils. Dampland or low sandy dunes in banksia woodland.	Sep-early Nov
Stenanthemum sublineare	P2	-	P	White sand on coastal plains.	Oct-Dec
Thelymitra variegata	P2	-	P	Sandy clay, sand, laterite.	Jun-Sep
Austrostipa mundula	P3	-	P	Grey sand over limestone.	Sept-Nov
Conostylis bracteata	P3	-	P	Sand, limestone. Consolidated sand dunes	Aug-Sep

Table 5: Conservation significant flora species considered to have potential to occur in the site based on known habitat preferences (continued)

Species	Level of significance		Life strategy	Habitat	Flowering period
	State	EPBC Act			
Cyathochaeta teretifolia	P3	-	P	Grey sand, sandy clay in swamps and creek edges.	Oct-Jan
Dampiera triloba	P3	-	P	Damp peat/loam soil.	Aug-Dec
Hibbertia leptotheca	P3	-	P	Brown to white sand with limestone.	Aug-Oct
Pimelea calcicola	P3	-	P	Sand, limestone on coastal ridges.	Sep-Nov
Sarcozona bicarinata	P3	-	P	White sand.	Aug
Stylidium paludicola	P3	-	P	Peaty sand over clay. Winter wet habitats. Marri and Melaleuca woodland, Melaleuca shrubland	Oct-Dec
Styphelia filifolia	P3	-	P	Brown over pale yellow sand.	Feb-Apr
Anigozanthos humilis subsp. *chrysanthus*	P4	-	P	Grey or yellow sand	Jul-Oct
Jacksonia sericea	P4	-	P	Calcareous and sandy soils on Swan Coastal Plain	Dec-Feb
Stylidium longitubum	P4	-	A	Sandy clay, clay. Seasonal wetlands.	Oct-Dec
Tripterococcus sp. Brachylobus (A.S. George 14234)	P4	-	P	Winter-wet areas on grey sand.	Oct-Feb

CR=critically endangered, EN=endangered, VU=vulnerable, P1-P4=Priority 1-Priority 4, P=perennial, PG=perennial geophyte.

4.2.2 Species inventory

A total of 198 native and 51 non-native (weed) species were recorded within the site during the field survey, representing 53 families and 163 genera. The dominant families containing native taxa were Fabaceae (28 native taxa and seven weed taxa) and Myrtaceae (22 native taxa and two weed taxa). The most common genus was *Acacia* and *Lomandra* with seven taxa each. Of the species recorded 214 were recorded in sample locations and 35 were recorded opportunistically.

A complete species list is provided in **Appendix C.**

4.2.3 Threatened and priority flora

One priority flora species was recorded within the site, *Jacksonia sericea* (P4) (**Plate 1** and **Plate 2**). *J. sericea* (P4) was locally common within the western portion of the site where 301 individual plants were recorded within the **BaBmJfXp** and **EmXp** plant communities. The locations of the priority flora is shown in **Figure 7**.



Plate 1: Jacksonia sericea (P4) habit



Plate 2: Jacksonia sericea (P4) flower

No other priority or threatened flora species were recorded within the site or are considered likely to occur. The majority of the threatened and priority flora species identified in the desktop assessment are not considered to occur in the site due to lack of suitable habitat and/or because they were not recorded during the field survey. The likelihood of occurrence of threatened and priority flora species results are provided in **Appendix B**.

4.2.4 Locally and regionally significant flora

Two regionally significant flora species, *Dielsia stenostachya* and *Hensmania turbinata* were recorded within the site. *D. stenostachya* is listed as 'significant flora of the Bassendean Dunes in the Perth metropolitan region' as it is endemic to the Swan Coastal Plain. *H. turbinata* is listed as significant because the site is at the 'northern or southern limit of its known geographical range' (Government of WA 2000b).

4.2.5 Declared pests

Two species listed as a declared pest (C3) pursuant to the BAM Act, **Asparagus asparagoides* (bridal creeper) and **Moraea flaccida* (one leaf cape tulip), was recorded within the site. Bridal creeper is also listed as a WoNs.

4.3 Vegetation

4.3.1 Desktop assessment

The database search results identified 10 TECs and eight PECs occurring or potentially occurring within a 10 km radius of the site. Information on these communities is provided in **Appendix D**.

Based on geomorphology, soils and regional vegetation patterns, seven TECs and five PECs were considered to have potential to occur in the site:

- 'Shrublands on dry clay flats' which is listed as 'critically endangered' under the EPBC Act and 'endangered' in WA.
- '*Banksia attenuata* woodlands over species rich dense shrublands' which is listed as endangered under the EPBC Act and in WA.
- 'Banksia woodlands of the Swan Coastal Plain' TEC/PEC which is listed as 'endangered' under EPBC Act and as Priority 3 in WA.

- '*Banksia ilicifolia* woodlands' which is listed as 'endangered' under EPBC Act and as Priority 3 in WA.
- 'Low lying *Banksia attenuata* woodlands or shrublands' which is listed as 'endangered' under EPBC Act and as Priority 3 in WA.
- 'Swan Coastal Plain *Banksia attenuata* - *Banksia menziesii* woodlands' which is listed as 'endangered' under EPBC Act and as Priority 3 in WA.
- 'Tuart (*Eucalyptus gomphocephala*) woodlands and forests of the Swan Coastal Plain' which is listed as 'critically endangered' under the EPBC Act and Priority 3 in WA.

4.3.2 Plant communities

A total of 17 plant communities were identified within the site. Plant community **EmXp** was the largest native plant community, mapped across the ridge present within the western portion of the site. Plant communities **BaBmEpAn**, **BaBmJfXp** and **Xp** were associated with upland areas of the site, within the western and south-eastern portions.

Plant communities **BaBmKgSi**, **BiAc**, **Cc**, **EmKg**, **ErAc**, **ErAs**, **ErLb**, **HaRc**, **Kg**, **KgAl**, **Mp** and **Mt** are located across the lower-lying areas of the site, associated with wetland features, and are present in different structural formations ranging from shrubland to closed forest. Whilst the wetland features were associated were observed to be dry year-round during the field surveys, these communities are likely associated, if not dependent on shallow groundwater, and have therefore been classified as 'wetland' vegetation.

The majority of the site contains non-native vegetation, dominated by non-native pasture grasses. Vegetation present within lots that were not accessed during the survey was able to be assessed from neighbouring lots, road reserves and aerial imagery.

A description and the area of each plant community is provided in **Table 6** and representative photographs of each are provided in **Plate 3** to **Plate 19**. The location of each plant community is shown in **Figure 5**. A matrix of species recorded within each plant community is provided in **Appendix E** and raw sample data in **Appendix F**.

Table 6: Description and extent of plant communities identified within the site

Plant community	Description	Area (ha)
Upland		
BaBmEpAn	Low woodland of *Banksia menziesii*, *Banksia attenuata*, *Eucalyptus todtiana* and *Nuytsia floribunda* over open shrubland of *Adenanthos cygnorum*, *Eremaea pauciflora* and *Jacksonia furcellata* over low shrubland of *Hibbertia hypericoides*, *Hypocalymma robustum* and *Scholtzia involucrata* over forbland of *Alexgeorgea nitens*, *Lyginia barbata* and open grassland of **Ehrharta calycina* and **Briza maxima* (**Plate 3**).	5.40
BaBmJfXp	Low woodland of *Banksia menziesii*, *Banksia attenuata* and *Allocasuarina fraseriana* over shrubland of *Jacksonia furcellata* over low shrubland of *Hibbertia hypericoides*, *Acacia huegelii* and *Conostephium pendulum* over forbland of *Desmocladus flexuosus* and *Alexgeorgea nitens* over open grassland of **Ehrharta calycina* and **Briza maxima* (**Plate 4**)	0.57

Table 6: Description and extent of plant communities identified within the site (continued)

Plant community	Description	Area (ha)
Upland		
EmXp	Woodland of *Eucalyptus marginata* over low woodland of *Banksia menziesii* (or absent) over shrubland of *Xanthorrhoea preissii* and *Jacksonia sternbergiana* over low open shrubland of *Hibbertia hypericoides*, *Jacksonia sericea* and *Persoonia saccata* over forbland of *Mesomelaena pseudostygia* and *Desmocladus flexuosus* over open grassland of **Ehrharta calycina* and **Briza maxima* (**Plate 5**).	23.7
Xp	Scattered *Eucalyptus todtiana* over open shrubland of *Xanthorrhoea preissii* and *Jacksonia furcellata* over open low shrubland of *Lechenaultia biloba* over forbland of *Haemodorum spicatum* and *Patersonia occidentalis* over open grassland of **Ehrharta calycina* and **Briza maxima* (**Plate 6**).	21.43
Wetland		
BaBmKgSi	Low woodland of *Banksia attenuata* and *Banksia menziesii* over shrubland of *Kunzea glabrescens* and *Adenanthos cygnorum* over low shrubland of *Acacia pulchella* var. *pulchella*, *Bossiaea eriocarpa* and *Scholtzia involucrata* over forbland of *Sowerbaea laxiflora*, *Stylidium repens* and *Lyginia barbata* over open grassland of **Ehrharta calycina* and **Briza maxima* (**Plate 7**)	1.84
BiAc	Low open woodland of *Banksia ilicifolia* and *Eucalyptus todtiana* over open shrubland of *Adenanthos cygnorum*, **Acacia longifolia* and *Kunzea glabrescens* over low shrubland of *Macarthuria australis*, *Scholtzia involucrata* and *Acacia pulchella* var. *pulchella* over forbland of *Alexgeorgea nitens*, *Desmocladus flexuosus* and **Carpobrotus edulis* open grassland of *Microlaena stipoides*, **Ehrharta* spp. and **Briza maxima* (**Plate 8**).	5.05
Cc	Closed forest of *Corymbia calophylla* and *Eucalyptus rudis* over open shrubland of *Xanthorrhoea preissii* over closed fernland of *Pteridium esculentum* over forbland of *Sowerbaea laxiflora* and open grassland of **Ehrharta calycina* and **Briza maxima* (**Plate 9**).	0.73
EmKg	Open forest of *Eucalyptus marginata* and *Melaleuca preissiana* over tall shrubland of *Kunzea glabrescens* and **Acacia longifolia* over shrubland of *Xanthorrhoea preissii*, *Pultenaea reticulata* and *Conostephium pendulum* over forbland of *Phlebocarya ciliata* and *Dasypogon bromeliifolius* over open grassland of **Ehrharta calycina* and **Briza maxima* (**Plate 10**).	4.74
ErAc	Open forest of *Eucalyptus rudis* over shrubland of *Adenanthos cygnorum*, *Regelia ciliata* and *Kunzea glabrescens* over forbland of **Carpobrotus edulis* and *Trachymene pilosa* over open grassland of **Ehrharta calycina* and **Vulpia myuros* (**Plate 11**).	7.83
ErAs	Open forest of *Eucalyptus rudis* over open tall shrubland of *Astartea scoparia* and **Acacia longifolia* over sparse open shrubland of *Hibbertia cuneiformis* over forbland of *Dielsia stenostachya* over open grassland of **Briza maxima* and **Romulea rosea* (**Plate 12**).	10.79
ErLb	Open forest of *Eucalyptus rudis* over open tall shrubland of *Exocarpos sparteus*, *Astartea scoparia* and *Jacksonia furcellata* over forbland of *Lyginia barbata*, *Lepidosperma longitudinale* and *Hypolaena exsulca* over grassland of *Ehrharta* spp. and **Pentameris airoides* (**Plate 13**).	8.58
HaRc	Scattered *Melaleuca preissiana* over shrubland of *Hypocalymma angustifolium* and *Regelia ciliata* over forbland of *Dasypogon bromeliifolius*, *Hypolaena exsulca* and *Lyginia barbata* over open grassland of **Ehrharta calycina* and **Briza maxima* (**Plate 14**).	4.64
Kg	Scattered *Eucalyptus rudis* over closed tall shrubland of *Kunzea glabrescens* and **Acacia longifolia* over shrubland of *Hypocalymma angustifolium* over scattered grassland of **Ehrharta longiflora* (**Plate 15**).	12.07

Table 6: Description and extent of plant communities identified within the site (continued)

Plant community	Description	Area (ha)
Wetland		
KgAl	Scattered *Eucalyptus rudis and* **Pinus pinaster* over closed tall shrubland of *Kunzea glabrescens* and **Acacia longifolia* over shrubland of *Pultenaea reticulata* over forbland of *Machaerina vaginalis* and *Lyginia barbata* over scattered grassland of **Ehrharta longiflora* and **Briza maxima* (**Plate 16**).	10.42
Mp	Open forest of *Melaleuca preissiana* over shrubland of *Adenanthos cygnorum* and *Xanthorrhoea preissii* over forbland of *Dasypogon bromeliifolius*, *Patersonia occidentalis* and *Phlebocarya ciliata* over open grassland of **Ehrharta calycina* (**Plate 17**).	2.74
Mt	Open shrubland of *Melaleuca teretifolia* over forbland of **Carpobrotus edulis* and **Lotus angustissimus* over grassland of **Bromus diandrus*, **Ehrharta* spp and **Pentameris airoides* (**Plate 18**).	11.43
Non-native	Heavily disturbed areas comprising non-native or planted vegetation with occasional scattered native trees, shrubs or forbs. Buildings, bare ground and areas of horticulture were also included in this community (**Plate 19**).	181.84



*Plate 3: Plant community **BaBmEpAn** in 'very good' condition*



*Plate 4: Plant community **BaBmJfXp** in 'very good' condition*



*Plate 5: Plant community **EmXp** in 'good' condition*



*Plate 6: Plant community **Xp** in 'degraded' condition*



*Plate 7: Plant community **BaBmKgSi** in 'very good' condition*



*Plate 8: Plant community **BiAc** in 'very good' condition*



*Plate 9: Plant community **Cc** in 'very good' condition*



*Plate 10: Plant community **EmKg** in 'very good' condition*



*Plate 11: Plant community **ErAc** in 'good' condition*



*Plate 12: Plant community **ErAs** in 'good ' condition*



*Plate 13: Plant community **ErLb** in 'good' condition*



*Plate 14: Plant community **HaRc** in 'good' condition*



*Plate 15: Plant community **Kg** in 'good' condition*



*Plate 16: Plant community **KgAl** in 'good' condition*



*Plate 17: Plant community **Mp** in 'degraded' condition*



*Plate 18: Plant community **Mt** in 'degraded' condition*



*Plate 19: **Non-native** vegetation in 'completely degraded' condition*

4.3.3 Vegetation condition

The most intact native vegetation is located in the eastern portion of the site. Plant communities **BaBmJfXp**, **BaBmKgSi** and **Cc** and portions of communities **BaBmEpAn**, **BiAc**, **EmKg**, **ErAs** and **HaRc** were mapped as being in 'very good' condition. The remainder of the native vegetation within the site was mapped in condition ranging from 'good' to 'degraded.

The areas of non-native vegetation within the site were mapped in 'completely degraded' condition and consist of scattered native species including *Jacksonia furcellata* and *Xanthorrhoea preissii* over non-native species of pasture grasses. Market gardens, roads and areas of buildings and bare earth were also mapped as being in 'completely degraded' condition.

The extent of vegetation by condition category is detailed in **Table 7** and shown in **Figure 6**.

Table 7: Extent of vegetation condition categories within the site

Condition category (Keighery 1994)	Size (ha)
Pristine	0
Excellent	0
Very good	25.16
Good	64.59
Good - degraded	2.04
Degraded	40.16
Completely degraded	181.84

4.3.4 Floristic community types

The areas of upland vegetation within the site were determined to represent the following FCTs:

- FCT 23a 'central Banksia attenuata – B. menziesii woodlands'
- FCT 28 'Spearwood *Banksia attenuata* or *Banksia attenuata – Eucalyptus* woodlands'.

Areas of vegetation located in lower-lying areas of the site, associated with wetland features were determined to represent several FCTs:

- FCT 4: '*Melaleuca preissiana* damplands'
- FCT 6: 'weed dominated wetlands on heavy soils'
- FCT 11: 'wet forests and woodlands'
- FCT 14: 'deeper wetlands on sandy soils'
- FCT 21c 'low lying *Banksia attenuata* woodlands or shrublands'

Areas of the site where the plant communities were in 'degraded' condition were considered too disturbed to assign an FCT. Nevertheless they are likely remnants of the aforementioned FCTs.

The plant community alignment with the Gibson *et al*. (1994) FCT sites are shown in **Table 8** and the relevant portions of the cluster dendrograms showing Q1, Q5, R6, R7, Q10, Q11, R17, R20 and R21 are provided in **Appendix G**.

Table 8: Plant community and likely FCT represented within the site for each sample

Plant community	Sample unit	Most similar Gibson *et al.* (1994) sites	Similarity (%)	Most likely floristic community type (FCT)	Reservation and conservation status (Gibson *et al.* 1994)
BaBmEpAn	**Q1**	WIRR-1 (FCT 23a)	46	FCT 23a: Central *Banksia attenuata – B. menziesii* woodlands	Well reserved Low risk
	Q2^	WIRR-2 (FCT 23a)	41		
		HURST04 (FCT 23a)	40		
		MODO-2 (FCT 21c)	39		
BaBmJfXp	**Q11**	KING-2 (FCT 28)	49	FCT 28: Spearwood *Banksia attenuata* or *Banksia attenuata – Eucalyptus* woodlands	Well reserved Low risk
BaBmKgSi	**Q5**	HYMUS03 (FCT 21c)	40	FCT 21c: Low lying *Banksia attenuata* woodlands or shrublands	Well reserved Susceptible
BiAc	**Q9^**	THOM-2 (FCT 24)	50	FCT 21c: Low lying *Banksia attenuata* woodlands or shrublands	Well reserved Susceptible
		FL-5 (FCT 21c)	49		
		WAND-1 (FCT 23a)	48		
Cc	**R7**	ROWE01 (FCT 11)	36	FCT 11: Wet forests and woodlands	Well reserved Low risk
EmKg	**R3^**	MODO-2 (FCT 21c)	40	FCT 21c: Low lying *Banksia attenuata* woodlands or shrublands	Well reserved Susceptible
		HARRY-4 (FCT 23a)	39		
	Q4^	LOW07 (FCT 21c)	40		
		HARRY-5 (FCT 21a)	40		
EmXp	**Q12^**	SHENT-1 (FCT 28)	45	FCT 28: Spearwood *Banksia attenuata* or *Banksia attenuata – Eucalyptus* woodlands	Well reserved Low risk
		KING-2 (FCT 28)	42		
	Q13^	WARI-2 (FCT 28)	49		
		SHENT-1 (FCT 28)	46		
ErAc	**R17**	YAN-21 (FCT 14)	26	FCT 14: Deeper wetlands on sandy soils	Unreserved Insufficiently known
ErAs	**R20**	HYMUS01 (FCT 11)	48	FCT 11: Wet forests and woodlands	Well reserved Low risk
ErLb	**Q14^**	CARD-11 (FCT 6)	30	FCT 6: Weed dominated wetlands on heavy soils	Well reserved Low risk
		ELLEN-7 (FCT 6	30		
HaRc	**Q15^**	MODO-3 (FCT 11)	32	FCT 4: *Melaleuca preissiana* damplands	Well reserved Low risk
		FL-9 (FCT 4)	32		
		MELA-1 (FCT 4)	31		

Table 8: Plant community and likely FCT represented within the site for each sample (continued)

Plant community	Sample unit	Most similar Gibson *et al.* (1994) sites	Similarity (%)	Most likely floristic community type (FCT)	Reservation and conservation status (Gibson *et al.* 1994)
Kg	**R6**	PEARCE-1 (FCT 6)	18	FCT 6: Weed dominated wetlands on heavy soils	Well reserved Low risk
	R21	CARD10 (FCT 6)	19		
KgAl	**Q10**	YAN-21 (FCT 14)	34	FCT 14: Deeper wetlands on sandy soils	Unreserved Insufficiently known

Note: ^ shows highest percent similarity to individual Gibson et al. (1994) samples rather than similarity to a cluster of samples.

4.3.5 Threatened and priority ecological communities

The following TECs and PECs were identified within the site:

- 'Banksia woodlands of the Swan Coastal Plain' TEC/PEC.
- 'Low lying *Banksia attenuata* woodlands or shrublands' PEC

The locations of the TECs and PECs within the site are shown in **Figure 7**.

The structure, composition and patch sizes of portions of plant community **BaBmEpAn**, **BaBmJfXp**, **BaBmKgSi** and **BaAc** indicates that it represents the Commonwealth listed 'banksia woodlands of the Swan Coastal Plain' TEC (banksia woodland TEC), as outlined in **Table 8**.

Table 9: Criteria for determining presence of Banksia Woodlands of the Swan Coastal Plain TEC adapted from DoEE (2016a)

Criteria	Requirements for meeting criteria	Site implications
1. Must meet key diagnostic characteristics	A variety of factors relating to: • Location • Soils • Structure • Composition	• Site meets location and soils criteria. • The **BaBmEpAn**, **BaBmJfXp**, **BaBmKgSi** and **BiAc** vegetation includes the key diagnostic feature of a tree layer of *Banksia attenuata*, *Banksia menziesii* and/or *Banksia ilicifolia*. • The **BaBmEpAn**, **BaBmJfXp**, **BaBmKgSi** and **BiAc** vegetation within site also meets structure and composition criterion. FCTs 21c, 23a and 28 are identified as constituent FCTs comprising the banksia woodland TEC.
2. Must meet condition thresholds	• A patch should at least meet the 'good' condition category (see **Table 2**)	• The **BaBmEpAn** vegetation within the south-eastern portion is present in 'very good' and 'good - degraded' condition. The conservation advice indicates that a single patch may include areas of variable condition, meaning the **BaBmEpAn** vegetation in 'good - degraded' condition may still be considered the TEC as they are contiguous with vegetation in 'very good' condition. • The **BaBmJfXp** vegetation within the western portion is in 'very good' condition. • The **BaBmKgSi** vegetation within the western portion is in 'very good' condition • The **BiAc** vegetation within the eastern portion of the site is present in 'very good' condition.

Table 9: Criteria for determining presence of Banksia Woodlands of the Swan Coastal Plain TEC adapted from DoEE (2016a) (continued)

Criteria	Requirements for meeting criteria	Site implications
3. Must meet minimum patch size	Minimum size of patch: • Pristine=no minimum size • Excellent=0.5 ha • Very Good=1 ha • Good=2 ha	• The **BaBmEpAn** vegetation in 'very good' condition in the south-eastern portion is 2.87 ha, which meet this criterion. • The **BaBmEpAn** vegetation in 'good – degraded' condition is mapped across 2.04 ha. This vegetation would be viewed as contiguous with the 2.87 ha patch, and therefore increases the patch of TEC to 4.91 ha. • The **BaBmJfXp** vegetation within the western portion of the site is present in 'very good' condition that is mapped across 0.57 ha. This patch alone does not meet the minimum patch size criterion. However, the vegetation in the adjacent lot to the west of the site represents banksia woodland TEC (Emerge Associates 2018). As the **BaBmJfXp** vegetation within the western portion of the site is contiguous with the vegetation to the west of the site, it forms a patch of the TEC. • The **BaBmKgSi** vegetation in 'very good' condition in the south-eastern portion is 1.84 ha, which meets this criterion. • The **BaBmEpAn** vegetation within the central portion of the site in 'good' condition is mapped across 0.49 ha. This vegetation does not independently meet this criterion. • The **BiAc** vegetation within the eastern portion of the site in 'very good' condition that is mapped across 4.78 ha, which meets the minimum patch size. • The **BiAc** vegetation within the northern portion in 'good' condition and is mapped across 0.27 ha which does not independently meet this criterion.
4. Must incorporate surrounding context	• Breaks (e.g. tracks) < 30 m do not separate vegetation into separate patches • Buffer zones may apply (20-50 m recommended from patch edge) • The site should be thoroughly sampled (2 surveys in same spring). • Survey timing should be appropriate. • Surrounding environment should be considered (e.g. connectivity, conservation values, fauna habitat)	• Small scale tracks (<30 m wide) exist within the **BaBmEpAn**, **BaBmJfXp**, **BaBmKgSi** patches within the western and the south-eastern portions. • Land surrounding the patches is a combination of native vegetation, cleared areas and rural-residential properties. • This survey was conducted between August and November (within the main flowering period). • Formal assessment of vegetation to the north of the northern **BiAc** patch was not undertaken. However, photos taken during the surveys and review of aerial imagery indicates that this vegetation tends towards wetland vegetation that would not meet the diagnostic criteria for the banksia woodland TEC and would not form a patch with the vegetation within the site.
Result	The site supports 12.10 ha of the banksia woodland of the Swan Coastal Plain TEC.	

DBCA's *Priority Ecological Community* list indicates that the description, area and condition thresholds that apply to the Commonwealth-listed TEC of the same name also apply to the 'banksia woodlands of the Swan Coastal Plain' PEC (DBCA 2022c). Therefore, total of 12.10 ha of this PEC occurs within the site as shown in **Figure 7**.

FCT 21c is synonymous with the State listed SCP21c 'low lying *Banksia attenuata* woodlands of shrublands' PEC. No conservation advice exists for the SCP21c PEC so it is unclear whether a condition threshold should be applied when identifying its presence. DBCA has historically applied 'good' condition as a threshold for the identification of conservation significant vegetation. The **BaBmKgSi** and **BiAc** vegetation that represents FCT 21c occurs in 'good' or 'very good' condition and therefore is considered to represent this PEC. A total of 6.89 ha of this PEC occurs within the site as shown in **Figure 7**.

No other TECs or PECs were recorded or are considered likely to occur within the site.

4.3.6 Locally and regionally significant vegetation

Plant communities **BiAc**, **Cc**, **EmKg**, **ErAc**, **ErAs**, **ErLb**, **HaRc**, **Kg**, **KgAl**, **Mp** and **Mt** were associated with wetland features. Whilst the wetland features were apparently dry year-round (from observation during the field survey), these communities are likely associated, if not dependent on shallow groundwater.

Multiple plant species within the site provide habitat for threatened species of black cockatoo. In particular, the *Corymbia calophylla*, *Eucalyptus marginata*, *E. todtiana*, *E. rudis* and *Banksia* spp. trees may provide potential breeding, roosting and/or foraging habitat for black cockatoos.

Areas of vegetation in 'good' or better condition where intact native understorey provides suitable habitat for native fauna including some that may be conservation significant.

4.4 Species richness

A total of 214 species were recorded from 21 samples. A species accumulation curve derived from sample data is presented in **Plate 20**. After 21 samples the curve is still increasing and has not reached its asymptote. This indicates that a proportion of species likely remain undetected by sampling.

Species richness was estimated in PRIMER v6 to be between 302 (Jacknife1) and 363 (Chao2). Based on the trend of the species accumulation curve more than 50 samples would be required to capture that many species. Including the 35 additional species recorded opportunistically, a total of 249 species was recorded in the site. This indicates that between 69 and 82% of the estimated 302 - 363 species in the site were recorded.

As a variety of different plant communities were recorded (wetland, transition and upland), which were often significantly disturbed ('degraded' or 'completely degraded'), it is understandable that species accumulation estimators forecast more species occur in the site than were recorded from sampling. Degraded areas of vegetation were generally not sampled, and given a small number of species were recorded opportunistically, the site was likely under-sampled at scale. However, the most intact vegetation was surveyed and sampled across multiple occasions and it is considered survey effort was adequate to prepare a near-comprehensive species inventory for the site.

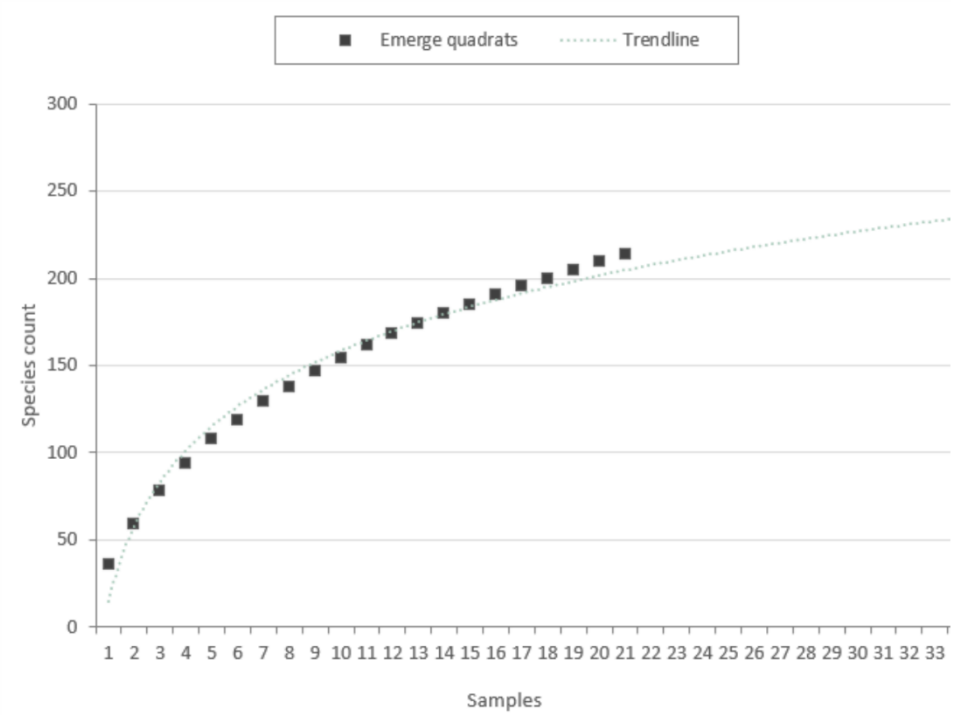

Plate 20: Species accumulation curve derived from sample data (y =62.335ln(x) + 14.96, R^2 = 0.9809)

5 Discussion

5.1 Threatened and priority flora

Jacksonia sericea (P4) was common where it was recorded in the western portion of the site. The low shrub habit of this species is readily detectable and it is likely most if not all, individuals were recorded. *J. sericea* is known to extend across calcareous and sandy soils of the Swan Coastal Plain, from south of Mandurah to north of Joondalup, with numerous records occur within 10 km of the site. With regard to other threatened or priority flora with potential to occur (refer **Section 4.2.1**), the absence of the larger perennial species such as *Eucalyptus argutifolia*, *Grevillea curviloba* subsp. *incurva* and *Melaleuca* sp. Wanneroo (G.J. Keighery 16705) was relatively easy to confirm. However, due to their size and seasonal lifeform, smaller annual or geophytic species such as *Caladenia huegelii*, *Drakaea elastica*, *D. micrantha*, *Diuris micrantha, Poranthera moorokatta* and *Stylidium longitubum* can be more difficult to detect.

The timing of the surveys coincided with the main flowering period of the majority of smaller annual or geophytic conservation significant flora identified in the desktop assessment and therefore they should have been visible, if present. Areas of suitable habitat were searched intensively for these species and, as none were detected, it is considered unlikely that they occur in the site.

It is very unlikely that any threatened and priority flora species occur within the lots that could not be accessed in the south of the site as vegetation in these lots appears completely degraded. However, the presence or absence of such species could not be confirmed given physical access was not possible.

5.2 Vegetation condition

The method applied to assess vegetation condition was robust, as it combined the standard qualitative, categorical scheme of Keighery (1994), with the additional indicators for diversity and weed cover outlined in DoEE (2016b).

BaBmEpAn, **BaBmJfXp** and **BaBmKgSi** vegetation was mapped as being in 'very good' condition as it retains the structure expected of a banksia woodland community and has moderate native species diversity. A patch of the **BaBmEpAn** was mapped in 'good – degraded' condition as there were localised patches of low native species diversity, with high grassy weed cover across the majority of the patch. The structure of this patch of **BaBmEpAn** vegetation is significantly altered by obvious signs of disturbance, particularly historical clearing. Weed cover also exceeded 50% across the majority of the patch, aligning with 'degraded' condition (DoEE 2016b). However, whilst native species diversity was low there were enough species present to align the patch with a 'good' condition rating (DoEE 2016b).

Similarly, the **BiAc**, **HaRc** and **ErAs** vegetation retains the structure composition expected of heathland or wetland communities. The **EmKg** vegetation has high species diversity and low weed cover, with structure that is appropriate for the transitional zone between areas of adjacent banksia woodland and wetland vegetation.

Plant communities **EmKg**, **ErLb** and **KgAl** and portions of communities **BaBmEpAn**, **BiAc**, **ErAs**, **ErAc**, **HaRc**, **Kg** were mapped in 'good' condition due to higher weed cover and lower native species cover. Weed cover was predominantly grassy weed species, with woody weeds (**Acacia longifolia*) the dominant weed in the **KgAl** community.

Plant communities **Mp**, **Mt** and **Xp** and portions of communities **ErAc**, **ErAs** and **Kg** were mapped in 'degraded' condition due to the basic vegetation structure being severely impacted by disturbance with minimal understorey structure and high weed cover. Localised patches of the **Xp** community contained reasonable native cover in parts. However, due to the high degree of disturbance and high weed cover, it was mapped in 'degraded' condition.

The vegetation within lots that were unable to be accessed was predominantly assigned 'completely degraded' condition, except where it could be confirmed over the boundary that native plant communities occur (that is extended over the boundary from accessible lots). Otherwise, it was apparent that most vegetation had been subject to significant historical disturbance, and appeared to support predominantly planted vegetation and non-native pasture grasses.

5.3 Floristic community type assignment

The site is relatively large and prior to historical disturbance would have supported a mosaic of plant communities associated with upland and wetland environments linked by transitional assemblages.

Samples within the **BaBmEpAn** plant community clustered with FCT 23a 'central Banksia attenuata – B. menziesii woodlands', whilst Q11 within the **BaBmJfXp** plant community clustered with FCT 28 'Spearwood *Banksia attenuata* or *Banksia attenuata – Eucalyptus* woodlands'. Sample Q5 within the **BaBmKgSi** plant community clustered with FCT 21c 'low lying Banksia attenuata woodlands or shrublands'. These banksia woodland samples clustered with high similarity, and appropriately reflect the variation in topography and soil associations within the site.

Sample R3 in plant community **EmKg** clustered with FCT 4 '*Melaleuca preissiana* damplands' and showed highest similarity to a Gibson *et al.* (1994) site representing FCT 21c (40%). Q4 in **EmKg** clustered with two FCT 21a 'Central *Banksia attenuata – Eucalyptus marginata* woodlands' sites. As plant community **EmKg** was mapped within a lower-lying area of the site, in association with a wetland feature, and the predominant overstorey of *Eucalyptus marginata* and *Melaleuca preissiana*, it is considered assignment of the **EmKg** community to FCT 21c was the most appropriate FCT classification for this vegetation.

Plant community **EmXp** clustered with FCT 6 'weed dominated wetlands on heavy soils' with moderate similarity (32%), which was unexpected as the community was dominated by upland vegetation. Examination of the Gibson *et al.* (1994) data showed a highest similarity to a site representing FCT 28 (45%). Given the location of the plant community with the Spearwood dune system, and the presence of upland flora species, it is considered assignment of the **EmXp** community to FCT 28 was the most appropriate FCT classification for this vegetation, albeit without a dominant overstorey of *Banksia* spp.

Plant community **BiAc** clustered with FCT 24 'northern Spearwood shrublands and woodlands' and showed highest similarity with Gibson *et al.* (1994) sites representing FCT 24 and FCT 21c. FCT 24 are

predominantly heath communities, and are located on the Spearwood dune systems. Given plant community **BiAc** is located on the Bassendean dune system and is a low open woodland community within a low-lying area adjacent to a wetland feature, it is considered that assignment to FCT 24 is not appropriate. Due to the presence of species including *Banksia menziesii*, *Kunzea glabrescens*, *Gompholobium tomentosum*, *Lyginia barbata* and *Stylidium repens*, it is considered assignment of the **BiAc** community to FCT 21c was the most appropriate FCT classification for this vegetation.

Plant community **HaRc** clustered with FCT 11, and showed highest similarity with Gibson *et al.* (1994) sites representing FCT 11 and FCT 4. FCT 11 is dominated by an overstorey of *Corymbia calophylla* or *Eucalyptus rudis*, which were absent from the **HaRc** plant community. Given the absence of the dominant FCT 11 overstorey species, presence of key FCT 4 species including *M. preissiana*, *Hypocalymma angustifolium* and *Hypolaena exsulca* and the location of the patches of the **HaRc** plant communities adjacent to wetland features, it is considered assignment of the **HaRc** community to FCT 4 was the most appropriate FCT classification for this vegetation.

Plant communities **ErLb** and **Kg** clustered with two FCT 6 sites which was considered appropriate as these communities occur association with wetland features that have been disturbed by historical clearing, and as a result has low native species diversity and high weed cover.

Sample R7 in the **Cc** plant community and R20 within the **ErAs** plant community clustered with FCT 11 'wet forests and woodlands'. This was considered appropriate, due to the forest structure of the vegetation and growth in association with a wetland feature.

Sample R17 in the **ErAc** plant community and Q10 within the **KgAl** plant community clustered with FCT 14 'deeper wetlands on sandy soils'. The assignment of these two communities to FCT 14 is considered appropriate due to their association with wetland features that appeared to have historically had wetter hydrological regimes than currently occurs.

No FCT analysis was undertaken for plant communities **Mp**, **Mt** and **Xp** due to the low number of native species present and the high weed cover. Plant community **Mp** was inferred to represent FCT 4 due to the *M. preissiana* overstorey and adjacent **HaRc** community that was determined to represent the same FCT. Plant community **Mt** was dominated by *Melaleuca teretifolia* and did not align with any of the FCTs. A review of historical aerial imagery shows that this area was previously regularly inundated and the change in hydrological regime has impacted the native vegetation communities. Plant community **Xp** was significantly disturbed and lacked a native understorey. The community was located adjacent to the **BaBmJfXp** community that aligned with FCT 28, and it was inferred that the **Xp** plant community would represent a degraded form of this FCT.

5.4 Threatened and priority ecological communities

Four patches of vegetation were determined to meet the criteria for the banksia woodlands TEC/PEC, as shown in **Figure 7**. The three patches of **BaBmEpAn**, **BaBmKgSi** and **BiAc** vegetation within the eastern portion of the site meet the diagnostic criteria. This includes 2.04 ha of **BaBmEpAn** vegetation in 'good – degraded' condition which does not independently meet the diagnostic criteria, as a patch is required to be in 'good' condition or better. However, as this vegetation is contiguous with a 2.87 ha patch in 'very good' condition, the **BaBmEpAn** vegetation is a single patch extending across 4.91 ha, in predominantly 'very good' condition.

The **BiAc** vegetation within the northern portion of the site does not meet the minimum patch size required to be mapped as the banksia woodland TEC/PEC. The vegetation adjacent to the site was not surveyed. However, assessment of this vegetation from within the site indicated that the vegetation was not representative of the banksia woodland TEC due to a lack of *Banksia* overstorey. Therefore, the **BiAc** vegetation within the northern portion is not independently mapped as the banksia woodland TEC, nor is it part of a larger patch extending outside of the site.

The **BaBmJfXp** vegetation within the western portion (0.57 ha) of the site does not independently meet the minimum patch size criteria for the banksia woodland TEC/PEC. However, vegetation within the adjacent Lot 4 Coogee Road is mapped as representing 2.94 of the banksia woodland TEC/PEC in 'very good' and 'very good – good' condition (Emerge Associates 2018). The vegetation within the site is separated from the adjacent vegetation through small breaks (< 30 m) which do not break up the overall patch. Accordingly, the **BaBmJfXp** vegetation within the site forms part of a larger patch of the banksia woodland TEC/PEC which extends to the west.

An additional 1.08 ha of the banksia woodland TEC/PEC is known to occur within Lot 3 Coogee Road (Strategen 2017). Lot 3 is adjacent to the western boundary of the site and directly north of Lot 4. The banksia woodland TEC/PEC patch therefore extends over at least 4.59 ha, including the vegetation within the site and adjacent Lots 3 and 4. Emerge Associates (2018) noted that the banksia woodland TEC/PEC is likely to extend further to the west of Lots 3 and 4, and therefore the patch size is likely to be larger than 4.59 ha.

Plant communities **EmKg** and **EmXp** were determined to represent communities that are constituent FCTs of the banksia woodland TEC (FCT 21c and FCT 28 respectively) (DoEE 2016). As these plant communities do not have the key diagnostic feature of a tree layer of *Banksia attenuata* and/or *B. menziesii* they were determined not to represent the banksia woodland TEC.

Plant communities **BaBmKgSi** and **BiAc** were determined to represent FCT 21c which is associated with the State listed PEC 'low lying *Banksia attenuata* woodlands of shrublands' (P3). No conservation advice exists for this PEC. However, DBCA has historically applied 'good' condition as a threshold for the identification of conservation significant vegetation. Based on this, 6.89 ha of this PEC was identified within the eastern portion of the site.

5.5 Wetland vegetation

Plant communities **BaBmKgSi**, **BiAc**, **Cc**, **EmKg**, **ErAc**, **ErAs**, **ErLb**, **HaRc**, **Kg**, **KgAl**, **Mp** and **Mt** are located across the lower-lying areas of the site, are associated with wetland features, and contain a number of plant species that are likely to be dependent on wetter soil conditions such as *Eucalyptus rudis*, *Melaleuca preissiana*, *Astartea scoparia* and *Machaerina juncea*. These plant communities may therefore be considered wetland vegetation.

5.6 Locally and regionally significant flora and vegetation

Flora and vegetation may be significant irrespective of protection under policy or legislation. Two key reasons that flora or vegetation within the site may be significant are listed below:

- The vegetation has potential value as habitat for threatened or priority fauna species. In particular, mature *Corymbia calophylla*, *Eucalyptus marginata* and to a lesser extent *Eucalyptus rudis* and *Eucalyptus todtiana* trees have the potential to provide breeding or foraging habitat for black cockatoos listed as threatened under the EPBC Act and BC Act. Where native vegetation is relatively intact it provides habitat for quenda (P4) and banksia woodland vegetation provides habitat for black-striped burrowing snake (P3) (Emerge Associates 2023).
- Two flora species listed in *Bush Forever* 'significant flora of the Bassendean dunes in the Perth metropolitan region', *Dielsia stenostachya* and *Hensmania turbinata*, occur within the site (Government of WA 2000b).

6 Conclusions

Over half the site is highly disturbed and modified, with approximately 181.84 ha comprising non-native vegetation, market gardens and roads in 'completely degraded' condition. The remaining 131.94 ha of the site supports native vegetation.

Seventeen plant communities were identified that are present in 'very good', 'good', 'good - degraded', degraded' and 'completely degraded' condition.

One priority flora species were recorded within the site, *Jacksonia sericea* (P4). A total 301 individuals of *J. sericea* (P4) were recorded.

A total of 12.10 ha of the Commonwealth listed TEC and State listed PEC 'banksia woodlands of the Swan Coastal Plain' was recorded in the site.

A total of 6.89 ha of the State listed PEC 'low lying *Banksia attenuata* woodlands of shrublands' (P3) was recorded within the site.

Plant communities **BaBmKgSi**, **BiAc**, **Cc**, **EmKg**, **ErAc**, **ErAs**, **ErLb**, **HaRc**, **Kg**, **KgAl**, **Mp** and **Mt** are associated with wetland features and contain a number of plant species that are likely to be dependent on wetter soil conditions.

Vegetation within the site includes wetland vegetation and vegetation thatprovides habitat for conservation significant fauna, including black cockatoo species, quenda and black-striped burrowing snake.

7 References

7.1 General references

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The online resources that have been utilised in the preparation of this report are referenced in **Section 7.1**, with access date information provided in **Table R 1**.

Table R 1 Access dates for online references

Reference	Date accessed	Website or dataset name
BoM (2023)	16 January 2023	Climate Data Online
DAWE (2022)	25 March 2022	Protected Matters Search Tool
DBCA (2022)	22 March 2022	NatureMap
DCCEEW (2021)	16 January 2023	Threatened Ecological Communities
WALIA (2023)	16 January 2023	Landgate Map Viewer
Weeds Australia (2021)	16 January 2023	Weeds of National Significance (WoNS)
Western Australian Herbarium (2022)	22 March 2022	Florabase

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Figure 2: Lot Access

Figure 3: Hydrography, Soils and Topography

Figure 4: Environmental Features

Figure 5: Plant Communities

Figure 6: Vegetation Condition

Figure 7: Conservation Significant Values

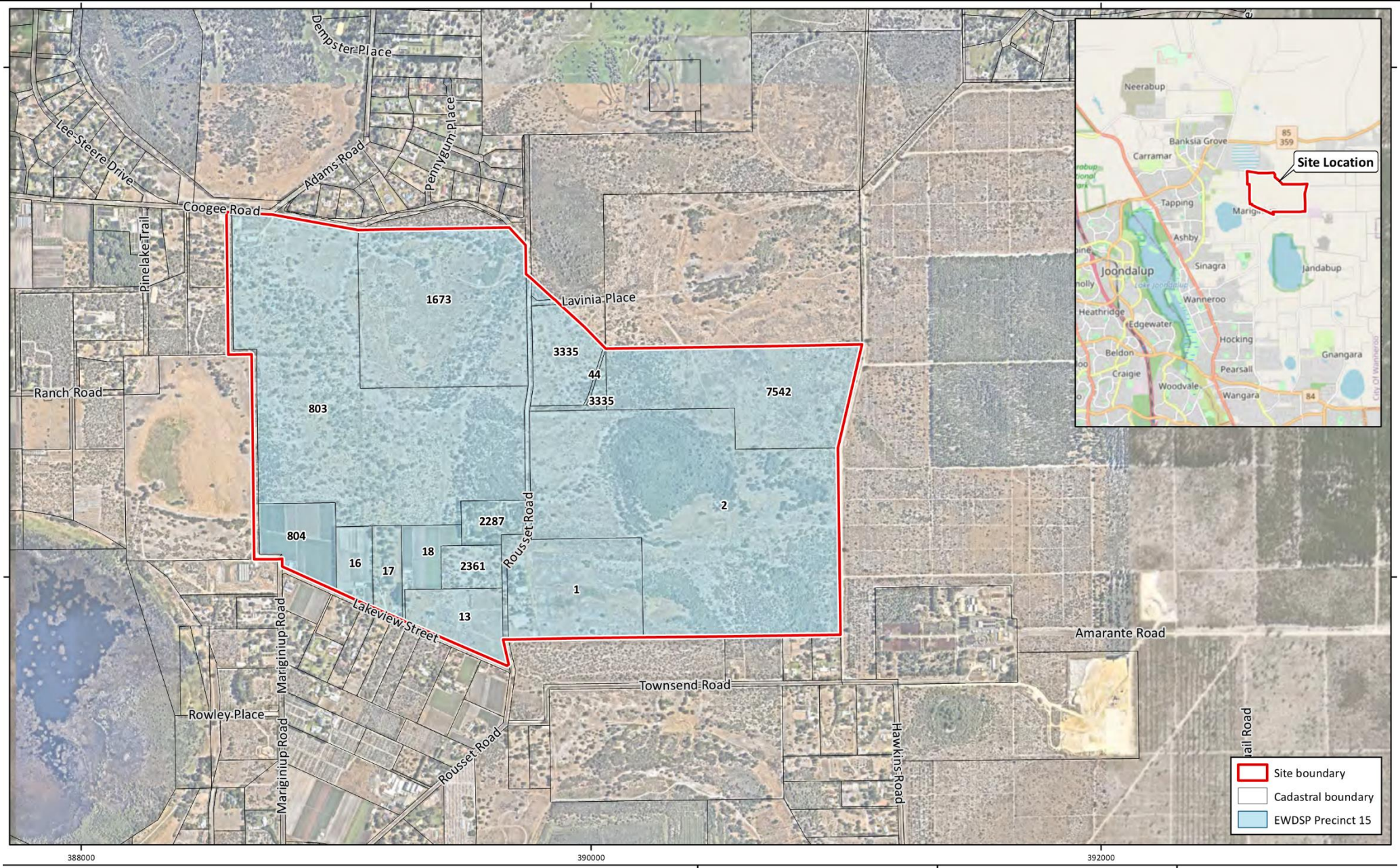


Figure 1: Site Location

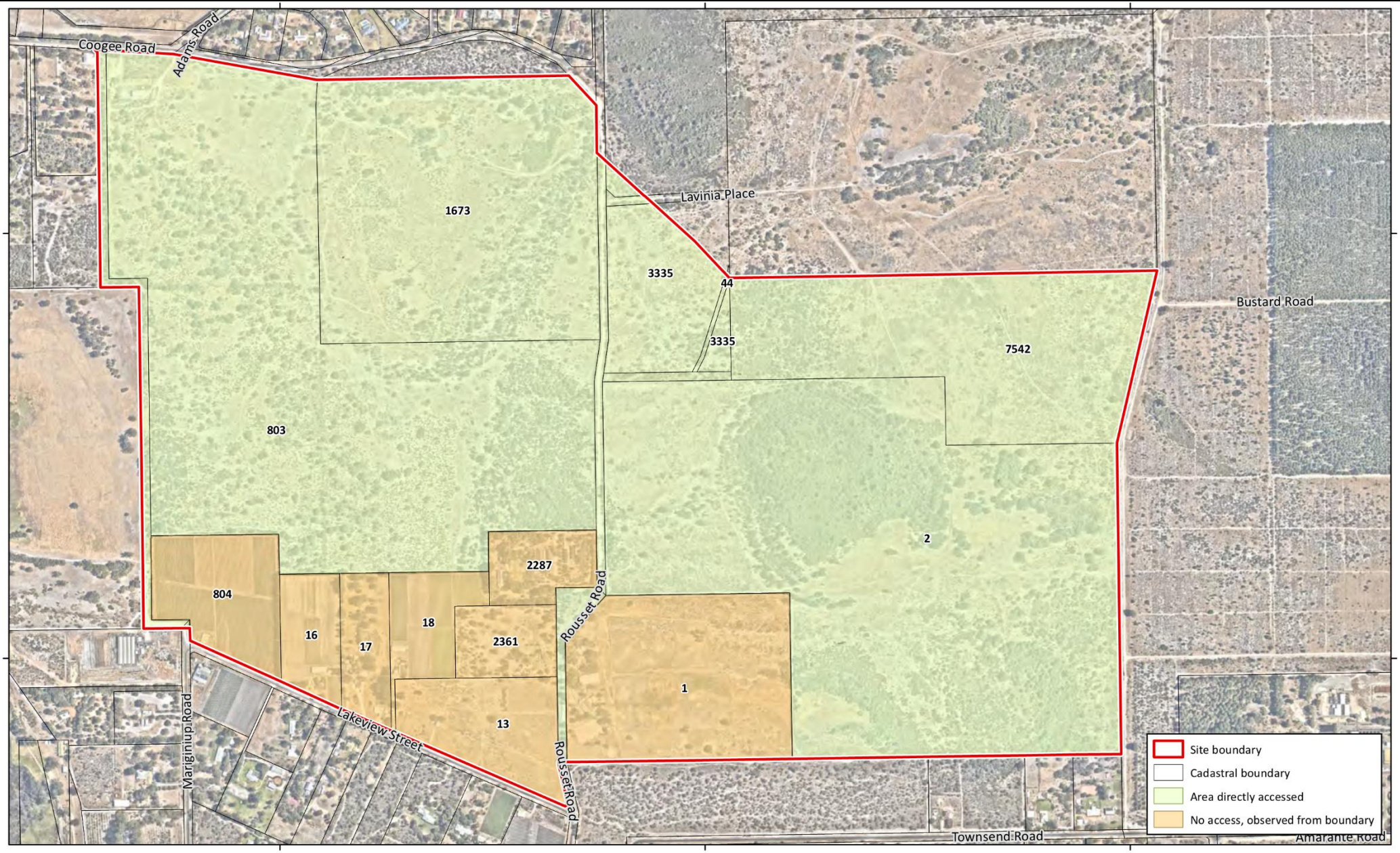
Project: Detailed Flora and Vegetation Assessment
Various Lots, Mariginiup

Plan Number: EP22-019(01)--F30
Drawn: SCM
Date: 22/02/2023
Checked: SCM
Approved: TAA

N

0 200 400 600
Meters
Scale: 1:20,000@A4
GDA 1994 MGA Zone 50

emerge ASSOCIATES



igure 2: Lot Access

roject: Detailed Flora and Vegetation Assessment
Various Lots, Mariginiup

Plan Number:
EP22-019(01)--F54
Drawn: GAR
Date: 22/02/2023
Checked: SCM
Approved: TAA

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Meters
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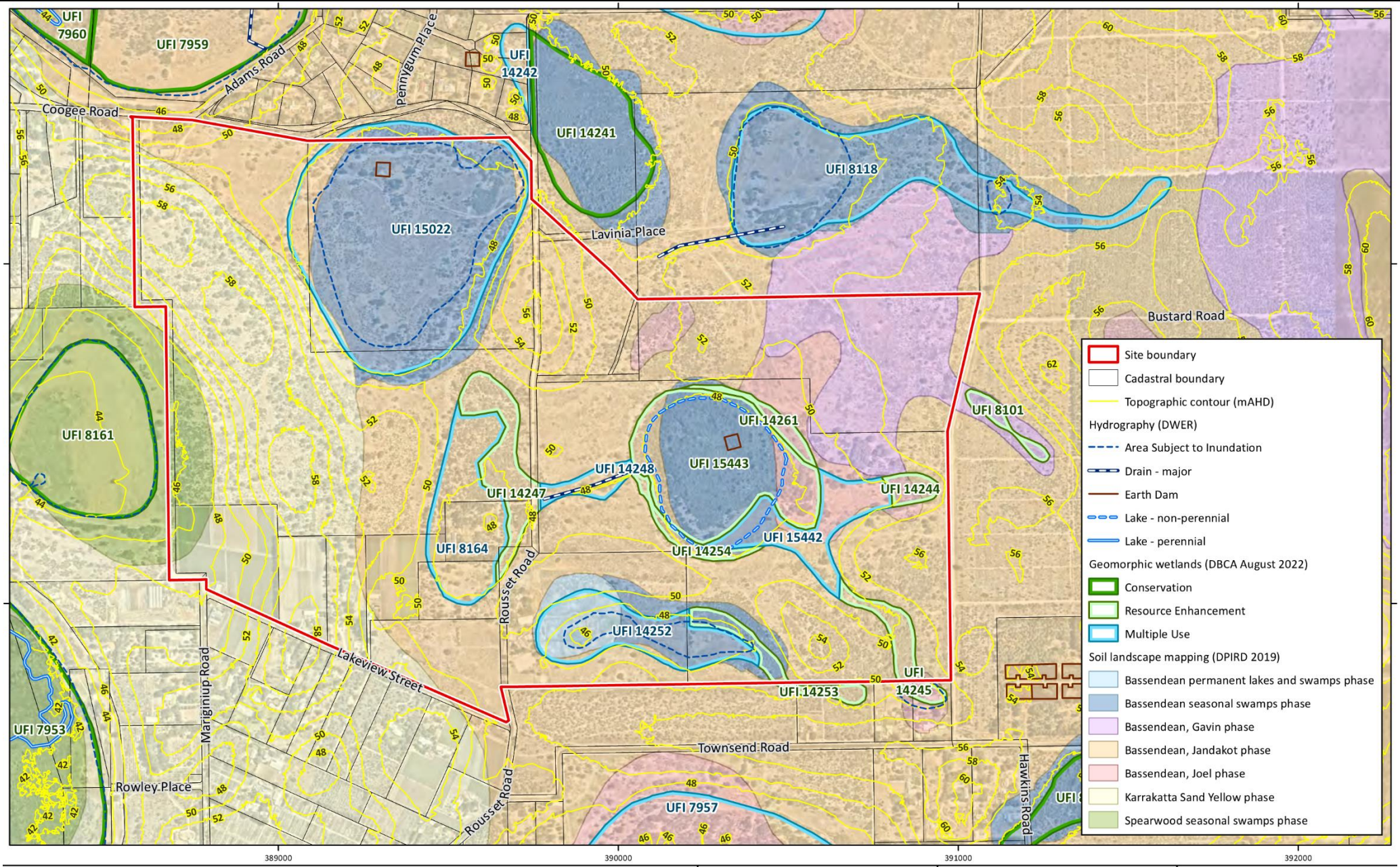

igure 3: Hydrography, Soils and Topography

roject: Detailed Flora and Vegetation Assessment
Various Lots, Mariginiup

Plan Number:
EP22-019(01)--F31
Drawn: SCM
Date: 22/02/2023
Checked: SCM
Approved: TAA

N

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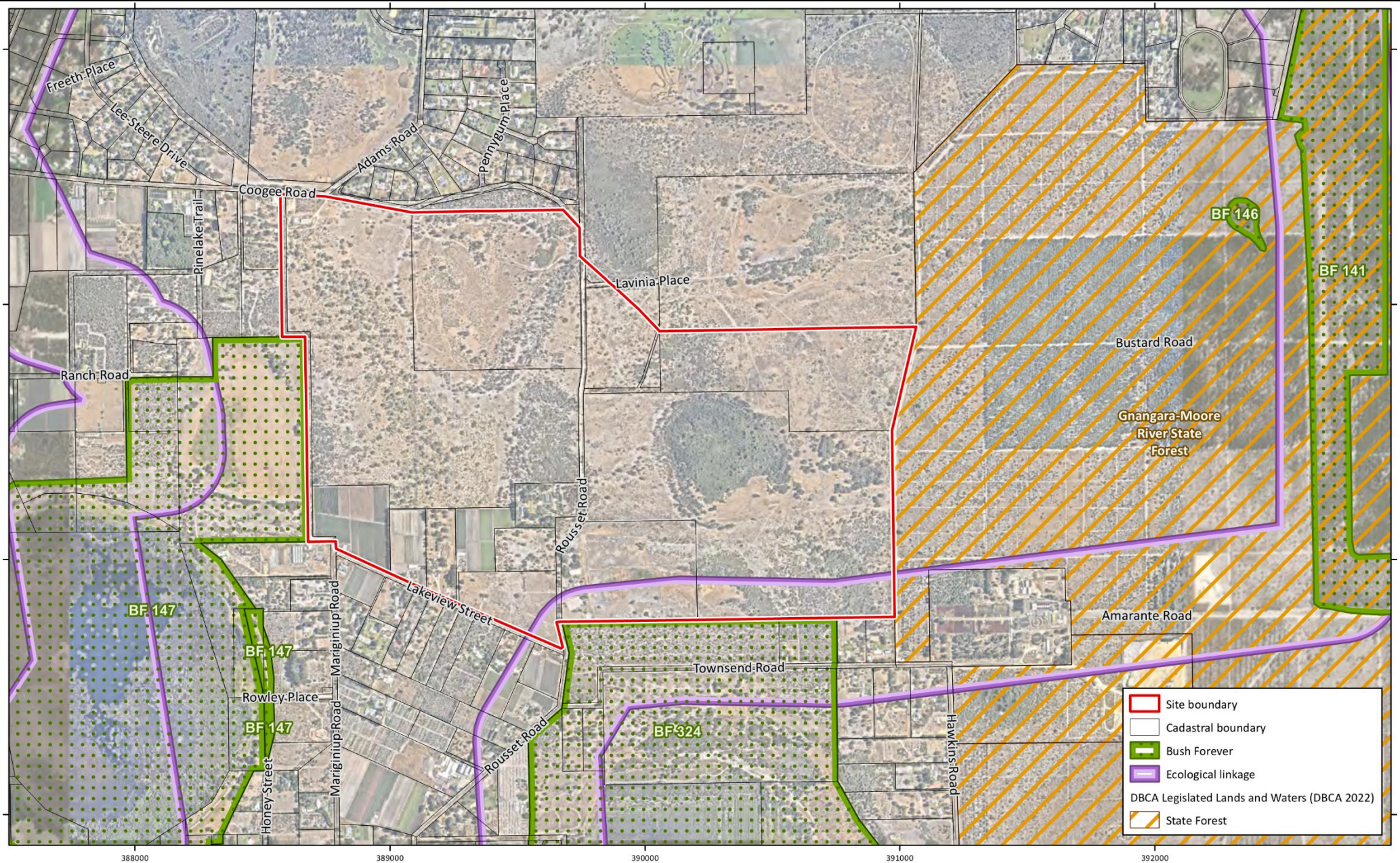
Meters
Scale: 1:15,000@A4
GDA 1994 MGA Zone 50

emerge ASSOCIATES



igure 4: Environmental Features

roject: Detailed Flora and Vegetation Assessment
Various Lots, Mariginiup

Plan Number:
EP22-019(01)--F32
Drawn: SCM
Date: 22/02/2023
Checked: SCM
Approved: TAA

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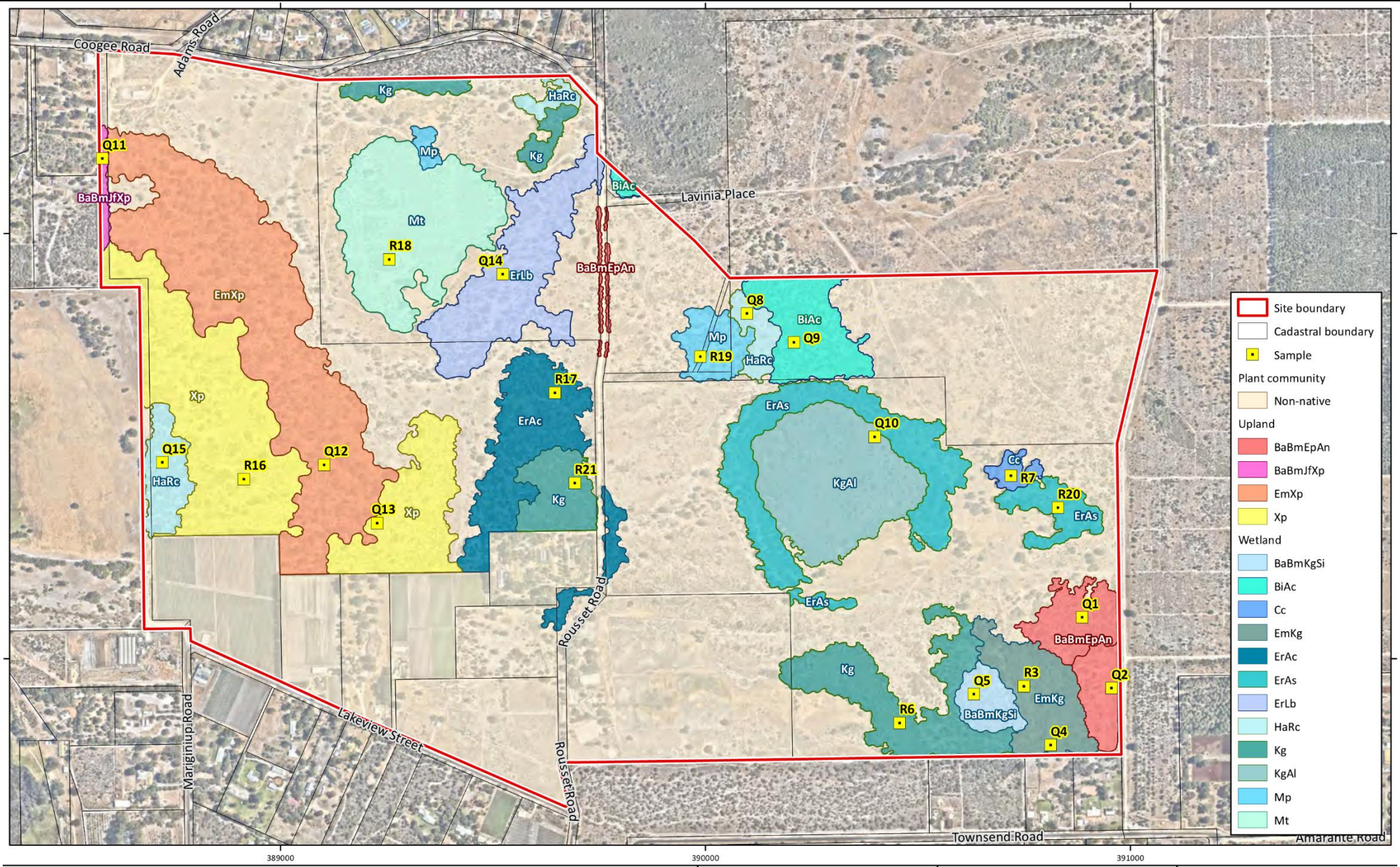
GDA 1994 MGA Zone 50

emerge ASSOCIATES



igure 5: Plant Communities

roject: Detailed Flora and Vegetation Assessment
Various Lots, Mariginiup

Plan Number:
EP22-019(01)--F33
Drawn: SCM
Date: 22/02/2023
Checked: SCM
Approved: TAA

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Meters
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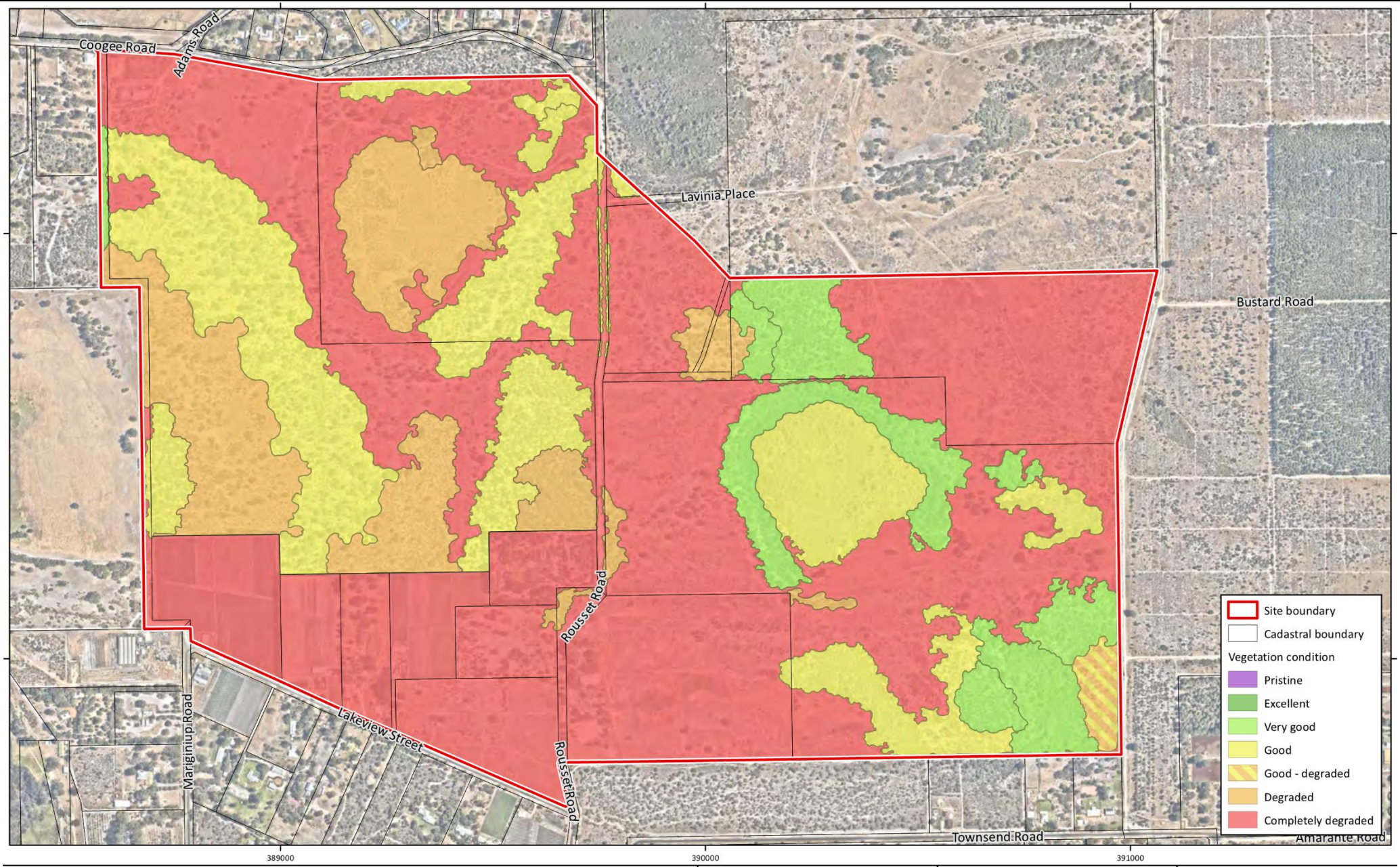
GDA 1994 MGA Zone 50

emerge ASSOCIATES



igure 6: Vegetation Condition

roject: Detailed Flora and Vegetation Assessment
Various Lots, Mariginiup

Plan Number:
EP22-019(01)--F34
Drawn: SCM
Date: 22/02/2023
Checked: SCM
Approved: TAA

N

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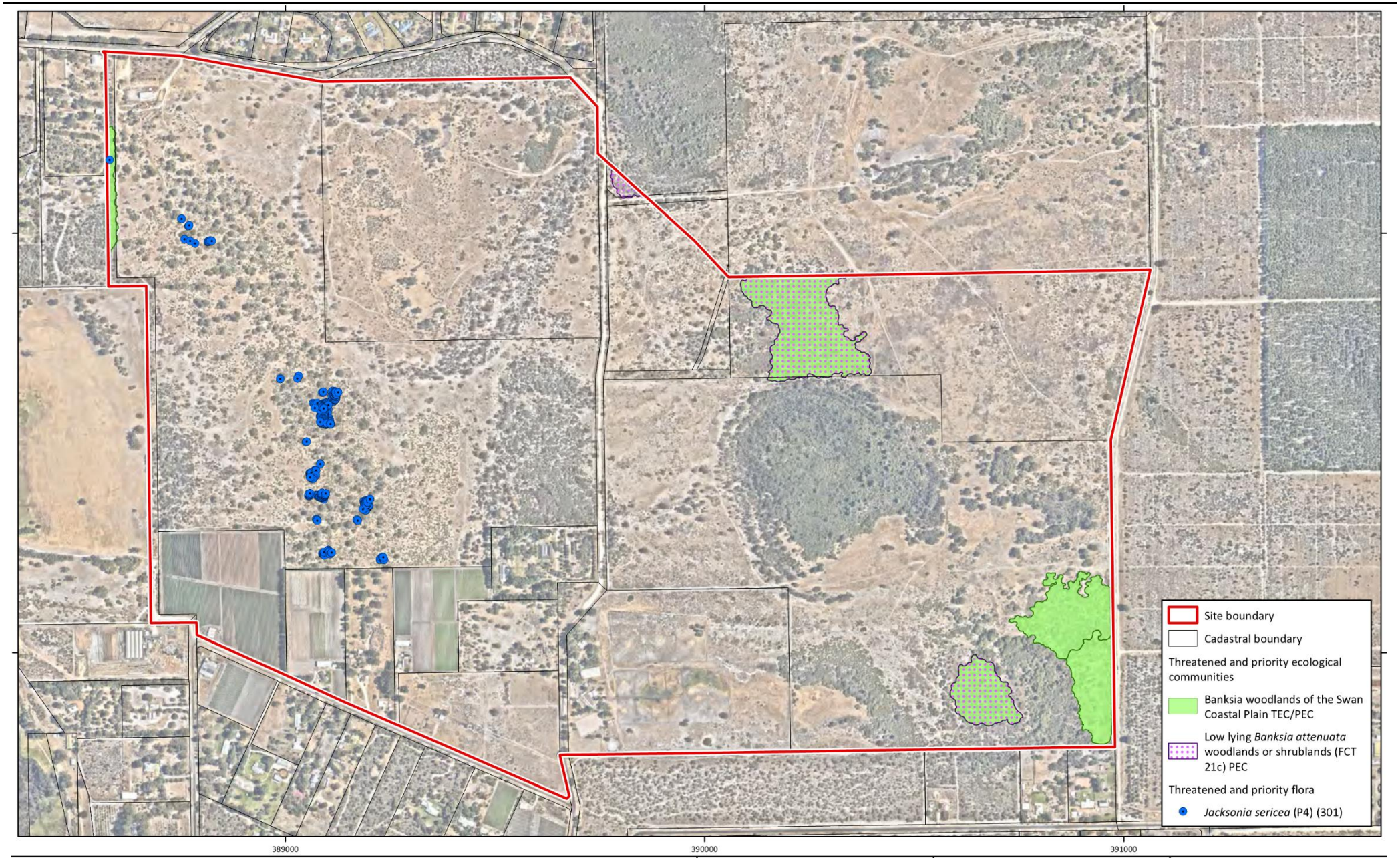
Meters
Scale: 1:12,000@A4
GDA 1994 MGA Zone 50

emerge ASSOCIATES



igure 7: Conservation Significant Values

roject: Detailed Flora and Vegetation Assessment
Various Lots, Mariginiup

Plan Number:
EP22-019(01)--F35a
Drawn: SCM
Date: 25/07/2023
Checked: SCM
Approved: TAA

N

0 200 400
Meters
Scale: 1:12,000@A4
GDA 1994 MGA Zone 50

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Integrated Science & Design

Bushfire Management Plan

Precinct 15 Structure Plan

Project No: EP22-019(16)



Document Control

Doc name:	Bushfire Management Plan Precinct 15 Structure Plan				
Doc no.:	**EP22-019(16)–014 PPS**				
Version	**Date**	**Author**		**Reviewer**	
1	February 2023	Pascal Scholz	PPS	Andreas Biddiscombe	ADB
				Anthony Rowe	AJR
	Draft report issued for client and project team review.				
A	August 2023	Pascal Scholz	PPS	Andreas Biddiscombe	ADB
				Anthony Rowe	AJR
	Updated structure plan and minor amendments.				

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This document has been prepared primarily to consider the layout of development and/or the appropriate building construction standards applicable to development, where relevant. The measures outlined are considered to be prudent minimum standards only based on the standards prescribed by the relevant authorities. The level of bushfire risk mitigation achieved will depend upon the actions of the landowner or occupiers of the land and is not the responsibility of the author. The relevant local government and fire authority (i.e. Department of Fire and Emergency Services or local bushfire brigade) should be approached for guidance on preparing for and responding to a bushfire.

Notwithstanding the precautions recommended in this document, it should always be remembered that bushfires burn under a wide range of conditions which can be unpredictable. An element of risk, no matter how small, will always remain. The objective of the Australian Standard AS 3959:2018 is to "prescribe particular construction details for buildings to reduce the risk of ignition from a bushfire" (Standards Australia 2018). Building to the standards outlined in AS 3959 does not guarantee a building will survive a bushfire or that lives will not be threatened by the effects of bushfire attack.

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Executive Summary

Stockland (the Proponent) are progressing a Structure Plan (SP) over 14 land parcels within the City of Wanneroo (CoW), an area also referred to as Precinct 15 of the East Wanneroo District Structure Plan (EWDSP). The collective land parcels (herein referred to as 'the site') extend over a 310 hectare (ha) area situated approximately 25 km north of the Perth Central Business District.

The proposed Precinct 15 SP will guide a transit orientated shopping and community hub serving the northern areas of East Wanneroo and will include a mix of uses including residential, commercial, recreation including a sports hub, public open space (POS) and conservation areas, in accordance with the overarching EWDSP.

The site is predominantly located within a 'bushfire prone area' under the state-wide *Map of Bush Fire Prone Areas* prepared by the Office of Bushfire Risk Management (OBRM 2021). The identification of a site within an area declared as bushfire prone necessitates that a further assessment of the determined bushfire risk affecting the site in accordance with *Australian Standard 3959:2018 Construction of buildings in bushfire prone areas* (AS 3959), and the satisfactory compliance of the proposal with the policy measures described in *State Planning Policy 3.7 Planning in Bushfire Prone Areas* (SPP 3.7) (WAPC 2015) and the *Guidelines for Planning in Bushfire Prone Areas Version 1.4* (the Guidelines) (DPLH & WAPC 2021).

The purpose of this BMP is to assess the bushfire hazards, both within and nearby the site, and identify the 'management' strategies required to ensure the development of the land is consistent with the intent of SPP 3.7 – *to preserve life and reduce the impact of bushfire on property and infrastructure.*

This BMP has followed the requirements of SPP 3.7 to identify bushfire risk and the bushfire protection measures that will make the land suitable for its intended purpose. As part of this, a Bushfire Attack Level (BAL) assessment involving the classification and condition of vegetation within 150 m of the site has been undertaken.

As part of assessing the long-term bushfire risk to the site, vegetation classifications have been detailed for the post-development scenario (in accordance with AS 3959) in order to inform a bushfire attack level (BAL) assessment. Classified vegetation has been identified surrounding the site in all directions, in addition to selected areas within the site where existing or landscaped vegetation is proposed for future retention without further or ongoing hazard management (including wetlands, wetland buffers and drainage bio-retention areas).

In order to resolve the potential for bushfire to affect the site, a post development scenario has been assumed in which classified vegetation within proposed public open space (POS) in the site will be converted to low threat vegetation in accordance with Section 2.2.3.2 of AS 3959, with the exception of planted bio-retention areas which are assumed to comprise a hazard. Existing classified vegetation within resource enhancement wetlands and associated buffers will be retained and revegetated within the site and therefore will pose a bushfire risk to the site post-development. Existing classified vegetation within future subdivision and development areas within the site will be removed and converted to non-vegetated land and/or low threat vegetation. All classified vegetation outside the

site is assumed to remain in its existing condition and therefore pose a bushfire risk to the site in the long-term.

Compliance Assessment

The outcomes of this BMP demonstrate that as development progresses, it will be possible for an acceptable solution to be adopted for each of the applicable bushfire protection criteria outlined in the Guidelines. This includes:

- **Location**: The majority of the site will be able to achieve a BAL rating of BAL-29 or less through the location of public roads, landscaped POS areas and in-lot setbacks. Future development is to be restricted in areas subject to BAL-40 and above.
- **Siting and Design**: All future habitable buildings can be sited within the proposed development so that BAL-29 or less can be achieved. Asset Protection Zones will be achieved for all lots through management of residential lots, non-vegetated areas and low threat vegetation in the future subdivision design including roadways and POS areas.
- **Vehicular Access**: The proposed Precinct 15 SP provides for access and egress opportunities via multiple points onto Lakeview Street to the south, Mariginiup Road to the west, Coogee Road to the north and Boundary Road to the east of the site. Presently existing Lakeview Street and Coogee Road provide access in two different directions. Additional access and egress opportunities will ultimately exist once development progresses within the site including the extension of Mariginiup Road adjacent to the western site boundary, the Coogee Road and Rousset Road upgrades and realignment through the centre of the site, and road upgrades of Boundary road (presently unsealed) to the east of the site. Given future development within the site might be staged, vehicular access arrangements in the short, medium and long term duration of development will need to ensure that all occupiers and visitors are provided with at least two vehicular access routes at all times. In the instance that roads external to the site boundary have not been constructed prior to subdivision within the site, temporary no-through roads with suitable turnaround areas will be constructed.
- **Water**: the development will be provided with a permanent and reticulated water supply to support onsite firefighting requirements.

The management/mitigation measures to be implemented through the proposed development of the site have been outlined as part of this BMP. If the current development layout changes at the future subdivision process, a revised BMP is likely to be required to support future subdivision applications.

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Appendices

Appendix A

Precinct 15 Structure Plan and Indicative Master Plan (CDP 2023)

Appendix B

Landscape Master Plan (Emerge Associates 2023)

List of Abbreviations

Table A1: Abbreviations – General terms

General terms	
AHD	Australian Height Datum
AS	Australian Standard
APZ	Asset Protection Zone
BAL	Bushfire Attack Level
BMP	Bushfire Management Plan
BPAD	Bushfire Planning and Design
ESA	Environmentally Sensitive Area
REW	Resource enhancement wetlands
FDI	Fire Danger Index
FZ	Flame Zone
TEC	Threatened ecological community

Table A2: Abbreviations – Organisations

Organisations	
CoW	City of Wanneroo
DBCA	Department of Biodiversity, Conservation and Attractions
DWER	Department of Water and Environmental Regulation
DFES	Department of Fire and Emergency Services
DPLH	Department of Planning, Lands and Heritage
OBRM	Office of Bushfire Risk Management
WAPC	Western Australian Planning Commission

Table A3: Abbreviations – Legislation and policies

Legislation	
AS 3959	Australian Standard 3959 Construction of Buildings in Bushfire Prone Areas
Guidelines	*Guidelines for Planning in Bushfire Prone Areas version 1.4* (DPLH & WAPC 2021)
SPP 3.7	State Planning Policy 3.7 Planning in Bushfire Prone Areas (WAPC 2015)

Table A4: Abbreviations – Planning and building terms

Planning and building terms	
EWDSP	East Wanneroo District Structure Plan
LMP	Landscape Master Plan
LPS	Local Planning Scheme
MRS	Metropolitan Region Scheme

Table A4: Abbreviations – units of measurement

Units of measurement	
ha	Hectare
m	Metre
m AHD	m in relation to the Australian height datum

1 Introduction

1.1 Background

Stockland (the Proponent) is progressing a structure plan (SP) over 14 land parcels within the City of Wanneroo (CoW), an area also referred to as Precinct 15 of the approved East Wanneroo District Structure Plan (EWDSP).

The land parcels (herein referred to as 'the site') extend over a 310 hectare (ha) area within the locality of Mariginiup and are generally bounded by the Gnangara-Moore River State Forest (existing and former pine plantation) to the east, remnant bushland and rural-residential areas to the north, rural-residential land and Mariginiup Lake (Bush Forever Site 147) to the west and Bush Forever Site 324 and rural-residential land to the south. The site is situated approximately 25 km north of the Perth Central Business District. The location of the site, cadastral boundaries and lot numbers are shown in **Figure 1**.

The proposed Precinct 15 SP will guide a transit orientated shopping and community hub serving the northern areas of East Wanneroo and will include a mix of land uses including residential, commercial, recreation (including a sports hub) public open space (POS) and conservation areas consistent with the overarching approved EWDSP. The intended land uses are shown in the SP in addition to an Indicative Master Plan provided in **Appendix A**.

The site is predominantly located within a 'bushfire prone area' under the state-wide *Map of Bush Fire Prone Areas* prepared by the Office of Bushfire Risk Management (OBRM 2021) as shown in **Plate 1**. The location of the site necessitates that a further assessment of the determined bushfire risk affecting the site in accordance with *Australian Standard 3959:2018 Construction of buildings in bushfire prone areas* (AS 3959), and the satisfactory compliance of the proposal with the policy measures described in *State Planning Policy 3.7 Planning in Bushfire Prone Areas* (SPP 3.7) (WAPC 2015) and the *Guidelines for Planning in Bushfire Prone Areas Version 1.4* (the Guidelines) (DPLH & WAPC 2021).

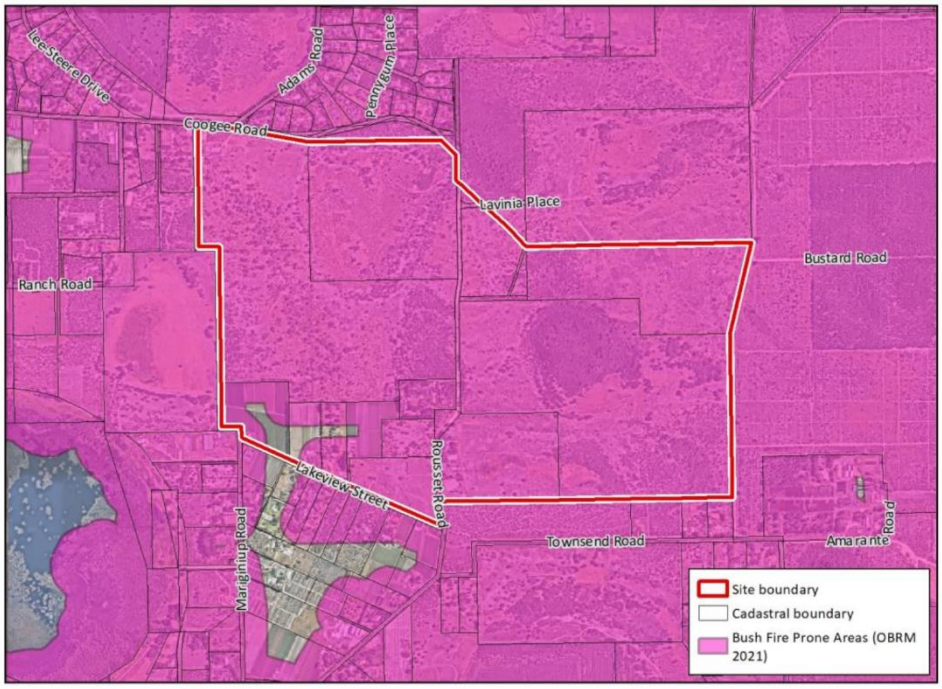

Plate 1: Areas within and surrounding the site identified as 'bushfire prone areas' (as indicated in purple) under the state-wide Map of Bush Fire Prone Areas (OBRM 2021).

The purpose of SPP 3.7 and its policy intent is to preserve life and reduce the impact of bushfire on property and infrastructure through effective risk-based land use planning. Importantly, it is risk-based, requiring a methodical approach to identify and evaluate the hazards and provide the treatments to ameliorate these hazards to an acceptable level.

> *SPP 3.7 does not require that there be no increase at all in the threat of bushfire to people property or infrastructure. Rather, as is seen in clause 2 of SPP 3.7, the intention of the policy is to 'implement effective, risk¬based land use planning and development to preserve life and* ***reduce the impact of bushfire on property and infrastructure'****.* (emphasis added) [1]

1.2 Aim of this report

The purpose of this BMP is to assess bushfire hazards both within and nearby to the site and demonstrate that the threat posed by any identified hazards can be appropriately mitigated and managed. This BMP has been prepared to support the structure planning process for the site and addresses the requirements of SPP 3.7, the Guidelines and AS 3959. The document includes:

- An assessment of the existing classified vegetation in the vicinity of the site (within 150 m) and consideration of bushfire hazards that will exist in the post development scenario (**Section 3**).
- Commentary on how the future development can achieve the bushfire protection criteria outlined within the Guidelines including an indication of BAL ratings likely to be applicable to future dwellings (**Section 5**).
- An outline of the roles and responsibilities associated with implementing this BMP (**Section 6**).

[1] Harmanis Holdings No. 2 Pty Ltd and Western Australian Planning Commission [2019] WASAT 43 (Harmanis).

1.3 Statutory policy and framework

The following key legislation, policies and guidelines are relevant to the preparation of a bushfire management plan:

- *Bush Fires Act 1954*
- *Fire and Emergency Services Act 1998*
- *Planning and Development Act 2005* and associated regulations
- *Building Act 2011* and associated regulations
- *State Planning Policy 3.7 Planning in Bushfire Prone Areas* (WAPC 2015)
- *Guidelines for Planning in Bushfire Prone Areas Version 1.4* (DPLH & WAPC 2021)
- *Australian Standard AS 3959 – 2018 Construction of buildings in bushfire prone areas* (Standards Australia 2018)

1.4 Description of the proposed Precinct 15 Structure Plan

The proposed Precinct 15 SP and the Indicative Master Plan (**Appendix A**) provide a framework for the provision of future land use, subdivisions and development within the site, consistent with the overarching EWDSP which covers an 8,300 ha area across East Wanneroo, comprising 28 separate SP precincts.

The EWDSP outlines the land use rationale for each precinct and specifies the information which is required to inform the preparation of the SP for each precinct. With respect to Precinct 15 (the site), the EWDSP proposes a shopping and community hub, comprising a neighbourhood centre and urban neighbourhoods integrated with natural features, with the site ultimately serving the northern areas of East Wanneroo. Additionally, the EWDSP intended for the site to provide for a 50 ha regional sporting facility with the balance of the site providing a transition from medium to low-rise built form, which has been factored into the proposed SP layout for the site. The SP and associated Indicative Master Plan (**Appendix A**) identifies the following land uses within the site:

- Approximately 109 ha of mixed density residential development for an estimated 3800 dwellings.
- Approximately 12 ha for Land Lease Community housing.
- A local neighbourhood centre providing retail and commercial opportunities.
- A primary school in the northern portion of the site and a combined primary and secondary school in the south.
- POS areas comprising more than 10% of the overall site's development footprint, providing vegetation retention opportunities and wetland retention areas, including buffer zones.
- Approximately 50 ha of regional sporting fields including ovals, tennis courts, playgrounds, club rooms, indoor sporting facilities, car parks and dog parks.
- A new Mariginiup train station including an associated Park n Ride facility.
- An integrated road network with connections to major roads such as to Lakeview Road, Franklin Road extension, Flynn Drive, Neaves Road and the proposed Whiteman Yanchep Highway to the east.

The site is predominantly zoned 'Urban Deferred', whilst a portion along the eastern site boundary is zoned 'Rural - Water Protection' under the Metropolitan Region Scheme (MRS), and zoned 'General Rural' and 'Rural Resource' under the CoW *District Planning Scheme No. 2* (DPS No. 2). The MRS zones and reserves are shown in **Plate 2**.

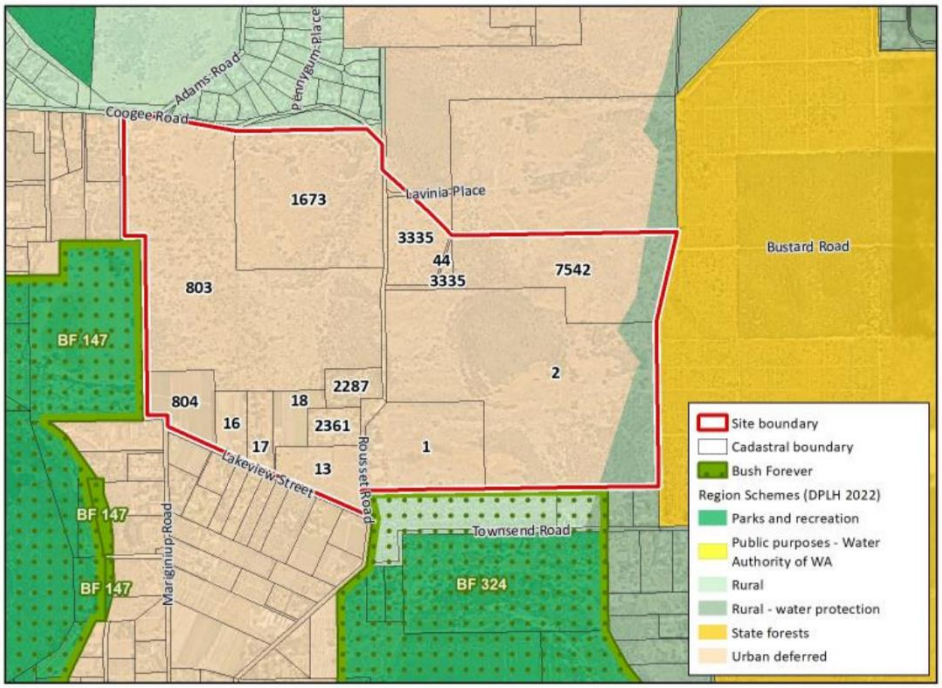

Plate 2: Metropolitan Region Scheme zones and reserves

1.5 Description of land characteristics

The site has been historically disturbed through agricultural land uses and was predominantly cleared of native vegetation prior to 1965, whilst significant regrowth of vegetation is evident from the 1980s and remains to date (Landgate 2023).

Surrounding land uses include:

- Bush Forever Site 147 (Mariginiup Lake) is located immediately to the west of the site.
- Bush Forever Site 324 (Jandabup Lake and Adjacent Bushland, Jandabup/Mariginiup) and rural residential lots and market gardens immediately to the south of the site.
- Gnangara-Moore River State forests comprising existing and historical pine plantations to the east of the site.
- Remnant vegetation and rural residential lots to the north of the site.

The site is generally flat with the exception of a ridgeline in the western portion of the site marking the transition from the Bassendean to the Spearwood dunal system. Elevations across the site range from 46 m Australian height datum (AHD) in the central portion of the site to 56 mAHD in the eastern portion and 59 mAHD along the ridgeline in the western portion of the site, as shown in **Figure 1**.

2 Environmental Considerations

In accordance with the *Bushfire Management Plan – BAL Contour* template prepared by the Department of Planning, Lands and Heritage (2018), this BMP has considered whether there are any environmental values that may require specific consideration through either protection, retention or revegetation. To support this, a review of publicly available databases has been undertaken, with particular reference to the Shared Location Information Platform (SLIP) databases in addition to site-specific investigations undertaken by Emerge Associates in 2022 and 2023. A summary of the search results has been provided in **Table 1**.

The majority of the site has been historically cleared of vegetation and mostly comprises regrowth vegetation including patches of mature native trees with a dense native understorey, whilst the balance of the site comprises non-native paddock grasses with scattered native shrubs. As a result, the site contains predominantly areas with limited environmental values; however, patches of remnant native vegetation provide environmental values of conservation significance.

Table 1: Summary of potential environmental considerations that may be associated with the site (based on a search of the SLIP databases)

Key environmental feature (information in brackets refers to mapping data source)	Yes / no / potentially occurring within the site	If yes / potentially, describe value that may be impacted
Conservation category wetlands and buffer (Geomorphic wetlands, Swan Coastal Plain (DBCA-019))	No	No Conservation Category Wetlands (CCWs) intersect the site. However, four CCWs (UFI's #14241, #7960 and 7959 (Lake Adams) and #8161 (Little Mariginiup) occur within close proximity to the north, north-west and west of the site respectively. Multiple resource enhancement wetlands (REWs) occur within the site (UFI's #14247, #15443, #14254, #14253, #14245, #14261 and #14244). The proposed SP provides for the future retention of REWs UFI #15443, #14254, #14261 and #14244 in addition to a 30 m wide wetland buffer.
RAMSAR wetlands (DBCA-010)	No	No RAMSAR wetlands are identified within the mapping as occurring within the site or in close proximity.
Swan Bioplan Regionally Significant Natural Areas 2010 (DWER-070)	No	Not applicable. No Regionally Significant Natural Areas are identified within the site.
Aboriginal cultural heritage (ACH Inquiry System), (Horizon 2023)	Yes	A desktop assessment of the Aboriginal Cultural Heritage (ACH) Inquiry System identified ACH 'Directory Place 22160 Marrynginup' extending across the majority of the site Horizon Heritage Management (2023) has undertaken an Aboriginal Heritage Desktop Assessment of the site. The assessment determined the true extent of ACH Directory Place 22160 (Marrynginup), which is associated with a CCW feature to the north of the site. Marrynginup extends slightly into the northern-central portion of the site. This heritage site was determined to be of significance; however, it is noted that the section intersecting into the site has been historically disturbed. Notwithstanding, ACH artefacts have the potential to occur within the broader site.

Table 1: Summary of potential environmental considerations that may be associated with the site (based on a search of the SLIP databases) (continued).

Key environmental feature (information in brackets refers to mapping data source)	Yes / no / potentially occurring within the site	If yes / potentially, describe value that may be impacted
Non-indigenous heritage (SHO-003)	No	Not applicable. No registered non-indigenous heritage sites were identified within or nearby the site.
Threatened and priority flora (Emerge Associates 2023b)	Yes	No threatened flora species were identified within the site. Emerge Associates (2023) recorded two priority flora species within the site including 300 individuals of *Jacksonia sericea* (P4) in the western portion of the site and two individuals of *Conostylis bracteata* (P3) at two separate sampling locations. All other threatened and priority species that were identified within desktop database searches are unlikely to occur within the site as they were not recorded or due to lack of suitable habitat within the site (Emerge Associates 2023).
Threatened and priority fauna (Emerge Associates 2023a)	Yes	Based on the results of the detailed fauna surveys undertaken (Emerge Associates 2023) 10 broad fauna habitat types were identified within the site. Intact fauna habitat values within the site associated with patches of native vegetation provide potential habitat for 14 fauna species of conservation significance. Four conservation significant species were recorded within the site by Emerge Associates (2023) including Carnaby's black cockatoo (CBC) (endangered), forest red-tailed black cockatoo (FRTBC) (vulnerable), the black-striped burrowing snake (P3) and quenda (P4). Native vegetation within the site provides approximately 50 ha of suitable foraging habitat for CBC and 25 ha for FRTBC. Additionally, the site contains 365 potential nesting trees for black cockatoo, none of which were determined to contain suitable nesting hollows. No existing black cockatoo roost site or secondary evidence of roosting activity was observed within the site. The site also provides a habitat for quenda and the black striped burrowing snake, both of which have been recorded within the site. The habitat for these two species is widespread across the site in areas comprising dense understorey vegetation such as shrubs and tall grasses.
Bush Forever areas (DOP-071)	No	No Bush Forever sites occur within the site. Bush Forever Site 147 (Mariginiup Lake and Adjacent Bushland, Mariginiup) is directly abutting the south-western corner of the site, and Bush Forever Site 324 (Jandabup Lake and Adjacent Bushland, Jandabup/Mariginiup) lies adjacent to the southern boundary.
Clearing regulations – Environmentally Sensitive Areas (ESA) (DWER-046)	No	The site is not mapped as an ESA; however, multiple ESA's occur abutting the site boundary to the south and west associated with Bush Forever Sites 147 and 324 and to the north likely associated with CCW UFI 14241 and UFI 7959 (Lake Adams).

2.1 Native vegetation – modification and clearing

Within the site

As outlined in **Section 2**, the majority of the site has been previously cleared and now comprises patches of mature native trees with a dense native understorey and non-native paddock grasses with scattered native shrubs. Native vegetation within the site has been identified as providing suitable habitat for black cockatoo species; therefore, opportunities to retain native vegetation within future POS areas have been considered throughout the structure planning process, with the POS layout to be implemented as outlined in the proposed Precinct 15 SP (**Appendix A**).

At this stage, it is assumed that:

- Existing classified vegetation within the proposed POS areas (outside future wetland reserves and buffer zones) will be modified and managed to a low threat standard whilst retaining as many native trees as possible. Future vegetation retention within POS areas will be focused on mature native trees, as opposed to intact native vegetation communities.
- Native vegetation within the retained resource enhancement wetlands (REWs) and associated buffer zones will be retained, with revegetation of buffers also assumed, as a worst-case bushfire hazard scenario.

Clearing of native vegetation will be required for bushfire management purposes as part of implementing this BMP, specifically to enable the proposed urban development and associated buildings outside the POS areas to meet the relevant siting requirements of the Guidelines. It is envisaged that all clearing of native vegetation within the site will be exempt from requiring a clearing permit under Schedule 6 of the *Environmental Protection Act 1986* (EP Act) in accordance with a future subdivision approval under the *Planning and Development Act 2005*.

Where native vegetation clearing will, or is likely to, result in a significant environmental impacts on matters of national environmental significance (such as species of black cockatoo), a referral of that proposed action to the Commonwealth Department of Climate Change, Energy, the Environment and Water pursuant to the *Environment Protection and Biodiversity Conservation Act 1999* will be required, even in the instance that native vegetation clearing is exempt under State legislation.

Outside the site

All vegetation outside the site is assumed to remain in its existing condition, with the exception of where vegetation exists in areas identified for future road construction, including:

- Mariginiup Road (west of the site), which has an existing road reserve but no constructed road carriageway.
- Coogee Road extension (north of the site), to extend the road carriageway into the Rousset Road reserve. This construction will occur within existing road reserves which currently do not support sealed public road carriageways.
- Boundary Road (east of the site), which is presently an unsealed track. The current track is situated on publicly owned land, but a new road reserve will ultimately need to be created.

It is anticipated that these road reserves will be cleared of vegetation (where required) and constructed as part of implementing the SP .

No other areas of native vegetation outside the site are proposed to be cleared by the proponent as part of the proposed future development within the site. Notwithstanding this, it is important to acknowledge that clearing of vegetation in areas external to the site will likely ultimately occur in the future as a result of the implementation of the EWDSP and associated structure planning for surrounding precincts. The timing of any development and the extent of any vegetation clearing surrounding the site is generally unknown; therefore, this BMP assumes any classified vegetation external to the site (unless where specified otherwise) will remain and this has been factored into the BAL assessment for the future development of the site.

2.2 Revegetation and landscape plans

A Landscape Master Plan (LMP) has been prepared for the site by Emerge Associates (2023) and is attached as **Appendix B**. The LMP provides an overarching framework to guide the future preparation, approval and implementation of landscape design within the site.

As shown in the LMP, road reserves and areas of POS are proposed to be landscaped as part of future development. These areas will be designed to achieve a low threat condition in accordance with Section 2.2.3.2 of AS 3959. Future verges and areas of turf and low shrub planting will be maintained and irrigated (if possible). The management of the POS and road reserves will be the responsibility of the proponent initially prior to the handover to the CoW. Ongoing management is likely to include:

- Irrigation of grass and garden beds (where achievable and where required).
- Regular removal of weeds and built up dead material (such as fallen branches, leaf litter etc.)
- Low pruning of trees (branches below 2 m in height removed where appropriate).
- Application of ground/surface covers such as mulch or non-flammable materials as required.
- Regular mowing/slashing of grass to less than 100 mm in height.

Whilst the POS areas within the site will largely be managed to meet the definition of 'low-threat vegetation' outlined in AS 3959 Section 2.2.3.2(f), the following exceptions have been assumed in order to consider a potential worst-case bushfire hazard scenario:

- Bio-retention areas within POS areas will comprise grassland (Class G) vegetation, on the basis they will have relatively dense low planting and may not be routinely maintained and managed to reduce bushfire hazards. In contrast, this has not been assumed for larger-event storage drainage areas where irrigated turf and more active landscaping is permissible.
- Retained REW wetlands and their wetland buffers will comprise forest (Class A) vegetation, on the basis they are likely to be subject to revegetation and are unlikely to be routinely maintained and managed to reduce bushfire hazards.

3 Bushfire Assessment Results

Bushfire risk for the site has been appropriately considered both in context to the development of the site and potential impact upon the site using AS 3959 and the Guidelines.

The objective of AS 3959 is to reduce the risk of ignition and loss of a building to bushfire. It provides a consistent method for determining a radiant heat level (radiant heat flux) as a primary consideration of bushfire attack. AS 3959 measures the Bushfire Attack Level (BAL) as the radiant heat level (kW/m^2) over a distance of 100 m. AS 3959 also prescribes deemed-to-satisfy construction responses that can resist the determined radiant heat level at a given distance from the fire. It is based on six Bushfire Attack Level (BAL) ratings: BAL-LOW, BAL-12.5, BAL-19, BAL-29, BAL-40 and BAL-FZ.

A BAL contour plan has been prepared in accordance with Appendix Three of the Guidelines and Method 1 of AS 3959 to determine the BAL ratings likely to be applicable to future buildings. This has been based on the vegetation classifications and the effective slope under the vegetation.

3.1 Assessment inputs

This bushfire attack level (BAL) assessment was undertaken in accordance with Method 1 of AS 3959. A site visit was undertaken on 10 February 2023.

3.1.1 Assumptions

The BAL assessment is based on the following assumptions:

- **Designated FDI**: 80
- **Flame temperature**: 1090 K
- **Effective slope beneath classified vegetation**: flat/upslope, downslope 0-5° (**Figure 2**)
- Vegetation to be retained within the site's future POS areas (excluding retained wetlands, associated wetland buffers and landscaped bio-retention drainage areas) will be modified to meet the exclusion criteria of clause 2.2.3.2 of AS 3959 and will be maintained in perpetuity.
- Areas of low threat vegetation outside the site within rural residential land holdings have been conservatively assumed to be either classified grassland (Class G) or classified woodland (Class B) vegetation post-development of the site based on existing vegetation structure. There is no guarantee that these land parcels will continue to be managed to a low threat condition in accordance with the CoW Fire Mitigation Notice.
- Areas of low threat vegetation outside the site, associated with existing market gardens, is assumed to remain low threat in accordance with Section 2.2.3.2 of AS 3959,.
- Classified vegetation that has been identified outside of the proponent's landholdings to the north, east, west and south of the site has been assumed to remain in its current state (unless stated otherwise, as above) and will therefore continue to be a bushfire hazard to development within the site until such a time development is progressed surrounding the site in accordance with future structure planning under the overarching EWDSP.
- Classified vegetation that has been identified directly adjacent to the entire western boundary of the site, within the road isolation for the future Mariginiup Road extension, is assumed to be

removed to enable road construction works and has therefore been excluded in accordance with clause 2.2.3.2(e) of AS 3959.

- Classified vegetation within REWs identified for future retention, as well as associated wetland buffer zones, has been assumed to remain as part of future development. Based on a conservative 'worst case' scenario, it was assumed the retained wetlands and associated buffers will be incorporated within POS areas and revegetated to a standard synonymous with the existing dominant wetland vegetation, ultimately comprising classified forest (Class A) vegetation at mature state. No management to reduce bushfire hazards has been assumed.
- Rehabilitated and revegetated areas associated with bio-retention drainage area across the site will be landscaped in accordance with the LMP and are expected to ultimately pose as a bushfire hazard based on the mature state of vegetation and are treated as classified grassland (Class G) vegetation based on the vegetation's mature state. No management to reduce bushfire hazards has been assumed.
- Areas of woodland vegetation (Class B) can include patches of mature trees with a 10%-30% foliage cover with a predominant understorey of grasses and occasional shrubs, in accordance with AS 3959.
- Areas of grassland vegetation (Class G) can include up to 10% foliage cover from shrubs and trees, as per AS 3959.

3.1.2 Vegetation Classification

All vegetation within 150 m of the site was classified in accordance with Clause 2.2.3 of AS 3959. Each distinguishable vegetation plot is described in **Table 2** and shown in **Figure 2**. A BAL Contour Plan has been prepared based on the developed condition of the site in accordance with Appendix Three of the Guidelines and is provided as **Figure 3**.

Not all vegetation is a classified bushfire risk. Vegetation and ground surfaces that are exempt from classification as a potential hazard are identified as a low threat under Section 2.2.3.2 of AS 3959. Low threat vegetation includes the following:

a) Vegetation of any type that is more than 100 m from the site.
b) Single areas of vegetation less than 1 ha in area and not within 100 m of other areas of vegetation being classified.
c) Multiple areas of vegetation less than 0.25 ha in area and not within 20 m of the site, or each other or of other areas of vegetation being classified.
d) Strips of vegetation less than 20 m in width (measured perpendicular to the elevation exposed to the strip of vegetation) regardless of length and not within 20 m of the site or each other, or other areas of vegetation being classified.
e) Non-vegetated areas, that is, areas permanently cleared of vegetation, including waterways, exposed beaches, roads, footpaths, buildings, and rocky outcrops.
f) Vegetation regarded as low threat due to factors such as flammability, moisture content or fuel load. This includes grassland managed in a minimal fuel condition, mangroves, and other saline wetlands, maintained lawns, golf courses (such as playing areas and fairways), maintained public reserves and parklands, sporting fields, vineyards, orchards, banana plantations, market gardens (and other non-curing crops), cultivated gardens, commercial nurseries, nature strips and wind breaks.



Plate 3: The five fuel layers in a forest environment that could be associated with fire behavior (Gould et al. 2007)

*Table 2: AS 3959 Vegetation Classification (refer to **Figure 2**)*

Photo ID:	1	**Plot:**	1
Vegetation Classification or Exclusion Clause			
Forest (Class A) – Flat/upslope			
Description / Justification for Classification			
Forest vegetation has been identified to the south of the site within Bush Forever Site 324 (adjacent to Townsend Road) comprising predominantly mature trees growing to a height of up to approximately 6 m to 8 m, with a greater than 30% foliage cover, over a predominant understorey of low shrubs, grasses and juvenile trees. The forest vegetation to the south of the site within Bush Forever Site 324 is assumed to remain the same post development of the site.			



Photo ID:	2	**Plot:**	1
Vegetation Classification or Exclusion Clause			
Forest (Class A) – Flat/upslope			
Description / Justification for Classification			
Photo ID 2 shows the forest vegetation identified to the south of the site within Bush Forever Site 324 (adjacent to Townsend Road) comprising predominantly mature trees growing to a height of up to approximately 6 m to 8 m, with a greater than 30% foliage cover, over a predominant understorey of low shrubs, grasses and juvenile trees. The forest vegetation to the south of the site within Bush Forever Site 324 is assumed to remain the same post development of the site.			



Photo ID:	3	**Plot:**	1
Vegetation Classification or Exclusion Clause			
Forest (Class A) – Flat/upslope			
Description / Justification for Classification			
Forest vegetation has been identified to the south-east of the site within the Gnangara-Moore River State Forest comprising predominantly juvenile eucalypts growing to a height of approximately 6 m to 7 m, with a greater than 30% foliage cover, over a predominant understorey of low shrubs, grasses and juvenile trees. The forest vegetation to the south-east of the site is assumed to remain the same post development of the site.			



*Table 2: AS 3959 Vegetation Classification (refer to **Figure 2**) (continued)*

Photo ID:	4	**Plot:**	1
Vegetation Classification or Exclusion Clause			
Forest (Class A) – Flat/upslope			
Description / Justification for Classification			
Forest vegetation has been identified to the south-west of the site (abutting Lakeview Street) within rural residential lots comprising predominantly mature trees growing to a height of between 10 m and 15 m, with a greater than 30% foliage cover, over an understorey of predominantly low shrubs, juvenile trees and grasses. The forest vegetation is assumed to remain the same in the post development scenario of the site.			
Photo ID:	5	**Plot:**	1
Vegetation Classification or Exclusion Clause			
Forest (Class A) – Flat/upslope			
Description / Justification for Classification			
Forest vegetation has been identified in the eastern portion of the site comprising predominantly mature trees growing to a height of up to 15 m, with a greater than 30% foliage cover, over an understorey of low shrubs and grasses. The forest vegetation in the eastern portion of the site is associated with REW UFI 15443 and it is anticipated this vegetation will be retained as part of the wetland conservation (including a 30 m wide wetland buffer) and is therefore assumed to remain classified as forest (Class A) vegetation post-development of the site.			

*Table 2: AS 3959 Vegetation Classification (refer to **Figure 2**) (continued)*

Photo ID:	6	**Plot:**	1
Vegetation Classification or Exclusion Clause			
Forest (Class A) - Flat/upslope			
Description / Justification for Classification			
Forest vegetation has been identified in the eastern portion of the site comprising predominantly mature trees growing to a height of up to 15 m, with a greater than 30% foliage cover, over an understorey of low shrubs and grasses. The forest vegetation in the eastern portion of the site is associated with REW UFI 15443 and it is anticipated this vegetation will be retained as part of the wetland conservation (including a 30 m wide wetland buffer) and is therefore assumed to remain classified as forest (Class A) vegetation post-development of the site.			
Photo ID:	7	**Plot:**	1
Vegetation Classification or Exclusion Clause			
Forest (Class A) - Flat/upslope			
Description / Justification for Classification			
Forest vegetation has been identified in the eastern portion of the site comprising predominantly mature trees growing to a height of up to 15 m, with a greater than 30% foliage cover, over an understorey of low shrubs and grasses. The forest vegetation in the eastern portion of the site is associated with REW UFI 14244 and it is anticipated this vegetation will be retained as part of the wetland conservation (including a 30 m wide wetland buffer) and is therefore assumed to remain classified as forest (Class A) vegetation post-development of the site.			

*Table 2: AS 3959 Vegetation Classification (refer to **Figure 2**) (continued*

Photo ID:	8	**Plot:**	3
Vegetation Classification or Exclusion Clause			
Woodland (Class B) – Flat/upslope			
Description / Justification for Classification			
Woodland vegetation has been identified to the west of the site comprising mature trees growing to a height of up to 15 m, with less than 30% foliage cover over a predominantly grassy understorey. This classified woodland vegetation is assumed to remain post-development of the site.			
Photo ID:	9	**Plot:**	3
Vegetation Classification or Exclusion Clause			
Woodland (Class B) – Flat/upslope			
Description / Justification for Classification			
Woodland vegetation has been identified to the south of the site within rural residential lots comprising mature trees growing to a height of up to 10 m, with less than 30% foliage cover. Although this vegetation was managed to a low threat standard at the time of the assessment including tree branches pruned to a height of 2 m and grasses slashed to a height of <100 mm (or stripped), as a conservative measure and since management of this land parcel cannot be guaranteed, this vegetation is assumed to be classified as woodland (Class B) post-development of the site.			

*Table 2: AS 3959 Vegetation Classification (refer to **Figure 2**) (continued)*

Photo ID:	10	**Plot:**	3
Vegetation Classification or Exclusion Clause			
Woodland (Class B) – Flat/upslope			
Description / Justification for Classification			
Woodland vegetation has been identified to the north of the site within a rural residential lot comprising mature trees growing to a height of up to 15 m, with less than 30% foliage cover. Although this vegetation was managed to a low threat standard at the time of the assessment including tree branches pruned to a height of 2 m and grasses slashed to a height of <100 mm, as a conservative measure and since management of this land parcel cannot be guaranteed, this vegetation is assumed to be classified as woodland (Class B) post-development of the site.			
Photo ID:	11	**Plot:**	4
Vegetation Classification or Exclusion Clause			
Woodland (Class B) – downslope 0-5°			
Description / Justification for Classification			
Woodland vegetation has been identified to the west of the site comprising mature trees growing to a height of up to 15 m, with less than 30% foliage cover over a predominantly grassy understorey. This classified woodland vegetation is assumed to remain post-development of the site.			

*Table 2: AS 3959 Vegetation Classification (refer to **Figure 2**) (continued)*

Photo ID:	12	**Plot:**	5
Vegetation Classification or Exclusion Clause			
Scrub (Class D) – Flat/upslope			
Description / Justification for Classification			
Scrub vegetation was identified to the north- of the site associated with the conservation category wetland (CCW) UFI 14241. This vegetation is dominated by melaleuca species (paper bark), generally between 4 m and 5 m in height with greater than 30% foliage cover and a dense understorey. This scrub vegetation comprises a closed continuous fuel profile and is assumed to remain post-development of the site.			
Photo ID:	13	**Plot:**	5
Vegetation Classification or Exclusion Clause			
Scrub (Class D) – Flat/upslope			
Description / Justification for Classification			
Scrub vegetation was identified to the north of the site within a CoW conservation reserve dominated by shrubs generally between 2 m and 4 m in height with greater than 30% foliage cover and a dense understorey. This scrub vegetation comprises a closed continuous fuel profile and is assumed to remain post-development of the site.			
Photo ID:	14	**Plot:**	5
Vegetation Classification or Exclusion Clause			
Scrub (Class D) – Flat/upslope			
Description / Justification for Classification			
Scrub vegetation was identified to the east of the site dominated by shrubs generally between 2 m and 4 m in height with greater than 30% foliage cover and a dense understorey. This scrub vegetation comprises a closed continuous fuel profile and is assumed to remain post-development of the site.			

*Table 2: AS 3959 Vegetation Classification (refer to **Figure 2**) (continued)*

Photo ID:	15	**Plot:**	5
Vegetation Classification or Exclusion Clause			
Scrub (Class D) – Flat/upslope			
Description / Justification for Classification			
Scrub vegetation was identified to the north of the site dominated by shrubs generally between 2 m and 4 m in height with greater than 30% foliage cover and a dense understorey. This scrub vegetation comprises a closed continuous fuel profile and is assumed to remain post-development of the site.			
Photo ID:	16	**Plot:**	5
Vegetation Classification or Exclusion Clause			
Scrub (Class D) – Flat/upslope			
Description / Justification for Classification			
Scrub vegetation was identified in the central - eastern portion of the site associated with REW UFI 15443 dominated by shrubs generally between 4 m and 5 m in height with greater than 30% foliage cover and a dense understorey. This scrub vegetation comprises a closed continuous fuel profile and is assumed to remain post-development of the site as part of the retained wetland feature and associated 30 m wide buffer.			
Photo ID:	17	**Plot:**	5
Vegetation Classification or Exclusion Clause			
Scrub (Class D) – Flat/upslope			
Description / Justification for Classification			
Scrub vegetation was identified in the central eastern portion of the site associated with REW UFI 15443 dominated by shrubs generally between 4 m and 5 m in height with greater than 30% foliage cover and a dense understorey. This scrub vegetation comprises a closed continuous fuel profile and is assumed to remain post-development of the site as part of the retained wetland feature and associated 30 m wide buffer.			

*Table 2: AS 3959 Vegetation Classification (refer to **Figure 2**) (continued)*

Photo ID:	18	**Plot:**	6
Vegetation Classification or Exclusion Clause			
Scrub (Class D) – downslope 0-5°			
Description / Justification for Classification			
Scrub vegetation was identified to the west of the site dominated by shrubs generally between 2 m and 4 m in height with greater than 30% foliage cover and a dense understorey. This scrub vegetation comprises a closed continuous fuel profile and is assumed to remain post-development of the site.			
Photo ID:	19	**Plot:**	7
Vegetation Classification or Exclusion Clause			
Grassland (Class G) – Flat/upslope			
Description / Justification for Classification			
Grassland vegetation has been identified to the north of the site within a rural residential lot. Although at the time of the assessment, the grass vegetation has been managed to a low threat condition and slashed to a height of <100 mm, future management on a regular basis cannot be guaranteed and therefore this vegetation has been classified as grassland (Class G) post-development of the site.			
Photo ID:	20	**Plot:**	7
Vegetation Classification or Exclusion Clause			
Grassland (Class G) – Flat/upslope			
Description / Justification for Classification			
Unmanaged grassland vegetation has been identified to the west of the site characterised by open weedy pasture grass cover >100 mm in height with an overstorey of occasional trees with a foliage cover of less than 10%. This vegetation is assumed to remain the same in the post development scenario of the site.			

*Table 2: AS 3959 Vegetation Classification (refer to **Figure 2**) (continued)*

Photo ID:	21	**Plot:**	7
Vegetation Classification or Exclusion Clause			
Grassland (Class G) – Flat/upslope			
Description / Justification for Classification			
Unmanaged grassland vegetation has been identified to the east of the site characterised by open weedy pasture grass cover >100 mm in height with an overstorey of occasional shrubs with a foliage cover of less than 10%. This vegetation is assumed to remain the same in the post development scenario of the site.			
Photo ID:	22	**Plot:**	7
Vegetation Classification or Exclusion Clause			
Grassland (Class G) – Flat/upslope			
Description / Justification for Classification			
Unmanaged grassland vegetation has been identified to the north of the site characterised by open weedy pasture grass cover >100 mm in height with an overstorey of occasional trees and shrubs with a foliage cover of less than 10%. This vegetation is assumed to remain the same in the post development scenario of the site.			
Photo ID:	23	**Plot:**	9
Vegetation Classification or Exclusion Clause			
Exclusion clause 2.2.3.2(e) non-vegetated areas			
Description / Justification for Classification			
Coogee Road to the north of the site has been excluded in accordance with clause 2.2.3.2(e) of AS 3959. Coogee Road will likely undergo road widening and will ultimately connect to Rousset Road within the site as part of the SP implementation.			

*Table 2: AS 3959 Vegetation Classification (refer to **Figure 2**) (continued)*

Photo ID:	24	**Plot:**	9
Vegetation Classification or Exclusion Clause			
Exclusion clause 2.2.3.2(e) non-vegetated areas			
Description / Justification for Classification			
The existing Rousset Road within the site has been excluded in accordance with clause 2.2.3.2(e) of AS 3959. This portion of presently unsealed Rousset Road will undergo significant upgrades including road widening and realignment and will ultimately comprise a major integrator road and underground railway reserve as part of the SP implementation.			
Photo ID:	25	**Plot:**	9
Vegetation Classification or Exclusion Clause			
Exclusion clause 2.2.3.2(e) non-vegetated areas			
Description / Justification for Classification			
Non-vegetated areas associated with light industrial development and hardstand to the south-west of the site along Mariginiup Road and Lakeview Street has been excluded in accordance with clause 2.2.3.2(e) of AS 3959.			
Photo ID:	26	**Plot:**	9
Vegetation Classification or Exclusion Clause			
Exclusion clause 2.2.3.2(e) non-vegetated areas			
Description / Justification for Classification			
Non-vegetated areas associated with the corner of Lakeview Street and Mariginiup Road to the south-west of the site have been excluded in accordance with clause 2.2.3.2(e) of AS 3959. This section of Mariginiup Road will be extended further adjacent to the western site boundary as part of SP implementation.			

*Table 2: AS 3959 Vegetation Classification (refer to **Figure 2**) (continued)*

Photo ID:	27	**Plot:**	9
Vegetation Classification or Exclusion Clause			
Exclusion clause 2.2.3.2(e) non-vegetated areas			
Description / Justification for Classification			
Existing Lakeview Street to the south of the site has been excluded in accordance with clause 2.2.3.2(e) of AS 3959.			



Photo ID:	28	**Plot:**	9
Vegetation Classification or Exclusion Clause			
Exclusion clause 2.2.3.2(e) non-vegetated areas			
Description / Justification for Classification			
Non-vegetated areas associated with the existing Boundary Road to the east of the site have been excluded in accordance with clause 2.2.3.2(e) of AS 3959. Boundary Road will be subject to further road upgrades including road widening and realignment as part of the SP implementation.			



Photo ID:	29	**Plot:**	10
Vegetation Classification or Exclusion Clause			
Exclusion clause 2.2.3.2(f) low-threat vegetation			
Description / Justification for Classification			
Market gardens to the south of the site along Lakeview Street have been excluded in accordance with clause 2.2.3.2(f) of AS 3959.			



3.1.3 Assessment outputs

The BAL assessment completed for the site indicates that a BAL rating of BAL 29 or less can be achieved for the majority of the site. BAL 40 and BAL-FZ extend into the central portion of the site (due to future bushfire hazards associated with the retained wetland vegetation, future buffers and bio-retention drainage areas). However, it should be noted that the vegetation classifications pertaining to these hazards are conservative, assuming revegetation to a classified forest (Class A) vegetation applies to the full extent of the wetland buffers and classified grassland (Class G) vegetation applies to bio-retention drainage areas. Notwithstanding this, appropriate set back distances will result in habitable buildings achieving a BAL rating of BAL-29 or below.

Table 3 provides a summary of the setback distances necessary from classified vegetation to achieve the indicated BAL ratings, with the BAL contour plan, provided in **Figure 3**, being a visual representation of these distances. The setback distances are based on the post-development classified vegetation (**Figure 2**) and effective slope taken from Table 2.5 of AS 3959.

Table 3: Setback distances based on vegetation classification and effective slope and Table 2.5 of AS 3959, as determined by the method 1 BAL assessment

Plot number (see Figure 2)	Vegetation classification (see Figure 2)	Effective slope (see Figure 2)	Distance to vegetation (from Table 2.5 of AS 3959)	BAL rating (see Figure 3)
Plot 1	Forest (Class A)	Flat/upslope	< 16 m	BAL-FZ
			16 - < 21 m	BAL-40
			21 - < 31 m	BAL-29
			31 - < 42 m	BAL-19
			42 - < 100 m	BAL-12.5
			> 100 m	BAL-LOW
Plot 2	Forest (Class A)	Downslope 0-5°	< 20 m	BAL-FZ
			20 - < 27 m	BAL-40
			27 - < 37 m	BAL-29
			37 - < 50 m	BAL-19
			50 - < 100 m	BAL-12.5
			> 100 m	BAL-LOW
Plot 3	Woodland (Class B)	Flat/upslope	< 10 m	BAL-FZ
			10 - < 14 m	BAL-40
			14 - < 20 m	BAL-29
			20 - < 29 m	BAL-19
			29 - < 100 m	BAL-12.5
			> 100 m	BAL-LOW

Table 3: Setback distances based on vegetation classification and effective slope and Table 2.5 of AS 3959, as determined by the method 1 BAL assessment (continued)

Plot number (see Figure 2)	Vegetation classification (see Figure 2)	Effective slope (see Figure 2)	Distance to vegetation (from Table 2.5 of AS 3959)	BAL rating (see Figure 3)
Plot 4	Woodland (Class B)	Downslope 0-5°	< 13 m	BAL-FZ
			13 - < 17 m	BAL-40
			17 - < 25 m	BAL-29
			25 - < 35 m	BAL-19
			35 - < 100 m	BAL-12.5
			> 100 m	BAL-LOW
Plot 5	Scrub (Class D)	Flat/upslope	< 10 m	BAL-FZ
			10 - < 13 m	BAL-40
			13 - < 19 m	BAL-29
			19 - < 27 m	BAL-19
			27 - < 100 m	BAL-12.5
			> 100 m	BAL-LOW
Plot 6	Scrub (Class D)	Downslope 0-5°	< 11 m	BAL-FZ
			11 - < 15 m	BAL-40
			15 - < 22 m	BAL-29
			22 - < 31 m	BAL-19
			31 - < 100 m	BAL-12.5
			> 100 m	BAL-LOW
Plot 7	Grassland (Class G)	Flat/upslope	< 6 m	BAL-FZ
			6 - < 8 m	BAL-40
			8 - < 12 m	BAL-29
			12 - < 17 m	BAL-19
			17 - < 50 m	BAL-12.5
			> 50 m	BAL-LOW
Plot 8	Grassland (Class G)	Downslope 0-5°	< 7 m	BAL-FZ
			7 - < 9 m	BAL-40
			9 - < 14 m	BAL-29
			14 - < 20 m	BAL-19
			20 - < 50 m	BAL-12.5
			> 50 m	BAL-LOW

4 Identification of Bushfire Hazard Issues

From a bushfire hazard management perspective, based on the requirements of SPP 3.7 and the Guidelines, the key issues that are likely to require management and/or consideration as part of ongoing operation and any future development within the site include:

- Provision of appropriate separation distance from bushfire hazards to ensure a BAL rating of BAL-29 or less can be achieved at buildings (built form) (i.e. classified vegetation associated with the wetlands and associated buffer areas and surrounding the site).
- Ensuring site access is designed, constructed and managed to ensure safe access and egress for fire fighting vehicles and occupants. This may include the use of temporary no through roads with suitable turn around areas or temporary emergency access ways during staged development that meet the requirements of the Guidelines.
- Ensuring that any landscaped areas including POS areas (outside of the wetland buffers and potentially the bio-retention drainage areas) and public road reserves within the site are appropriately designed (as per the LMP, **Appendix B**), implemented and managed to achieve low threat standards to reduce the risk of fires starting onsite.
- Ensuring the provision of appropriate reticulated water supply and associated infrastructure.

4.1 Permanent hazards

The majority of the site is surrounded by areas comprising classified vegetation within Bush Forever Sites 324 to the south and 147 to the west in addition to classified vegetation to the east within the Gnangara-Moore River State Forest) utilised for existing and historical pine plantations, and to the north of the site within rural land holdings and CCW UFI 14241. Vegetation within the site associated with the REWs and associated wetland buffers will be retained within POS areas and will pose a permanent bushfire hazard. Classified vegetation surrounding and within the site includes:

- Class A – Forest vegetation adjoining the site to the south associated with Bush Forever Site 324 and within rural residential lots.
- Class A – Forest vegetation to the east of the site associated with historical pine plantations of the Gnangara-Moore River State Forest.
- Class A – Forest vegetation within REW UFI 14245, UFI 15443 and UFI 14244
- Class B – Woodland Vegetation within rural residential lots and part of Bush Forever Site 147 to the west of the site.
- Class B – Woodland Vegetation within rural residential lots to the north of the site along Coogee Road. Although vegetation within these lots was managed to a low threat condition during the site assessment, conservatively this vegetation has been classified as woodland (Class B).
- Class D – Scrub vegetation to the north of the site within CCW UFI 14241 and along Coogee Road within a CoW conservation reserve.
- Class D – Scrub vegetation to the west of the site within a rural lots and to the east of the site associated with historical pine plantations.
- Class D – Scrub vegetation within the site associated with REW UFI 15443.
- Class G – Unmanaged grassland vegetation to the north, west, south and east of the site.

4.2 Temporary hazards

It is acknowledged that portions of classified vegetation surrounding the site will ultimately be removed as part of future structure planning of precincts in the area, as outlined in the EWDSP. Notwithstanding this, as the timing of any future structure planning and development in the area is generally unknown, no temporary hazards have been assumed and all classified vegetation surrounding the site (unless otherwise specified) has been treated as a permanent hazard for the purposes of this BMP and the associated BAL Contour Plan (**Figure 3**).

4.3 Vegetation management and landscaping

Vegetation within the site's POS areas (except within wetlands, associated buffers and bio-retention drainage areas) has been assumed to be able to achieve a low threat condition as a result of the proposed SP development. Future landscaping plans will need to ensure that all vegetation within the site can comply with clause 2.2.3.2 of AS 3959. The ideal outcome is the retention of mature trees and native vegetation in 'good' or better condition comprising threatened and priority ecological communities (as feasible) and all vegetation managed to a minimal fuel condition within POS areas.

As highlighted in **Section 4.1**, vegetation within the REWs will be retained and therefore remain a bushfire hazard, whilst revegetation and rehabilitation within wetland buffers have been conservatively assumed to pose a bushfire threat post-development of the site. Notwithstanding this, it is possible that portions of the buffer associated with the REW values including bio-retention areas within POS may be maintained in the future to achieve low threat for public recreation purposes.

4.4 Access

The proposed Precinct 15 SP provides for access and egress opportunities via multiple points onto Lakeview Street to the south, Mariginiup Road to the west, Coogee Road to the north and Boundary Road to the east of the site. Presently existing Lakeview Street and Coogee Road provide access in two different directions. Additional access and egress opportunities will ultimately exist once development progresses within the site including the extension of Mariginiup Road adjacent to the western site boundary, the Coogee Road and Rousset Road upgrades and realignment through the centre of the site and road upgrades of Boundary road (presently unsealed) to the east of the site. All neighbourhood connector and transport corridors surrounding the site will be implemented in accordance with the EWDSP to which the internal road network, including the major transit corridor within the centre of the site, will ultimately connect.

Given future development within the site might be staged, vehicular access arrangements in the short, medium and long term duration of development will need to ensure that all occupiers and visitors are provided with at least two vehicular access routes at all times. In the instance that roads external to the site boundary have not been constructed prior to staged subdivision within the site, temporary no-through roads and suitable turnaround areas will be constructed.

5 Assessment Against the Bushfire Protection Criteria

This BMP provides an outline of the mitigation strategies that will ensure that as development progresses within the site, an acceptable solution can be adopted for each of the bushfire protection criteria detailed within Appendix Four of the Guidelines. The bushfire protection criteria identified in the Guidelines and addressed as part of this BMP are:

- Element 1: Location of the development
- Element 2: Siting and design of the development
- Element 3: Vehicular access
- Element 4: Water supply.

A summary of how the 'acceptable solution' can be achieved and an associated compliance statement for each has been provided in Error! Reference source not found..

Table 4: Assessment against the bushfire protection criteria from the Guidelines

Bushfire protection criteria	Proposed bushfire management strategies
Element 1: Location	
A1.1 Development location	The BAL contour plan (**Figure 3**) indicates that the majority of the site will be able to achieve a BAL rating of BAL-29 or less. Based on the classified vegetation within the resource enhancement wetlands (REWs) and associated wetland buffers and bio-retention areas, some areas of the site are likely to be subject to a BAL rating exceeding BAL-29. Notwithstanding this, as part of future subdivision and detailed design, development can be designed to ensure habitable buildings achieve BAL-29 or less through the location of public roads, landscaped POS areas and in-lot setbacks compliant with A1.1. Further planning at the subdivision application and/or development application stage will inform the proposed lot layout for the site, with an updated BMP (and associated BAL assessment) to be prepared to ensure that future habitable buildings are able to achieve a BAL rating of BAL-29 or less.
Element 2: Siting and design	
A2.1 Asset Protection Zone	All lots are required to be managed to a low threat condition with a minimum Asset Protection Zone (APZ) equivalent to enable BAL-29 to be achieved. APZs are typically contained within a lot, but can also include areas of low threat vegetation managed in accordance with Section 2.2.3.2 (e) or (f) of AS 3959. For the site, this includes managed road reserves and POS areas (outside of wetlands and associated buffers). The proposal can and will comply with A2.1. The bushfire hazards in the post-development scenario that are relevant to the site are shown in **Figure 2**. These include retained forest and scrub vegetation within the site, associated with the REWs and the applicable wetland buffers and grassland vegetation associated with the bio-retention areas. Based on the outcomes of the BAL assessment and the BAL contour plan (see **Figure 3**), residential lots adjacent to the wetlands and associated wetland buffers may be exposed to a BAL rating exceeding BAL-29. However, the post development assumptions which have informed the assessment are based on a conservative approach that assumes the full extent of revegetation for the wetland buffers to result in vegetation being classified as forest (Class A) vegetation. It is possible portions of the buffer associated with the REW values may be maintained in the future to achieve low threat for public recreation purposes. This will provide appropriate separation between future residential areas and areas of potential revegetation. To ensure that future habitable buildings are not exposed to BAL ratings greater than BAL-29 in the future, the following management measures can be undertaken: • Landscaping at the interface of any potential revegetation areas, to enable these areas to be maintained to a 'low threat' standard to support this area being used as an APZ. • Internal lot setbacks. • Minor modifications to the road reserve and/or lot layout. Whilst the conservative assessment of the bushfire hazards indicates that some residential areas may be exposed to a BAL rating exceeding BAL-29, future habitable buildings will still be able to achieve a BAL rating of BAL-29 or less through the provision of in-lot setbacks and/or landscaping of small portions of the wetland buffer where it interfaces with residential development. Overall, the acceptable solution can be satisfied. Where habitable buildings proposed to be constructed within a designated bushfire prone area (Class 1, 2, 3 and 10a buildings) in an area subject to a BAL rating of BAL-12.5 or higher, these will need to satisfy higher construction standards in accordance with the National Construction Code (NCC) (i.e. AS 3959 or the National Association for Steel-framed Housing (NASH) Standard).

Table 4: Assessment against the bushfire protection criteria from the Guidelines (continued)

Bushfire protection criteria	Proposed bushfire management strategies
Element 3: Vehicular access	
A3.1 Public roads	All existing and proposed roads as part of the SP implementation, as shown in **Figure 4**, can and will comply with the minimum standards outlined in Appendix Four of the Guidelines (Table 6, column 1).
A3.2a Multiple access routes	The site will ultimately have access and provide egress via multiple points onto Lakeview Street, Mariginiup Road, Coogee Road, Rousset Road and Boundary Road to the east of the site. Presently Lakeview Street and Coogee Road provide access in two different directions compliant with A3.2a. Additional access and egress opportunities will ultimately exist once development progresses surrounding the site, associated with future structure planning within other precincts in accordance with the EWDSP. Where integrator arterial roads are located adjacent to the SP boundary (the site), these are assumed to be constructed prior to or concurrent with the development within the site to provide additional access and egress opportunities from and to the site's proposed interior road network. This includes the Mariginiup Road extension adjacent to the western site boundary, the future connection of Coogee Road and Rousset Road through the center of the site and Boundary Road along the eastern site boundary. All neighbourhood connector and transport corridors surrounding the site will be implemented in accordance with the EWDSP to which the internal road network, including the major transit corridor within the centre of the site, will ultimately connect. Given future development within the site might be staged, vehicular access arrangements in the short, medium and long term duration of development will need to ensure that all occupiers and visitors are provided with at least two vehicular access routes at all times. Where roads external to the site boundary have not been constructed prior to staged subdivision within the site, temporary no-through roads and suitable turnaround areas will need to comply with the technical requirements of the Guidelines Table 6 (**Plate 4**) and Figure 24.
A3.2b Emergency access way	There is no requirement for the proposed development to provide an emergency access way as the proposal is compliant with A3.2a. It is possible that as part of staged development, emergency access ways may be required to ensure future development has access to at least two different destinations, until the full public road network is constructed. This should be considered as part of each stage of development and where temporary no-through roads and suitable turnaround areas can not comply with the technical requirements of the Guidelines Table 6, as outlined in **Plate 4**. Any future emergency access way will need to meet the requirements of Table 6 of the Guidelines, provide through connection to a public road, be no more than 500 m in length and must be signposted and accessible at all times.
A3.3 Through-roads	The SP does not propose any no-through roads within the site. As highlighted above, where roads external to the site boundary have not been constructed prior to staged subdivision within the site, temporary no-through roads must be developed in accordance with A3.3, including having a maximum length of 200 m (unless where subject to BAL-LOW), a compliant turning head, and meet the minimum technical standards for a public road as detailed in Table 6, Column 1 of the Guidelines (**Plate 4**).

Table 4: Assessment against the bushfire protection criteria from the Guidelines (continued)

Bushfire protection criteria	Proposed bushfire management strategies
Element 3: Vehicular access (continued)	
A3.4a Perimeter roads	Public perimeter roads, meeting the requirements of Appendix Four of the Guidelines (Table 6, column 1), are proposed in the SP and would provide separation between the proposed lots and classified vegetation surrounding and within the site, compliant with A3.4a. Where perimeter roads are not proposed in the SP, these are adjacent to POS areas and vegetation that will be managed to a low threat condition. A3.4a of the Guidelines states that perimeter roads may not be required where the adjoining classified vegetation is Class G grassland. Based on this and provided any adjacent vegetation would be considered low threat vegetation in accordance with clause 2.2.3.2 of AS 3959, perimeter roads would not be required. Future planning at the subdivision stage will need to address the provision of temporary perimeter roads surrounding staged development.
Element 4: Water	
A4.1 Reticulated areas	The site will connect to the reticulated water supply network. Fire hydrants installed will meet the specifications of the Water Corporations and DFES. Fire hydrants on land zoned for residential purposes are generally required to be sited within 200 m of dwellings (Class 1a). Any commercial development will be subject to onsite hydrant requirements as specified by the National Construction Code.
A4.2 Provision of water for fire fighting purposes	Not applicable. The Guidelines state that the acceptable solutions do not apply at every stage of the planning process. The lot layout of the SP is not known at this stage of the planning process; therefore, on this basis A4.2 does not apply at this stage and although fire hydrants will be installed to meet the specifications of the Water Corporation and DFES, the general location of hydrants is unknown at this stage and will need to be addressed at future planning stages such as during subdivision.

Table 6: Vehicular access technical requirements

TECHNICAL REQUIREMENTS	1 Public roads	2 Emergency access way[1]	3 Fire service access route[1]	4 Battle-axe and private driveways[2]
Minimum trafficable surface (metres)	In accordance with A3.1	6	6	4
Minimum horizontal clearance (metres)	N/A	6	6	6
Minimum vertical clearance (metres)	4.5			
Minimum weight capacity (tonnes)	15			
Maximum grade unsealed road[3]	As outlined in the IPWEA Subdivision Guidelines	1:10 (10%)		
Maximum grade sealed road[3]		1:7 (14.3%)		
Maximum average grade sealed road		1:10 (10%)		
Minimum inner radius of road curves (metres)		8.5		

Notes:
[1] To have crossfalls between 3 and 6%.
[2] Where driveways and battle-axe legs are not required to comply with the widths in A3.5 or A3.6, they are to comply with the Residential Design Codes and Development Control Policy 2.2 Residential Subdivision.
[3] Dips must have no more than a 1 in 8 (12.5% -7.1 degree) entry and exit angle.

Plate 4: Excerpt of Table 6 from The Guidelines

5.1 Additional management strategies

5.1.1 Future approval considerations

The BAL assessment is a conservative and cautious assessment of the potential bushfire risk posed to future habitable buildings within the site based on the proposed management of vegetation and assumptions outlined in **Section 3**.

The measures to be implemented through the SP and associated future subdivision process have been outlined as part of this BMP and can be used to support future planning and development approval processes. A revised BMP is likely to be required for future subdivision applications within the site, particularly in the instance the SP layout is different to that outlined within this BMP and will further need to respond to the subdivision design and/or stage of development.

5.1.2 Landscape management

5.1.2.1 Within the site

Public open space and public road reserves

Areas of POS (outside of wetland reserves and associated buffers) and public road reserves within the site will be designed and/or maintained to achieve low threat vegetation in accordance with Section 2.2.3.2 of AS3959, as shown in **Figure 2**, and will initially be the responsibility of the proponent and subsequently that of the CoW. The management and modification of proposed POS areas will include the modification of the existing vegetation identified for future retention within the site's proposed POS area as outlined in the SP and the LMP, as shown in **Appendix B**. it is acknowledged that managed vegetation within future bio-retention areas cannot be assumed; therefore, vegetation within POS bio-retention areas have been conservatively assumed as classified grassland (Class G) post development of the site, as shown in **Figure 2**. Notwithstanding this, it is possible that portions of the bio-retention areas within POS may be maintained in the future to achieve low threat for public recreation purposes.

Modification and future management of these areas will likely include the following:

- Clearing of understorey vegetation and the removal of mature trees of low retention value
- Low pruning of trees (branches below 2 m in height removed where appropriate)
- Regular maintenance including removal of weeds and dead material
- Application of ground covers such as mulch or non-flammable materials.
- Irrigation of grass and garden beds (where required).
- Regularly mowing/slashing grass to less than 100mm in height.

City of Wanneroo Fire Mitigation Notice

The CoW releases a fire mitigation notice annually (or as required) to provide a framework for bushfire management within the CoW. The CoW is able to enforce this order in accordance with Section 33 of the *Bush Fires Act 1954* and landowners will need to ensure compliance with the fire mitigation notice, as published, or any directions provided by the CoW. Once future subdivision occurs, all landholders of residential landholdings larger than 0.4 ha will be required to implement the following:

- Install and maintain mineral earth firebreaks as per firebreak specifications of at least 3 m wide (no more than 4 m wide, but may have a corner turning radius of up to 10 m) immediately inside and along all lot boundaries (including on boundaries adjacent to roads, rail and drain reserves and al public open space reserves);
- Ensure driveways and access ways to all buildings are maintained at a minimum of 3 m in width and a vertical clearance height of 4 m, with all overhanging vegetation trimmed back to clear access.

Staged development

The development of the site is likely to occur over multiple stages and potentially across multiple subdivision approvals. To ensure that bushfire hazards are satisfactorily managed at all stages of development and subdivision, the proponent will be required to manage vegetation outside each stage to ensure BAL ratings meet those demonstrated in the BAL contour plan in **Figure 3**.

5.1.2.2 Surrounding the site

Classified vegetation surrounding the site will remain a bushfire hazard post-development of the site, whilst it is acknowledged that areas comprising classified vegetation will ultimately be cleared to enable future structure planning in the area in accordance with the EWDSP. Notwithstanding, the timing of any future structure planning and associated development is not yet known and therefore this vegetation has been assumed to remain a bushfire hazard post-development of the site for the unforeseeable future.

5.1.3 Vulnerable or high-risk land uses

The proposed primary and secondary schools within the site would be considered a 'vulnerable' land use in accordance with the definitions provided in SPP 3.7 and the Guidelines. The buildings will accommodate groups of children (under the age of 18) who may have a reduced physical and mental ability to respond in a bushfire event and may present evacuation challenges. The proposed schools are located more than 100 m from bushfire hazards in the post development scenario (therefore are subject to BAL-LOW) and do not require specific construction in accordance with SPP 3.7.

Should vulnerable or high-risk land uses be proposed in the future, the requirements of SPP 3.7 may need to be addressed at future development approvals (i.e. subdivision/development application) (when specific detail on the land use is known) and may include the preparation of an emergency evacuation plan and/or risk assessment for onsite flammable materials where applicable. This is generally only a consideration where a BAL rating greater than BAL-LOW applies.

6 Responsibilities for Implementation and Management of Bushfire Measures

Subject to the approval of the SP, development within the site will be implemented through future subdivision and development approvals.

Table 5 outlines the future responsibilities of the proponent (developer) and the CoW associated with implementing this BMP with reference to ongoing bushfire risk mitigation measures for existing land uses (through compliance with the CoW Fire Mitigation Notice) or future mitigation measures to be accommodated as part of the development process. These responsibilities will need to be considered as part of the subsequent development and implementation process.

Table 5: Responsibilities for the implementation of this BMP

Developer – Management action	
No.	Implementation and management actions
1	Provide a copy of this BMP to the relevant decision makers to support approval of the proposed Precinct 15 SP.
2	Comply with the CoW Fire Mitigation Notice as published and/or in accordance with directions given by the local government.
3	If required, prepare a new/revised BMP in accordance with SPP 3.7, the Guidelines and AS 3959 to support future subdivision applications, based on a proposed subdivision layout and in consideration of existing bushfire hazards or those that will be present post-development of the site. In addition, if the assumptions regarding the ongoing management of the POS areas and public road reserves change as part of future detailed design stages, a revised BMP or BAL assessment will be required.
4	Where applicable, as part of the structure plan and/or subdivision process, make spatial provisions for: • A suitable public road network that provides egress to at least two different destinations and meets the technical requirements of Table 6 within Appendix Four of the Guidelines (or as otherwise determined by a bushfire consultant and relevant approval authority). This may include the use of temporary cul-de-sacs (no through roads) and/or emergency access ways where required by staging. • Where possible, avoid cul-de-sacs and battle-axe lots as part of the spatial layout. If these are proposed as part of future development, these will need to be justified from a planning/development perspective and consistent with the minimum requirements outlined in Appendix Four of the Guidelines (or as otherwise determined by a bushfire consultant and relevant approval authority). • Ensure future habitable buildings are able to be located in an area subject to BAL-29 or less. The minimum separation distances between habitable buildings and classified vegetation to achieve BAL-29 should be in accordance with Table 3 in this BMP or as specified in subsequent BAL assessments. These separation distances can be accommodated through locating public roads and/or managed public open space between the habitable building and classified vegetation and/or ensuring proposed residential lots are adequately sized to ensure BAL-29 is not exceeded at the future habitable buildings.
City of Wanneroo	
No.	Management action
1	Maintaining fuel loads in existing public road reserves and public open space (under their management) to appropriate standards to minimise fuel loads.
2	Monitoring compliance with the CoW Fire Mitigation Notice and enforcing requirements as required.

7 Applicant Declaration

7.1 Accreditation

This assessment report has been prepared by Emerge Associates who have a number of team members who have undertaken Bushfire Planning and Design (BPAD) Level 1 and Level 2 training and are Fire Protection Association of Australia (FPAA) accredited practitioners. Emerge Associates have been providing bushfire risk management advice for more than 10 years, undertaking detailed bushfire assessments (and associated approvals) to support the land use development industry.

7.2 Declaration

I declare that the information provided is true and correct to the best of my knowledge.

Signature:



Name: Anthony Rowe

Company: Envision Bushfire Protection/Emerge Associates

Date: 17/08/2023

BPAD Accreditation: Level 3 BPAD no. 36690

8 References

8.1 General references

The references listed below have been considered as part of preparing this document.

Department of Planning, Lands and Heritage, and Western Australian Planning Commission, (DPLH & WAPC) 2021, *Guidelines for Planning in Bushfire Prone Areas Version 1.4*, Perth, Western Australia.

Department of Water and Environmental Regulation (DWER) 2021, *Water Register*, Perth, <https://maps.water.wa.gov.au/#/webmap/register>.

Emerge Associates 2023a, *Detailed Fauna and Targeted Black Cockatoo Assessment Various Lots, Mariginiup*, EP22-019(02)--010 WJC, 1.

Emerge Associates 2023b, *Detailed Flora and Vegetation Assessment Various Lots, Mariginiup*, EP22-019(01)--011 SCM, 1.

Gould, J., McCaw, W., Cheney, N., Ellis, P. and Matthews, S. 2007, *Field Guide: Fuel Assessment and Fire Behaviour Prediction in Dry Eucalypt Forest*, CSIRO and Department of Environment and Conservation, Perth, Western Australia.

Horizon Heritage Management (Horizon) 2023, *Precinct 15 Central Mariginiup Local Structure Plan Aboriginal Heritage Desktop Assessment Report*.

Office of Bushfire Risk Management (OBRM) 2021, *Map of Bush Fire Prone Areas*, Landgate, https://maps.slip.wa.gov.au/landgate/bushfireprone/.

Standards Australia 2018, *AS 3959:2018 Construction of buildings in bushfire-prone areas*, Sydney.

Western Australian Planning Commission (WAPC) 2015, *State Planning Policy 3.7 Planning in Bushfire Prone Areas*, Perth.

8.2 Online references

The online resources that have been utilised in the preparation of this report are referenced in **Section 8.1**, with access date information provided in **Table R-1**.

Table R 1 Access dates for online references

Reference	Date accessed	Website or dataset name
(DWER 2021)	February 2023	Landgate Map Viewer Plus

Figures

Figure 1: Site Location and Topographic Contours

Figure 2: AS 3959 Vegetation Classifications and Effective Slope

Figure 3: Bushfire Attack Level Contour Plan

Figure 4: Spatial Representation of Bushfire Management Strategies

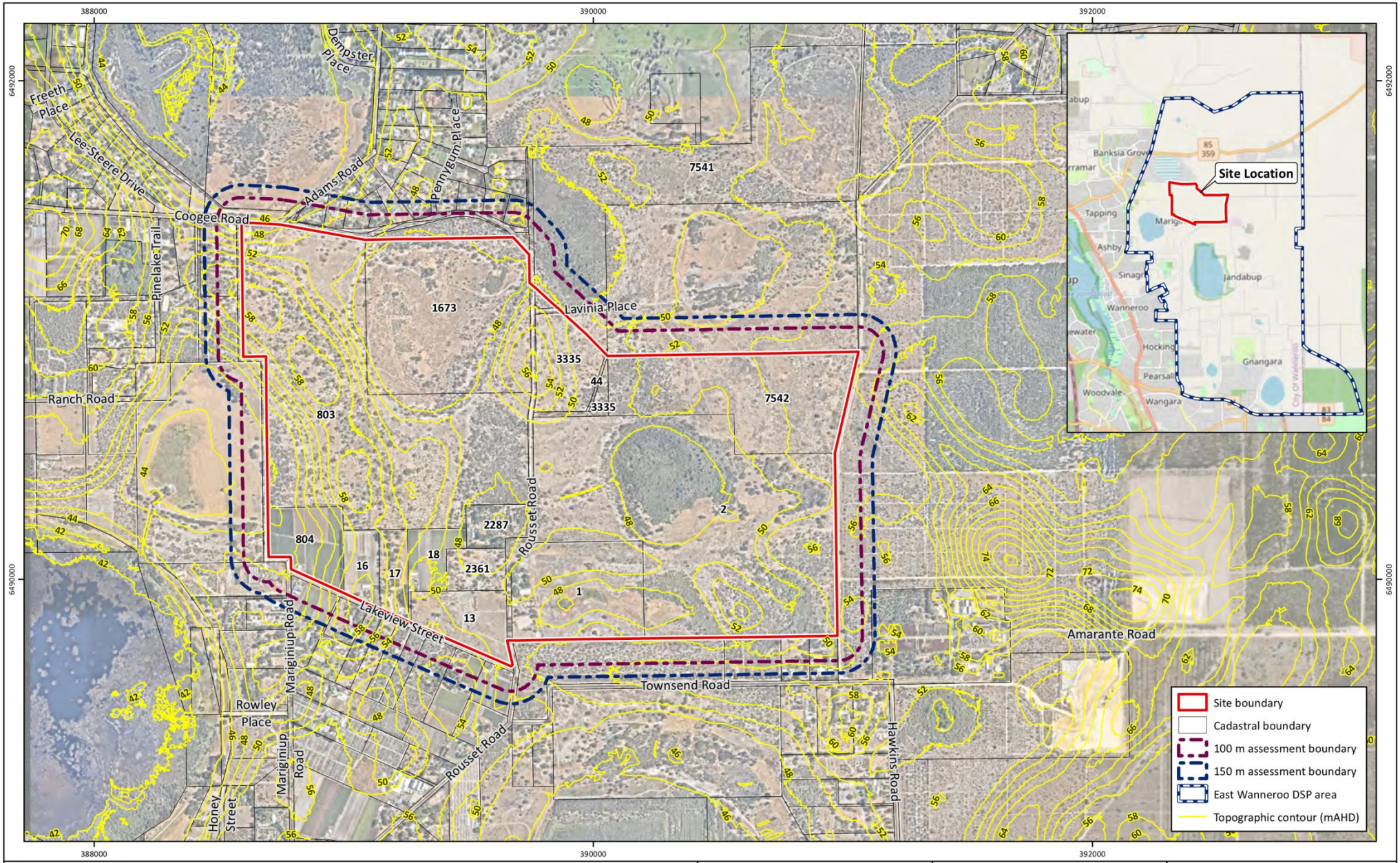

Figure 1: Site Location

Project: Bushfire Management Plan
Precinct 15 Structure Plan
Client: Stockland

Plan Number:
EP22-019(16)--F26
Drawn: GAR
Date: 17/02/2023
Checked: PPS
Approved: ADB
Date: 02/08/2023

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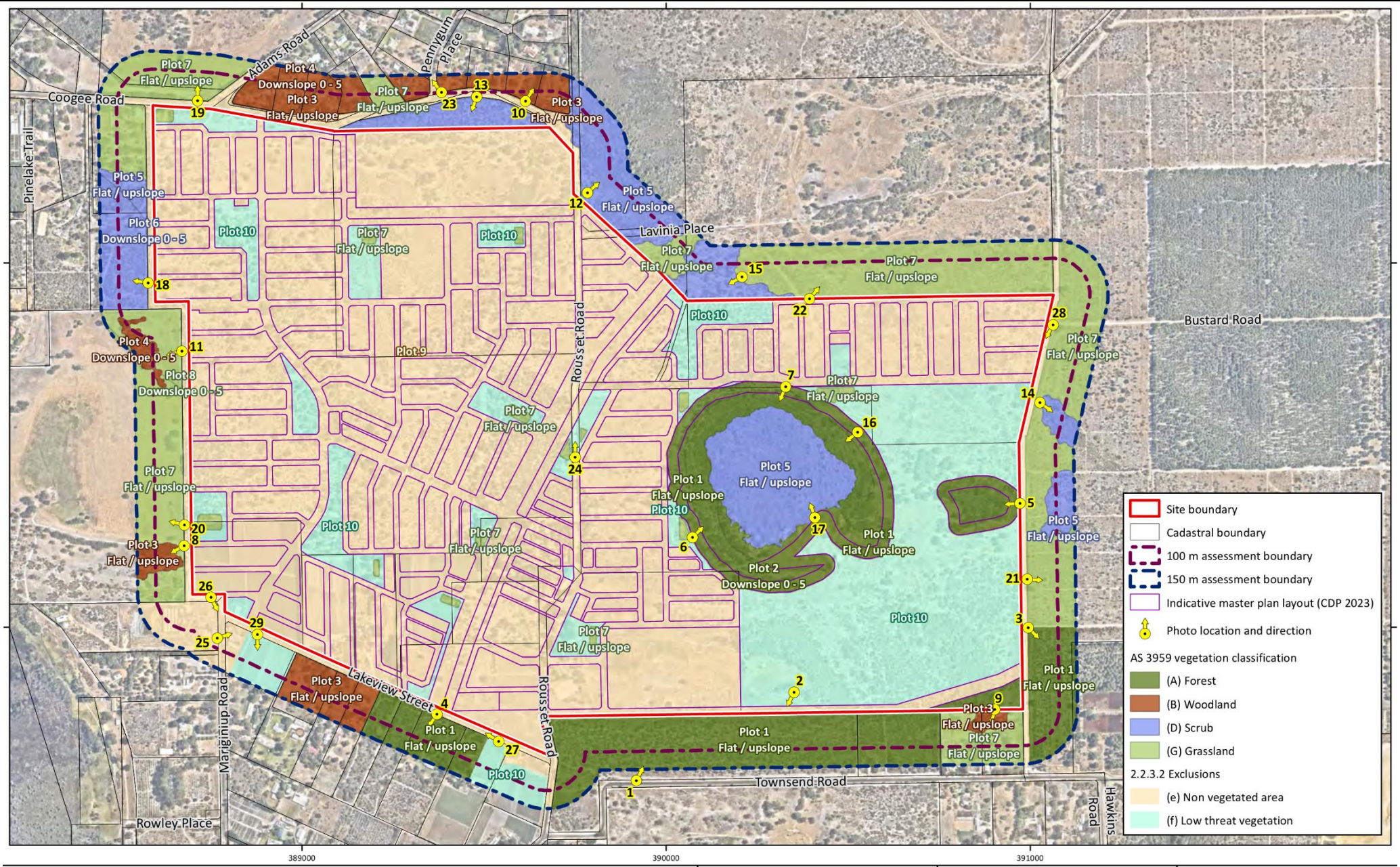

igure 2: AS 3959 Vegetation Classification and Effective Slope

roject: Bushfire Management Plan
Precinct 15 Structure Plan

Plan Number: EP22-019(16)--F27
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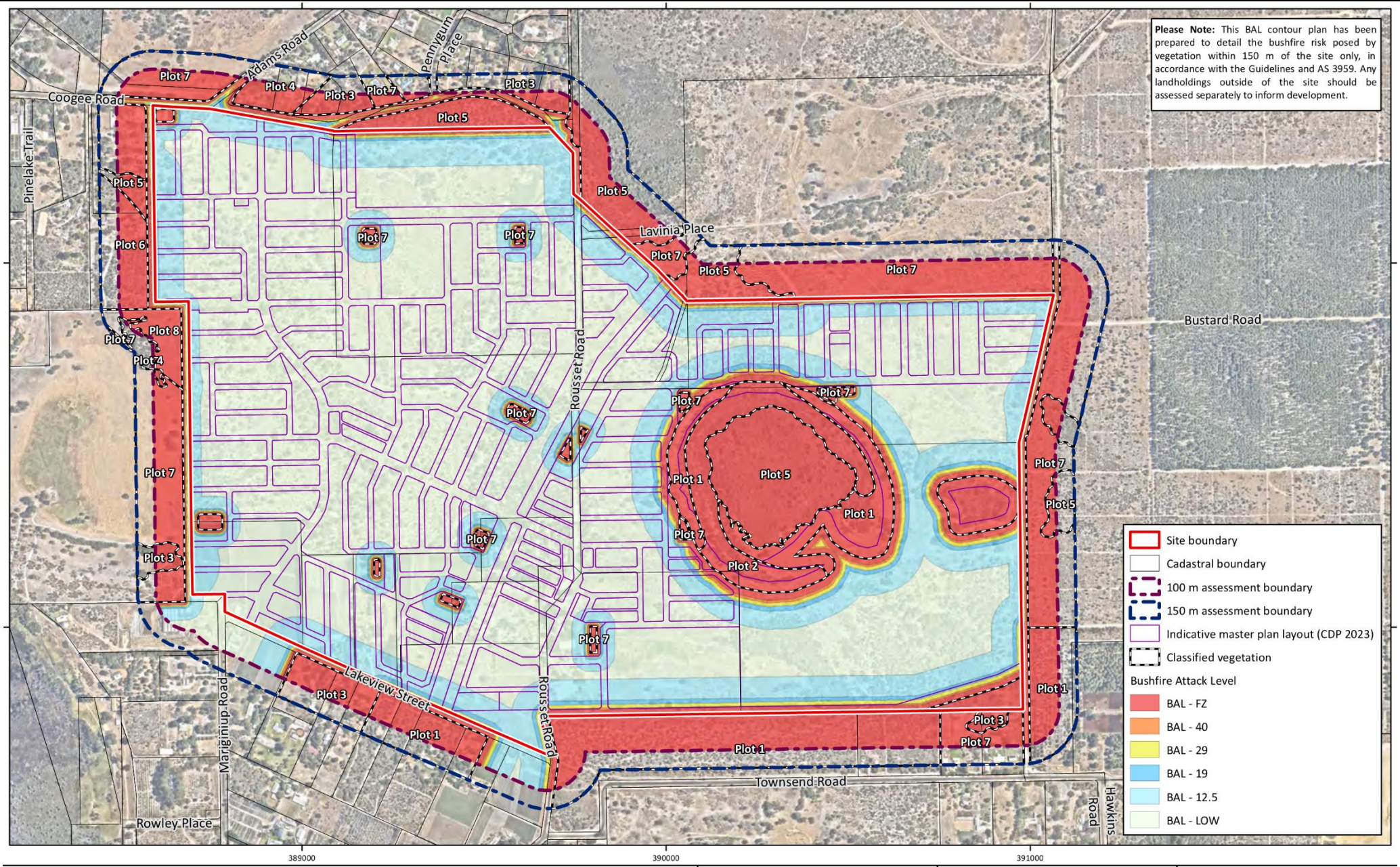

igure 3: Bushfire Attack Level Contour Plan

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Precinct 15 Structure Plan

Plan Number:
EP22-019(16)--F28
Drawn: GAR
Date: 17/02/2023
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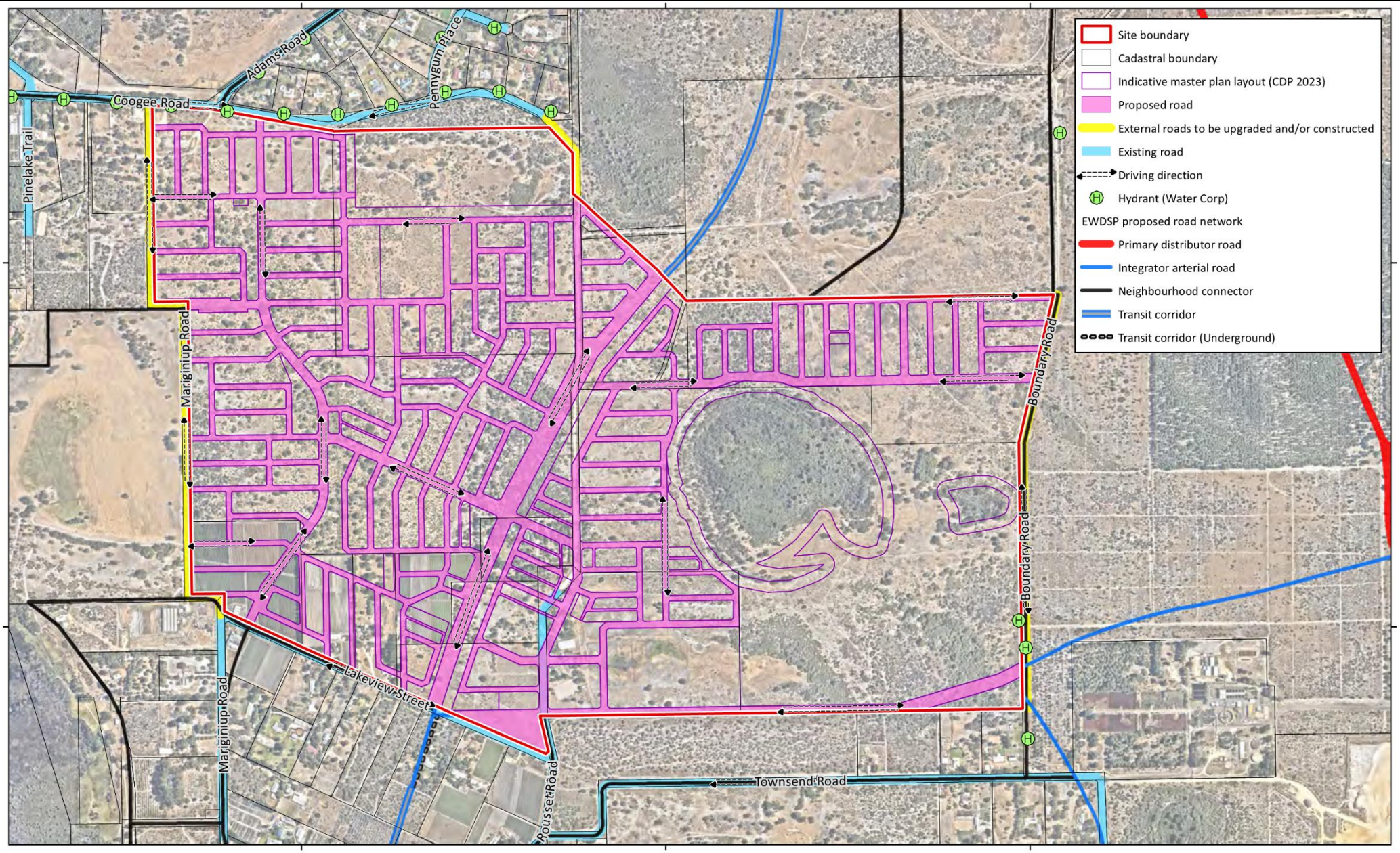

Figure 4: Spatial Representation of Bushfire Managment Strategies

Project: Bushfire Management Plan
Precinct 15 Structure Plan

Plan Number:
EP22-019(16)--F29
Drawn: GAR
Date: 17/02/2023
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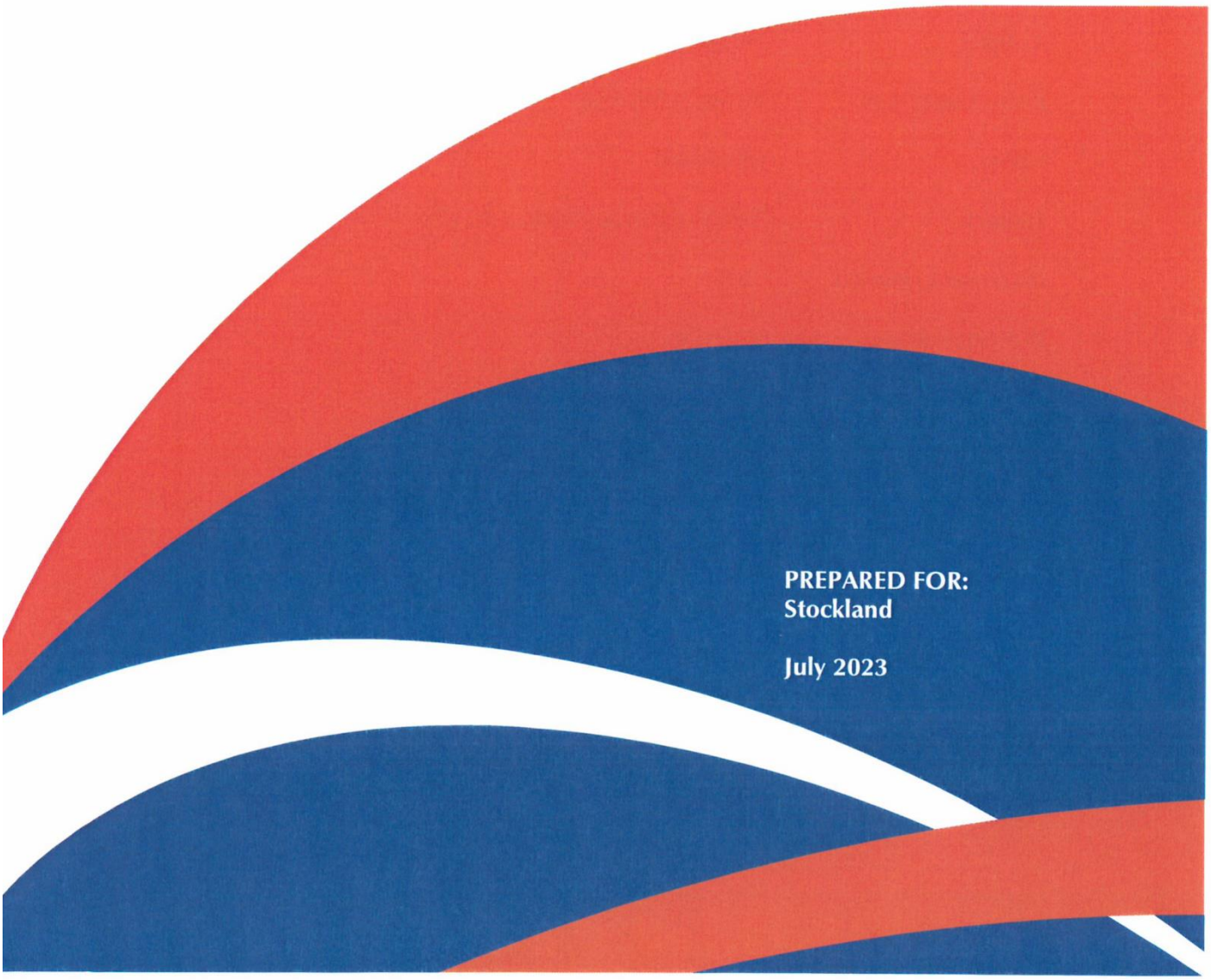
East Wanneroo Precinct 15 Local Structure Plan

Transport Impact Assessment



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Project: East Wanneroo Precinct 15 LSP

Document revision: r01a

Project number: t22.074

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1 Introduction

This Transport Impact Assessment has been prepared by Transcore on behalf of Stockland with regard to the Local Structure Plan (LSP) for East Wanneroo Precinct 15 in the City of Wanneroo.

The subject site is located approximately 4 kilometres northeast of the Wanneroo town centre and is bounded by Coogee Road to the north, Mariginiup Road to the west, Lakeview Street to the south and Boundary Road to the east.

The subject site is Precinct 15 of the *East Wanneroo District Structure Plan* (DSP), as shown in **Figure 1.** The DSP proposes Precinct 15 to include a neighbourhood activity centre, urban and suburban residential neighbourhoods, a high school and 50ha regional sporting facility. The DSP also indicates an underground transit corridor running north south through the middle of this precinct with a future Mariginiup Station and associated park & ride facility located adjacent to the neighbourhood centre site.

This report assesses the traffic flows that will be generated by the land uses proposed in the LSP and the corresponding road network requirements within the LSP area.

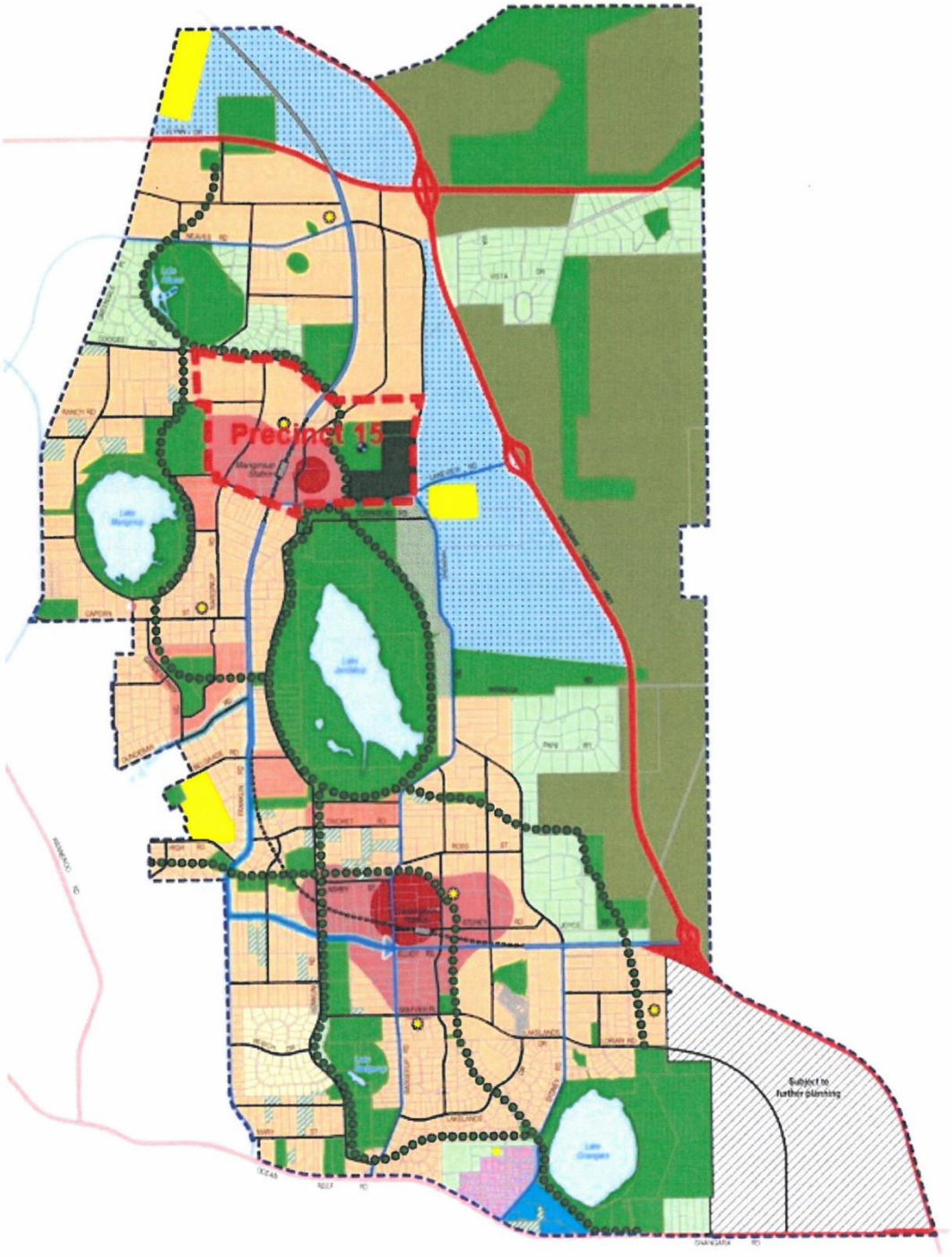

Figure 1: Site location on East Wanneroo District Structure Plan

2 Proposed Local Structure Plan

The proposed Local Structure Plan (LSP) for East Wanneroo Precinct 15 is included at **Appendix A** and a smaller copy (without legend) is shown in **Figure 2**.

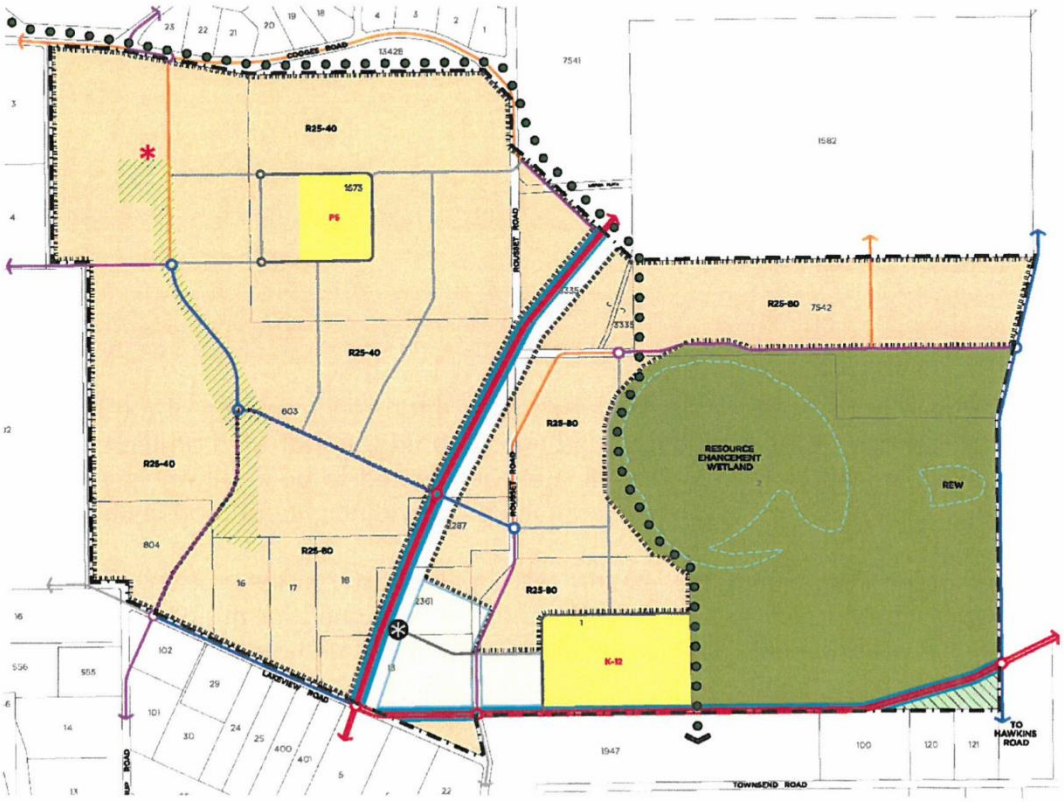

Figure 2: Local Structure Plan

The proposed land uses in the LSP area and anticipated size or quantity for the purpose of this Transport Impact Assessment, are summarised in **Table 1**.

Table 1: Proposed land uses

Land Use	Quantity
Residential	3,500 dwellings
Neighbourhood Centre	6,000m^2 NLA
K-12 School	2,000 students
Primary School	540 students
Mariginiup Station	1
Park & Ride car park	2,000 spaces
Regional sporting facility	47.4 hectares

The main north south arterial road corridor through the middle of the LSP area is Franklin Road. A future underground transit corridor is indicated on the eastern side of this road corridor, which is ultimately anticipated to be a railway line with a rail station located on the western side of the proposed neighbourhood centre.

The future Mariginiup rail station will be located on the western side of the neighbourhood centre. A park & ride car park is planned for this Mariginiup station. The LSP proposes this park & ride car park to be located on the eastern side of the neighbourhood centre so that the pedestrian movements between car park and station will travel via the east west 'main street' of the neighbourhood centre to activate this main street social and shopping environment.

A 1.78ha site is shown on the LSP for the proposed park & ride car park. It is anticipated this would be developed as a multi-storey car park of up to four levels to accommodate more than 2,000 parking spaces, if required in future. (2,000 spaces are assumed for the purposes of this assessment.)

A high school site is nominated in this precinct in the DSP but this is proposed as a combined high school and primary school site (Kindergarten to Year 12) in the LSP and is therefore anticipated to accommodate in the order of 2,000 students.

The regional sporting facility on the eastern side of the LSP area will provide a wide variety of sporting facilities including football ovals and other playing fields, tennis and netball courts, clubrooms and indoor recreation facilities. Highest usage would occur on weekends.

3 Existing Situation

3.1 Existing Land Use

Existing land uses within the subject site are predominantly rural, as shown in **Figure 3**.



Figure 3: Existing Land Use

3.2 Existing Road Network

The existing road network and its classification in the Main Roads WA functional road hierarchy is illustrated in **Figure 4**.



Figure 4: Existing road hierarchy

Coogee Road is classified as a Local Distributor in the Main Roads WA functional road hierarchy. It is constructed as a two-lane rural road with sealed width of approximately 6m and unsealed shoulders, adjacent to the subject site. It terminates as a cul-de-sac at its eastern end. The posted speed limit on this section of Coogee Road is 60km/h.

Rousset Road is also classified as a Local Distributor in the Main Roads WA functional road hierarchy. Rousset Road is constructed northwards from the Franklin Rd / Caporn St intersection as a two-lane rural road with sealed width of approximately 6m and unsealed shoulders. It has a posted speed limit of 80km/h, reducing to 50km/h north of the Lakeview Road intersection.

The sealed section of Rousset Road ends inside the LSP area, approximately 500m north of the Lakeview Road intersection. The remainder of Rousset Road through the LSP area is an unsealed road.

Lakeview Street is classified as an Access Road in the Main Roads WA functional road hierarchy. It is constructed as a two-lane rural road with sealed width of approximately 5.5 to 6m and unsealed shoulders.

Mariginiup Road is classified as an Access Road in the Main Roads WA functional road hierarchy. It is constructed as a two-lane rural road with sealed width of approximately 6m and unsealed shoulders south of Lakeview Road. North of Lakeview Road it is only an unsealed track for property access.

Boundary Road does not have a classification in the Main Roads WA functional road hierarchy. It is closed off by a gate north of Townsend Road and is not open to the public. It is currently only an unsealed track for property access.

3.3 Existing Traffic Volumes

No existing traffic counts are available within the LSP area. All existing roads in the LSP area are anticipated to have relatively low traffic volumes consistent with their relatively narrow sealed road widths.

3.4 Heavy Vehicle Routes

Restricted Access Vehicle (RAV) Network routes are designated for access by large heavy vehicle combinations that require special permits for each trip. Main Roads WA manages the RAV Networks and the permits for trucks to use them. **Figure 5** shows the roads that are permitted for use by Tandem Drive RAV Networks 2 (orange), 3, (light blue) and 4 (dark blue) vehicles in the surrounding area. RAV Networks 2, 3 and 4 permit access by a number of vehicle combinations up to 27.5m long subject to relevant height, width and weight limits.

Rousset Road is currently included in Tandem Drive RAV Network 4 with access south to and from Ocean Reef Road via Franklin Road – Lenore Road or via Townsend Road – Hawkins Road. (This section of Rousset Road is also included in other RAV Networks including Tandem Drive Network 4 Concessional Level 1, Tri Drive Network 1 including Concessional Level 1, PBS Tandem Drive Network 1 Concessional Level 1, PBS Tri Drive Concessional Level 1 and 27.5m Oversize B-Double, which offer other variations on maximum load and vehicle configurations.)

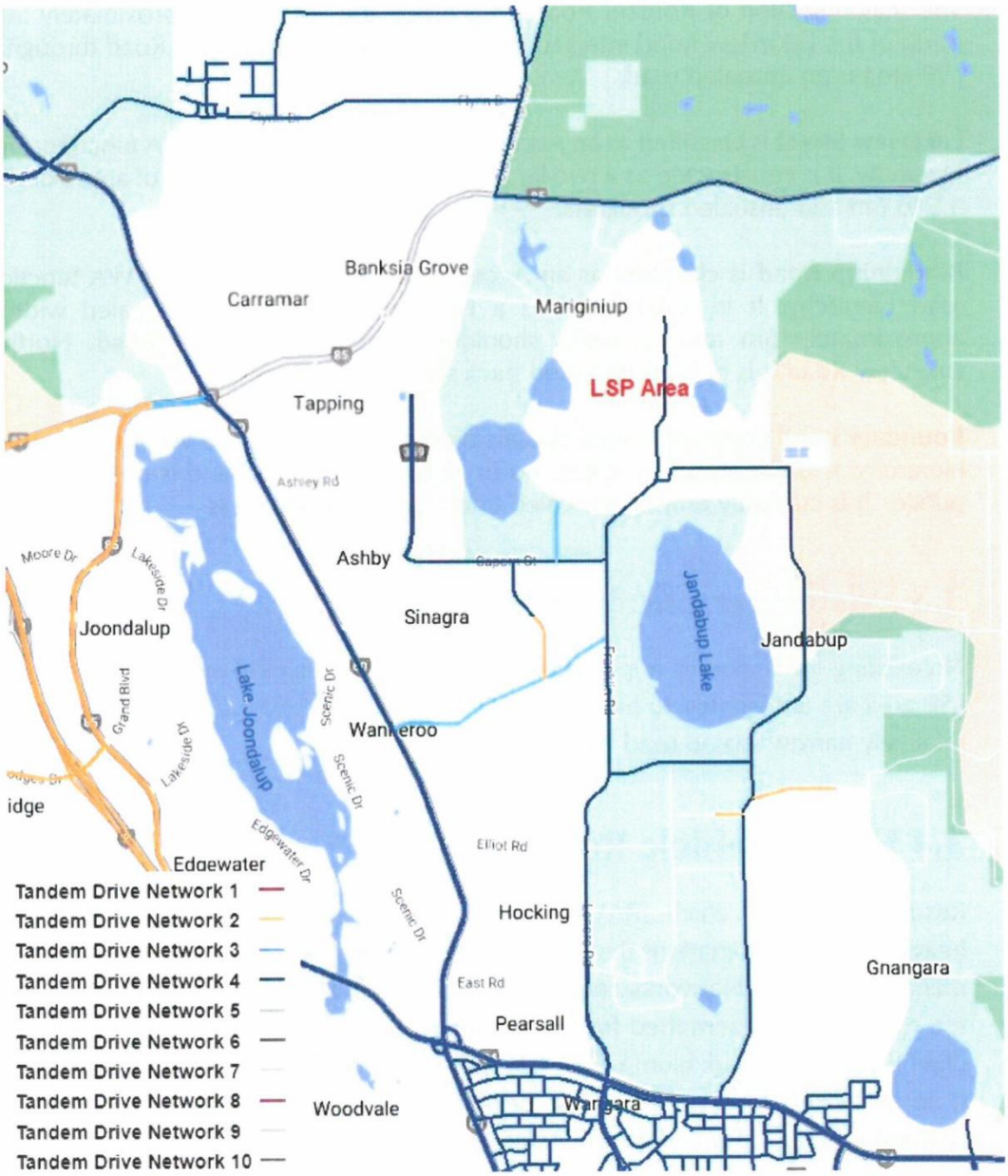

Figure 5: Restricted Access Vehicles Network

3.5 Public Transport

The closest existing bus routes to the subject site include:

- Route 389: Perth – Wanneroo (closest stop Steven St before Dundebar Rd, Wanneroo)
- Route 390: (Joondalup Station – Banksia Grove (closest stop Joondalup Dr before Pinjar Rd, Banksia Grove)
- Route 467: Whitfords Station – Joondalup Station (closest stop Elizabeth Rd before Dundebar Rd, Wanneroo)

The closest bus stop for route 390 is approximately 2.5km west of the LSP area and the closest bus stops for routes 389 and 467 are approximately 4km southwest of the LSP area.

3.6 Pedestrian and Cyclist Facilities

Existing bicycle facilities in the surrounding area are illustrated on the Perth Bike Maps published by the Department of Transport, as shown in **Figure 6**. There are currently no bicycle facilities within the LSP area.

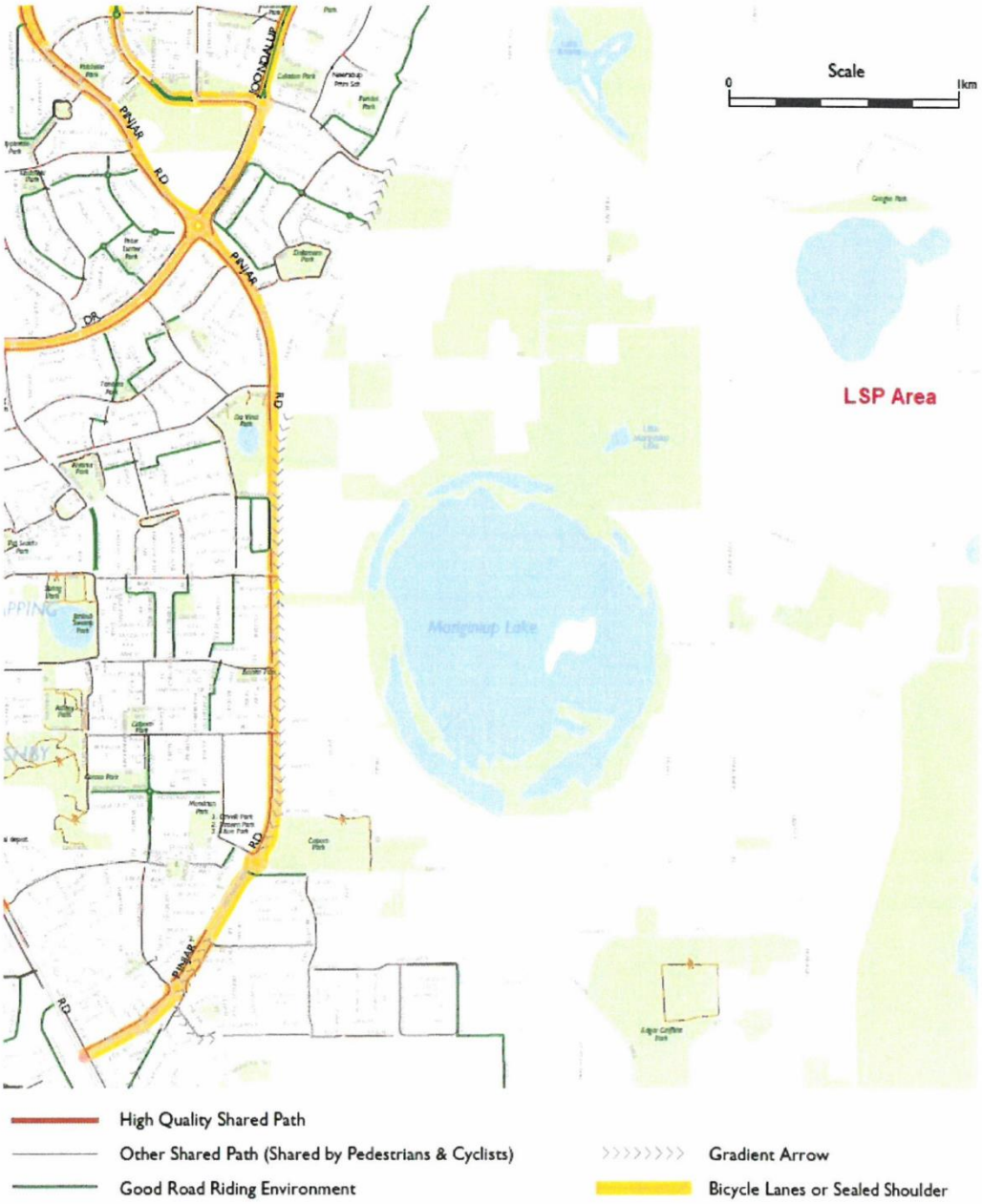

Figure 6: Existing bicycle facilities

High-level future planning for cycling facilities is now set out in Western Australia's Long Term Cycle Network (LTCN), which identifies an aspirational blueprint to ensure State and local governments continue to work together towards the delivery of a continuous cycling network providing additional transport options, recreational opportunities and support for tourism and commercial activity. The LTCN identifies the function of a route - primary, secondary or local - rather than the form it should take. Function considers the type of activities that take place along a route, and the level of demand (existing and potential). A route's built form is based on the characteristics of the environment, including space availability, topography, traffic conditions (speed, volumes), primary users, and so on.

The LTCN in the East Wanneroo area is illustrated in **Figure 7**, which shows future primary routes (red), secondary routes (blue) and local routes (green).

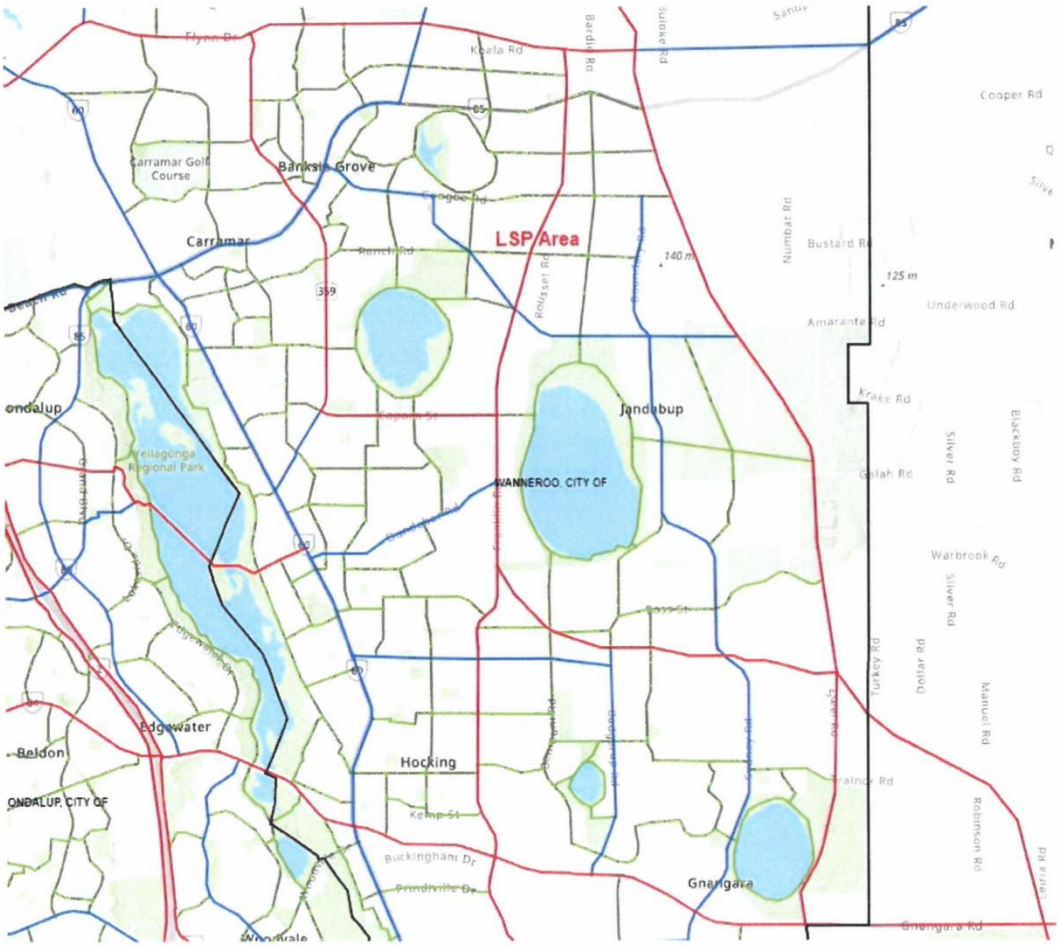

Figure 7: Long Term Cycle Network

A primary route is planned on the north south arterial / transit corridor through the LSP area. A north south secondary route is planned on Boundary Road – Hawkins Road (eastern boundary of the LSP area) and an east west secondary route is planned

on Townsend Road – Lakeview Road and diagonally northwest across the corner of the LSP area to Coogee Road. A number of local routes are also shown within the LSP area.

3.7 Changes to Surrounding Transport Network

The subject site is Precinct 15 of the *East Wanneroo District Structure Plan* (DSP), as shown in **Figure 1.**

The future arterial road network within the DSP area is illustrated in **Figure 8**. Key features of the future road network that are of particular relevance to Precinct 15 include:

- Whiteman Yanchep Highway (primary distributor) – a future 6-lane, controlled access highway along the eastern boundary of the DSP area;
- Lenore/Franklin Road (integrator arterial) – north south arterial road running through the centre of Precinct 15;
- Lakeview Road (integrator arterial) – east west arterial road along the southern boundary of Precinct 15 from Lenore/Franklin Road to Whiteman Yanchep Highway;
- Hawkins Road (integrator arterial) – north south arterial south of Lakeview Road; and
- Boundary Road (neighbourhood connector) – eastern boundary of Precinct 15.

The DSP shows a future transit corridor along the Lenore/Franklin Road alignment in the northern half of the DSP area but it should be noted that the DSP also identifies an alternative alignment for this future railway line within a 22-metre median along the Whiteman Yanchep Highway. The proposed LSP is designed to cater for the Lenore/Franklin transit corridor alignment to accommodate this option pending a final decision on this future rail alignment.

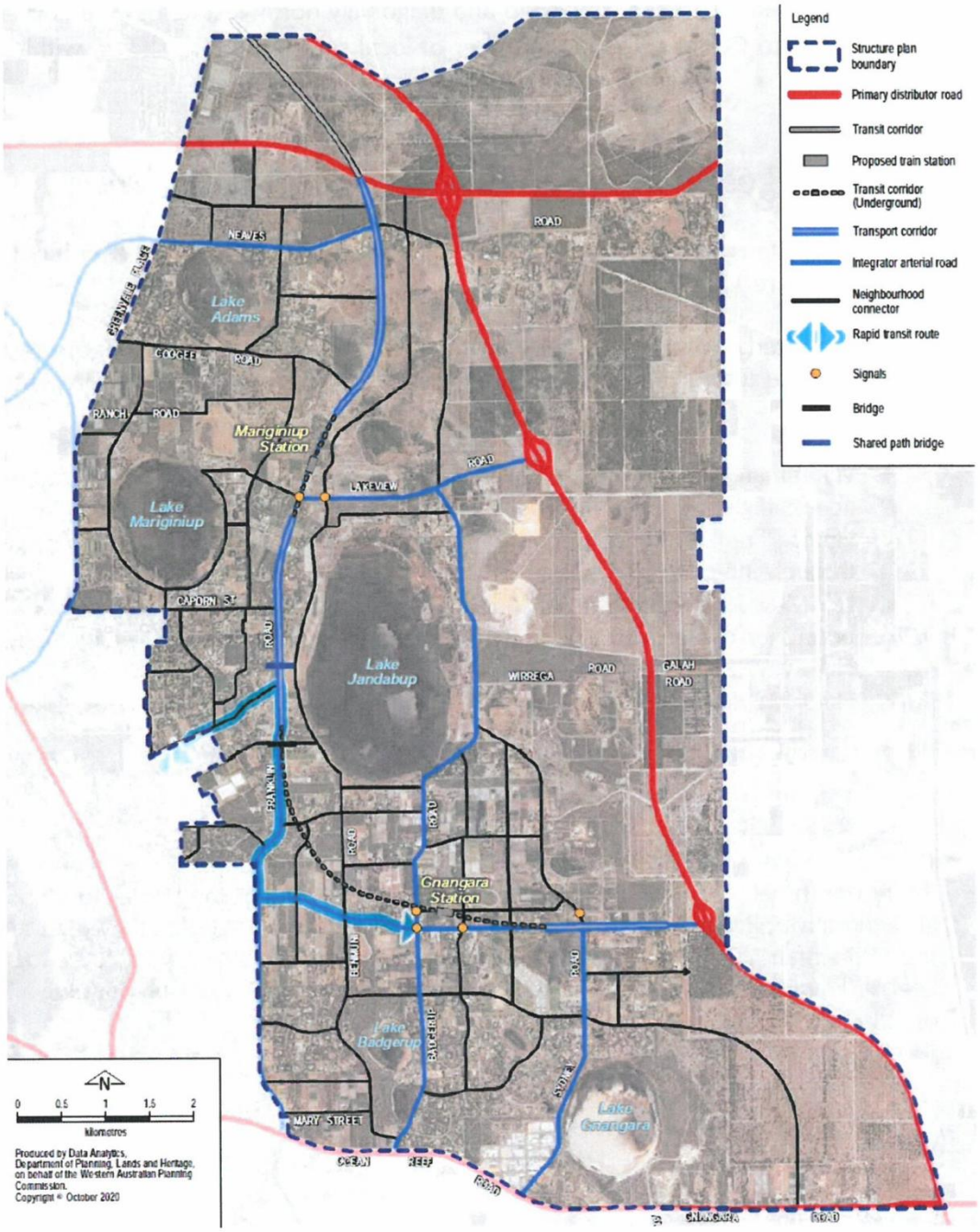

Figure 8: East Wanneroo DPS movement network

4 Proposed Transport Network

4.1 Road Hierarchy

The proposed hierarchy of roads in and around the LSP area is illustrated in **Figure 9** using the road hierarchy defined in the Western Australian Planning Commission *Liveable Neighbourhoods* (LN) policy.

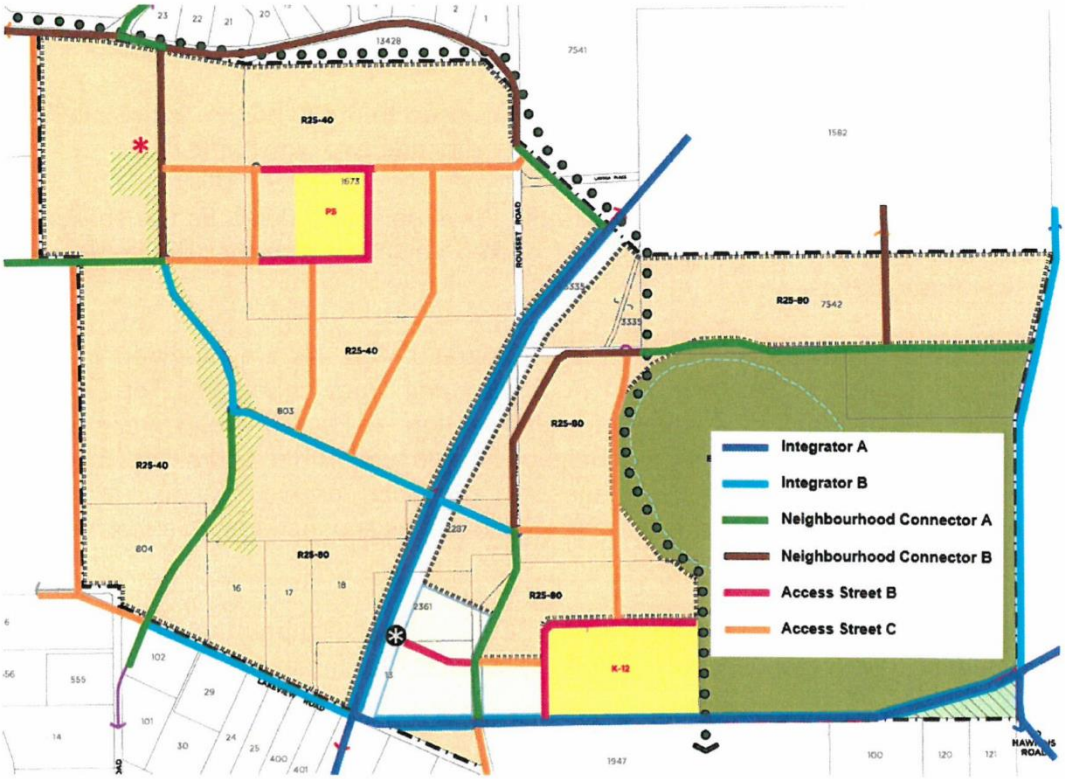

Figure 9: Proposed road hierarchy

The classification of roads in **Figure 9** is based on preliminary analysis of future traffic flows at section 6.3 of this report.

Integrator A roads are suitable for traffic flows up to 35,000vpd as dual carriageway roads (two lanes each way).

Integrator B roads are suitable for traffic flows up to 15,000vpd and can accommodate traffic flows up to 20,000vpd with suitable intersection treatments.

Neighbourhood Connector A roads are suitable for up to 7000vpd but some degree of flexibility with this upper limit may be appropriate in localised situations to avoid overdesigning some lengths of road. The main difference between Integrator B and Neighbourhood Connector A cross-sections is only the width of the median (6m

versus 2m) and the Liveable Neighbourhoods policy does allow for the median of an Integrator B to be reduced in width on sections that do not require right turn lanes in the median.

Neighbourhood Connector B roads are suitable for traffic flows up to 3000vpd but again some degree of flexibility with this upper limit should be considered appropriate in localised situations.

An Access Street B is suitable for traffic flows up to 3000vpd and can accommodate embayed parking on both sides. Access Street B is recommended for access streets abutting school sites but would typically only have parking on one side adjacent to the school site to avoid having students cross the road to access parked cars.

An Access Street C is suitable for traffic flows up to 3000vpd. Its 7.2m sealed width accommodates on-street parking without restricting two-way traffic flow.

An Access Street D is suitable for traffic flows up to 1000vpd. Its 6m sealed width accommodates on-street parking but parked vehicles do restrict simultaneous two-way traffic flow.

Proposed road cross-sections for the Integrator A roads are provided in the *East Wanneroo District Structure Plan Road Planning Study* report (11 Sep 2019). For convenience two cross-sections for this section of Franklin Road are included at **Appendix B**. Option 1 (outside of neighbourhood and district centres) has 6m median, 3.5m traffic lanes and 2m cycle lanes in a 35m road reserve. Option 5 (through the neighbourhood centre) adds two 3m parking lanes and increases the road reserve to 40.5m.

Standard cross-sections from the WAPC Liveable Neighbourhoods policy for the Integrator B, Neighbourhood Connectors and Access Streets are shown in **Appendix B.**

4.2 Public Transport

The planned transit corridor along the Lenore/ Franklin Road alignment through the LSP area will be the main public transport spine through the LSP area, with a future rail station and park & ride car park adjacent to the proposed neighbourhood centre.

All of the proposed neighbourhood connectors and integrator arterial roads shown on **Figure 9** would be of suitable standard to accommodate bus services through this area, providing suitable options for future feeder bus routes to the station and neighbourhood centre to service this area. This allows suitable flexibility for the Public Transport Authority to plan future bus routes within this area.

4.3 Pedestrian and Cyclist Facilities

All of the proposed neighbourhood connectors and integrator arterial roads shown on **Figure 9** would have paths on both sides in accordance with Liveable Neighbourhoods guidelines, including a shared path on one side.

Paths would be required on at least one side of all roads in accordance with Liveable Neighbourhoods guidelines.

On-street cycle lanes are normally included only on Neighbourhood Connector A roads and above, due to traffic flows above 3000vpd on these categories of roads.

The resultant path network associated with the road network within the LSP area is indicated in **Figure 10.** This does not include paths outside of the road network, such as within public open space, which will be addressed by other consultants for this LSP.

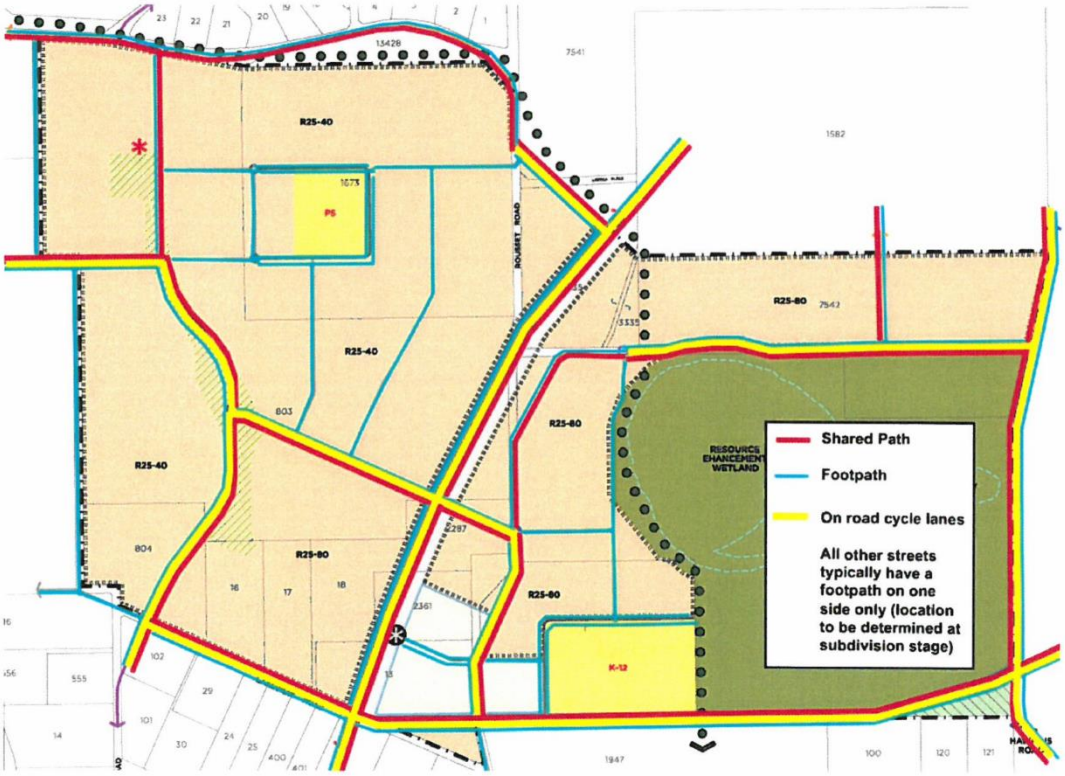

Figure 10: Pedestrian / Cycle Network

5 Integration with Surrounding Area

The *East Wanneroo District Structure Plan* (DSP) provides an overall plan to ensure coordination of future development of the subject site and the surrounding area. The proposed local structure plan for the subject site respects the principles and external connections of the DSP to ensure that good connectivity and integration with the surrounding area are achieved.

6 Analysis of the Transport Network

6.1 Assessment Period

The traffic assessment undertaken for the subject site is guided by the 2051 traffic projections reported for the arterial road network of the DSP area in the *East Wanneroo District Structure Plan Road Planning Study* report (11 Sep 2019) with full development of all land uses within the DSP area.

6.2 Traffic Generation and Distribution

The residential daily traffic generation rate used in the LSP area is 8 vehicle trips per day (vpd) per dwelling, which corresponds to peak hour trip generation rates of 0.8vph per dwelling recommended in the Western Australian Planning Commission (WAPC) *Transport Impact Assessment Guidelines* (2016). The anticipated yield of approximately 3,500 dwellings in the LSP area will therefore generate approximately 28,000vpd.

Information provided in the Department of Education's *Primary School Brief* indicates a daily trip rate of 2.6vpd per student is appropriate for new schools, with 1.0vph per student during before and after school peak periods. This is consistent with peak hour trip rates for schools in the WAPC TIA Guidelines. Therefore, the proposed K-12 school (2,000 students) is anticipated to generate approximately 5,200vpd and the primary school (540 students) approximately 1,400vpd.

Trip rates published in the NSW *Guide to Traffic Generating Developments* indicate a 6,000m^2 shopping centre under 10,000m^2 GLFA typically generates 121vpd/100m^2 GLFA on a Thursday, so the proposed 6,000m^2 neighbourhood shopping centre is anticipated to generate traffic flows of approximately 7,260vpd on a busy weekday.

The future park & ride car park (assumed 2,000 bays for this analysis) for the planned railway station is assumed to attract 2,000vpd inbound and 2,000vpd outbound for a total of 4,000vpd.

The regional sporting facility would have highest traffic generation on weekends and is anticipated to have much lower traffic generation on weekdays, particularly during road network weekday peak hours. The regional sporting facility weekday traffic generation is currently unknown but is not anticipated to be significant in comparison to the overall traffic generation of the LSP area and surrounding DSP area.

It should be noted that some of the trips calculated above will be internal trips within the LSP area, so the total trips generated within the LSP area is not simply the sum of traffic generations listed above. For example, a trip from home to the neighbourhood centre would be a single, combined trip rather than separate residential and shopping centre trips. The NSW *Guide to Traffic Generating Developments* suggests, "as a guide, about 25% of trips are internal to the subdivision, involving local shopping, schools

and local social visits." After allowing for internal trips to the park & ride facility as well, it is anticipated that approximately 30% of the total traffic generation will be internal trips within the LSP area.

The sum of traffic generations listed above is approximately 45,860 trip ends within the LSP area, with approximately 32,000 of those being internal-to-external trips or external-to-internal trips across the LSP area boundary.

Trip distribution of these external trips for the LSP area has been modelled to approximately reproduce the same overall trip pattern evidenced by the DSP traffic projections in the *East Wanneroo District Structure Plan Road Planning Study* report. The resultant external traffic distribution of traffic to and from the LSP area is as follows:

- 19% North (Franklin Rd, Boundary Rd and local roads)
- 10% West (Coogee Rd, Ranch Rd)
- 24% East (Lakeview Rd)
- 47% South (Franklin Rd, Hawkins Rd and local roads)

6.3 Traffic Flow Forecasts

Daily traffic flows generated by the LSP area and through traffic through this precinct generated by the rest of the DSP area have been assigned on the LSP area road network to determine future, full development, daily traffic flows on the LSP area road network.

The resultant total daily traffic flows on the LSP area road network are shown in **Figure 11**. The component of these total traffic flows that has an origin or destination within the LSP area is shown in brackets.

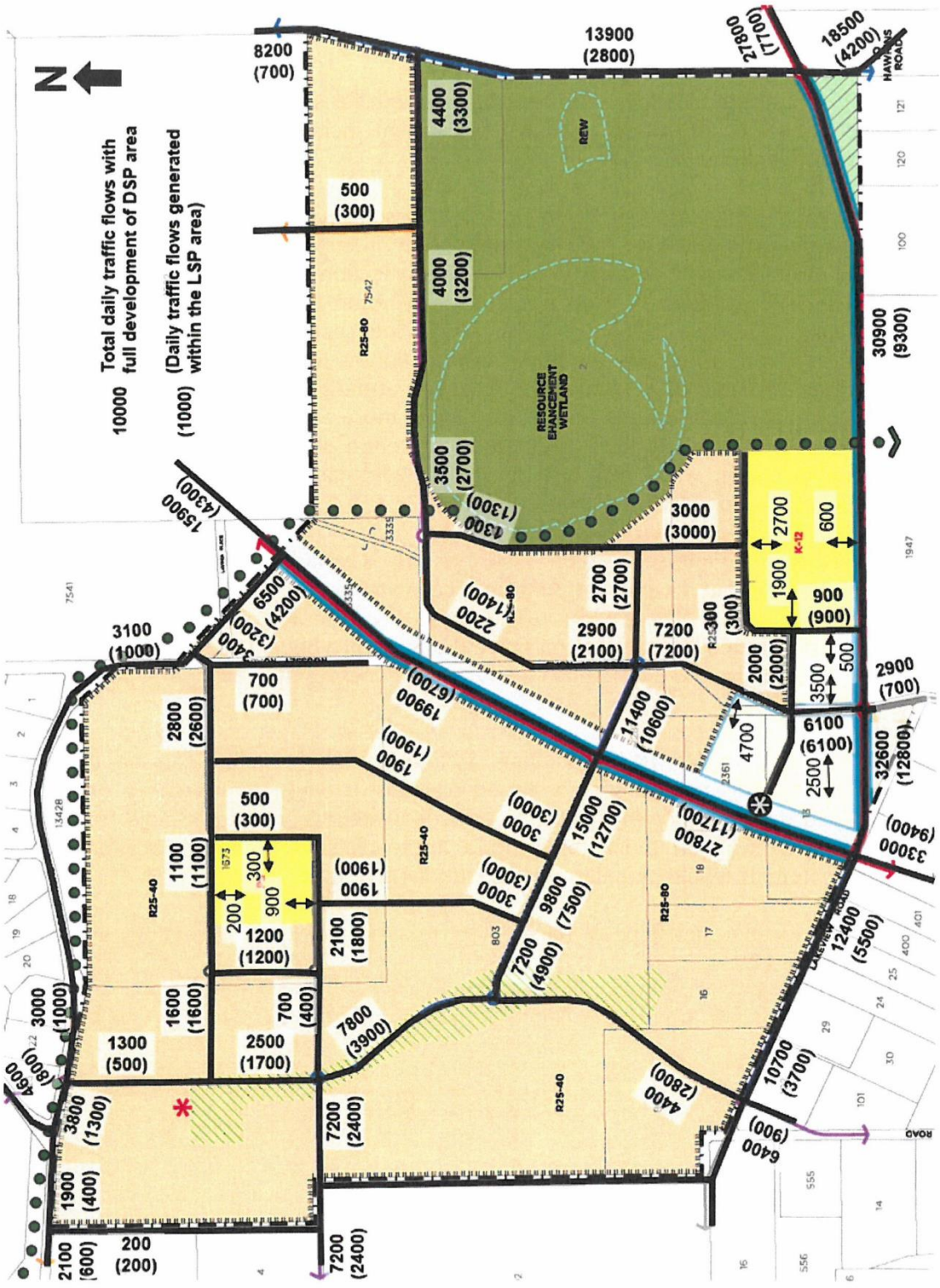

Figure 11: Future total daily traffic flows

6.4 Roads and Intersections

The anticipated future road network around the subject site has been detailed in section 4 of this transport impact assessment, including discussion of the proposed road hierarchy in section 4.1.

The *East Wanneroo District Structure Plan Road Planning Study* report (2019) identifies the Franklin Road / Lakeview Road 4-way intersection and the Lakeview Road / Hawkins Road / Boundary Road 4-way intersection as future signalised intersections. The *East Wanneroo District Structure Plan* report (2021, figure 2.12) indicates the Franklin Road / Lakeview Road 4-way intersection and the Lakeview Road / neighbourhood connector 4-way intersection as future signalised intersections but does not indicate a signalised intersection at the Lakeview Road / Hawkins Road / Boundary Road intersection. Accordingly, those two major 4-way intersections on Lakeview Road at the neighbourhood centre should be planned as signalised intersections, which will also facilitate pedestrian and cyclist movements across Lakeview Road to this activity centre.

Other major intersections on the arterial roads would either require traffic signals or a roundabout to provide sufficient capacity for right turn movements. There is generally a preference for roundabouts at these intersections unless it can be demonstrated that traffic signals would operate at a better level of service than signals. Accordingly, those other intersections will generally be indicated as roundabouts in the LSP.

Other minor 4-way intersections at intermediate locations can be treated with threshold treatments such as raised plateaus or brick-paved sections on the minor road legs to reduce speed and raise driver awareness of the intersection and the need to give way on those minor road approaches. Appropriate locations for such treatments would be determined at subdivision stage.

The location and type of intersection treatment of key intersections are shown in **Figure 12**.

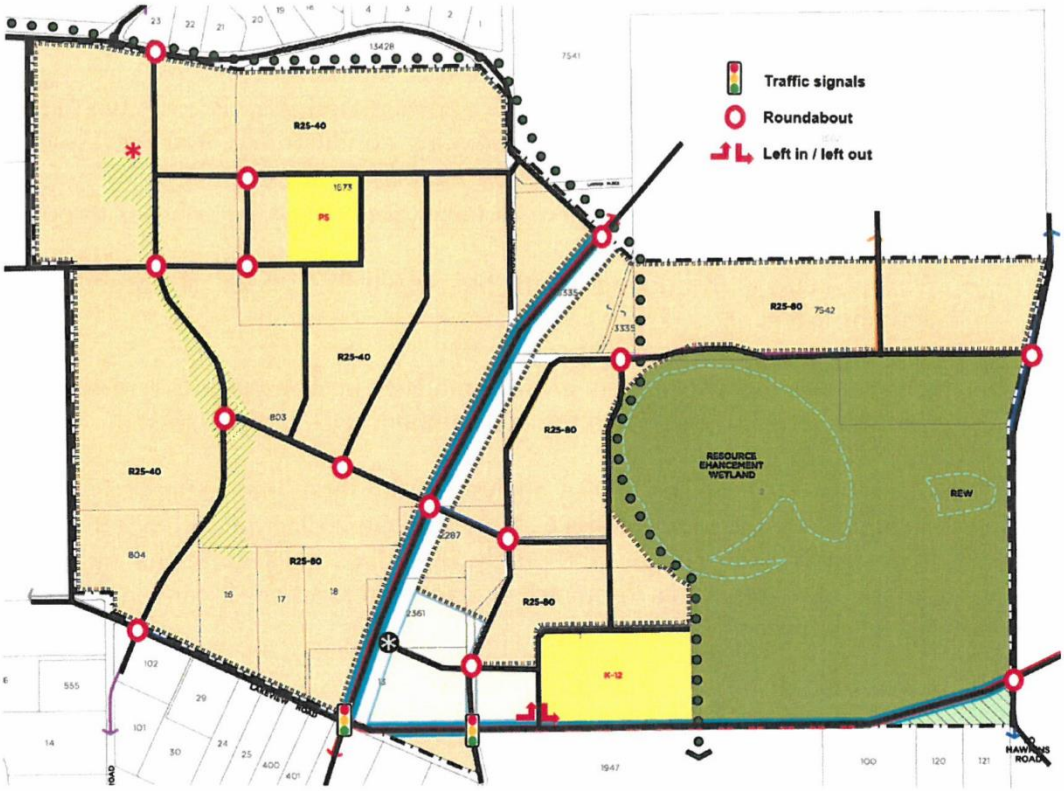

Figure 12: Key intersections

6.5 Intersection Analysis

Intersection capacity analysis has been undertaken for three key intersections near the neighbourhood activity centre for the weekday AM peak and PM peak hour flows that correspond to the modelled 2051 daily traffic flows in **Figure 11**. The peak hours adopted for this analysis are 8-9AM and 3-4PM to include before and after school peak traffic, which is anticipated to be a particularly significant factor in determining peak periods in this vicinity.

The three key intersections analysed are the two signalised intersections on Franklin Road and Lakeview Road, and the 4-way roundabout on Franklin Road north of the rail station.

Capacity analysis of these intersections has been undertaken using SIDRA Network analysis in the SIDRA computer software package. SIDRA is an intersection modelling tool commonly used by traffic engineers for all types of intersections. SIDRA outputs are presented in the form of Degree of Saturation, Level of Service, Average Delay and 95% Queue. These characteristics are defined as follows:

- Degree of Saturation is the ratio of the arrival traffic flow to the capacity of the approach during the same period. The Degree of Saturation ranges from close to zero for infrequent traffic flow up to one for saturated flow or capacity.

- Level of Service is the qualitative measure describing operational conditions within a traffic stream and the perception by motorists and/or passengers. In general, there are 6 levels of service, designated from A to F, with Level of Service A representing the best operating condition (i.e. free flow) and Level of Service F the worst (i.e. forced or breakdown flow).
- Average Delay is the average of all travel time delays for vehicles through the intersection.
- 95% Queue is the queue length below which 95% of all observed queue lengths fall.

The results of the SIDRA analysis are summarised in **Appendix C** and satisfactory intersection performance is shown for each of the intersections assessed.

Schematic diagrams from the SIDRA analysis of the three intersections assessed are shown in **Figure 13** and in **Appendix C**. Note that these diagrams are not to scale and are not design drawings. They are purely intended to illustrate the number and arrangement of traffic lanes required at each intersection to accommodate the modelled future traffic flows.

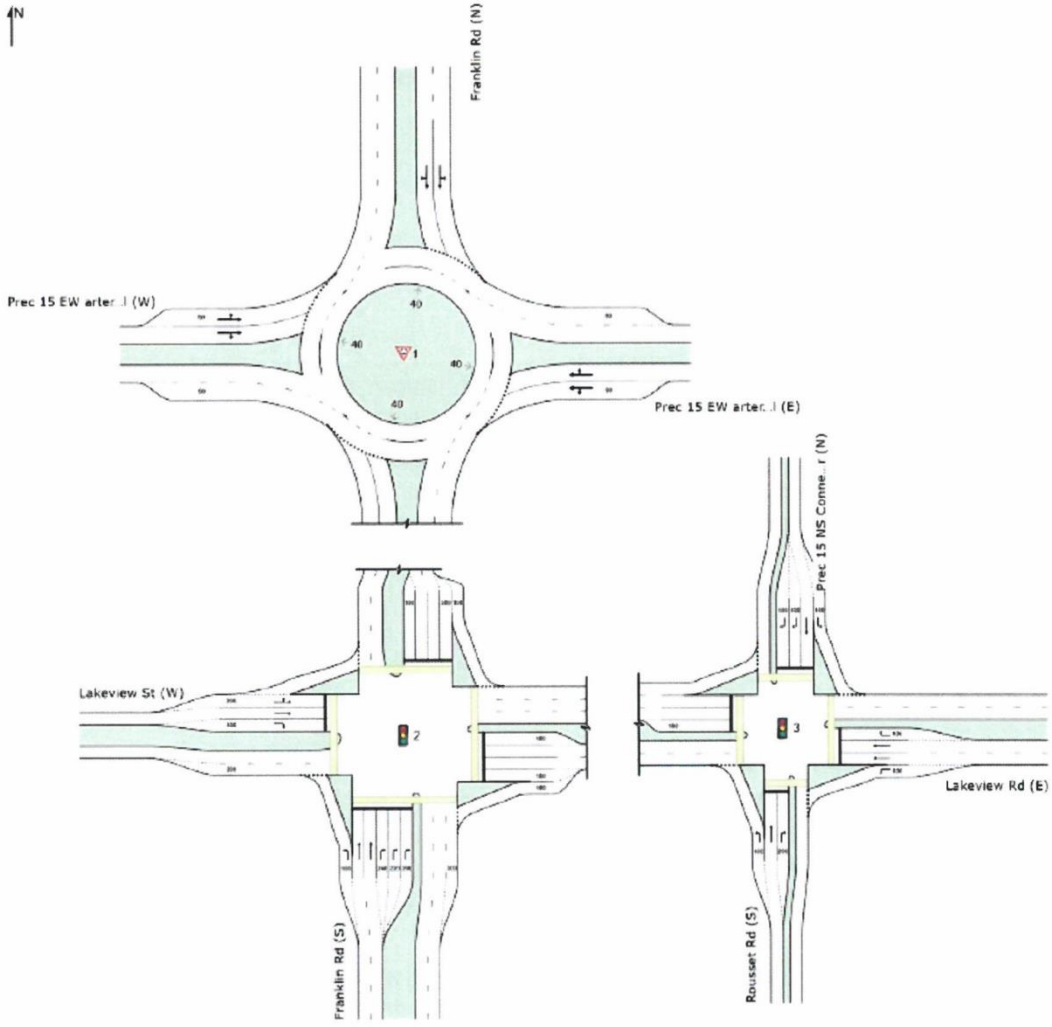

Figure 13: Intersection layouts analysed in SIDRA Network

6.6 Access to Frontage Properties

The WAPC *Liveable Neighbourhoods* policy requires that *"Development along integrator B and neighbourhood connector streets with ultimate vehicle volumes over 5,000 vehicles per day should be designed either so vehicles entering the street can do so travelling forward, or are provided with alternative forms of vehicle access."*

There is to be no direct driveway access to residential development on zoned land within the LSP area from the Integrator A roads – Franklin Road and Lakeview Road. Driveway access to car parks for the K-12 school and regional sporting facilities would be appropriate subject to detailed design of access arrangements as part of those future development applications.

Other roads within the LSP area carrying more than 5,000vpd can be seen in **Figure 11**, including each of the Integrator B roads and some of the Neighbourhood Connector A roads, particularly around the neighbourhood centre. Residential subdivisions along those roads would typically involve lot access via side roads or rear laneways. Another alternative suggested in Liveable Neighbourhoods involves wider lots with paired driveways and protected reversing areas in the parking lane but this would need to be coordinated by local development plans for those local areas.

All of the other roads in the LSP area are expected to carry less than 5,000vpd, so no restriction on vehicular access is required.

6.7 Pedestrian / Cycle Networks

The proposed network of footpaths and shared paths for pedestrians and cyclists is described in section 4.3 of this Transport Impact Assessment. This network of paths will provide an excellent level of accessibility and permeability for pedestrians and cyclists within the LSP area, and connections to neighbouring precincts at strategic locations.

The WAPC *Transport Impact Assessment Guidelines* (2016) provides guidance on the levels of traffic volumes that are likely to affect the ability for pedestrians to cross various types of road. Based on that guidance an undivided two-lane road should be acceptable for pedestrians crossing traffic volumes of up to approximately 11,000 vpd and this threshold can be increased to around 28,000 vpd by adding a central median or pedestrian refuge islands. On a four-lane road, because of its greater carriageway width, this threshold is lower; even with a median island the threshold is only around 16,000 vpd.

Only Franklin Road and Lakeview Road are expected to carry future traffic flows above these levels. The future K-12 school site north of Lakeview Rd, the railway station east of Franklin Road, the neighbourhood centre and the regional sporting facility will all be significant generators of pedestrian and cyclist movements across Franklin Road and Lakeview Road within the LSP area.

The signalised intersections at Franklin Rd / Lakeview Rd and at the north south neighbourhood connector intersection on Lakeview Road will include appropriate pedestrian facilities to assist pedestrians and cyclists crossing those roads at those locations. An additional pedestrian crossing facility should be provided on Franklin Road at the future rail station location to assist pedestrian and cyclist movements from residential areas west of Franklin Road to access the station, neighbourhood centre main street, K-12 school and regional sporting facilities. This could be in the form of a signalised pedestrian crossing when traffic and pedestrian numbers meet the warrants for that type of facility, or potentially a pedestrian underpass as part of a future underground rail line project within this LSP area.

It is anticipated that guard-controlled school crossings would be appropriate at the combined K-12 school site on Lakeview Road and the primary school site to assist students crossing the adjacent roads before and after school. Guard-controlled school crossings can easily be accommodated on Lakeview Road and on the Access Street B roads around those school sites at any location that suits the internal and external access routes of both schools at detailed design stage.

Information from the 2002-2006 Perth & Regions Travel Survey (PARTS) indicated that 25.4% of primary school students and 17.1% of high school students walk or cycle to school while 26.7% of primary and 21.9% of high school students walk or cycle home from school. Therefore a 540-student primary school would typically have about 140 students walking or cycling and a 1450-student high school would typically have about 250-320 students walking or cycling.

Warrant criteria provided on the WA Police website indicate that a Type A Children's Crossing may be provided where a minimum of 20 students and 200 vehicle movements occur within the hour immediately before and immediately after school, for a primary school, or 20 students and 700vph for high schools. The warrants are lower for a Type B Children's Crossing at 10 students and 100vph for a primary school or 10 students and 350vph for a high school. Such facilities can only be applied for by a School Principal or the President / Secretary of the relevant school/parent organisation (eg. P&C or P&F). The anticipated numbers of students crossing the Access Street B roads around the school sites would potentially meet these warrants in future, so it would be expected that the schools would apply for this type of facility when future student numbers and movements meet those warrants.

6.8 Access to Public Transport

At this stage of the structure planning process future bus routes are not known. As noted in section 4.2, all of the proposed neighbourhood connectors and integrator arterial roads shown on **Figure 9** would be of suitable standard to accommodate bus services through this area, providing suitable options for future feeder bus routes to the station and neighbourhood centre to service this area. This allows suitable flexibility for the Public Transport Authority to plan future bus routes within this area.

7 Conclusions

This Transport Impact Assessment relates to the Local Structure Plan (LSP) for Precinct 15 of the East Wanneroo District Structure Plan in the City of Wanneroo.

The subject site is located approximately 4 kilometres northeast of the Wanneroo town centre and is bounded by Coogee Road to the north, Mariginiup Road to the west, Lakeview Street to the south and Boundary Road to the east.

Precinct 15 will include a neighbourhood activity centre, urban and suburban residential neighbourhoods for approximately 3,500 dwellings, a K-12 school, a primary school and a regional sporting facility.

The LSP also accommodates the underground transit corridor indicated in the DSP running north south through the middle of this precinct with a future Mariginiup Station and associated park & ride facility located adjacent to the neighbourhood centre site.

The traffic flows generated within the LSP area will result in approximately 32,000vpd of internal-to-external trips or external-to-internal trips across the LSP area boundary, as well as internal traffic flows between land uses within the LSP area.

The main arterial roads within the LSP area include Franklin Road running north south through the middle of the LSP area and Lakeview Road running east west along the southern boundary east of Franklin Road.

Three key intersections within the LSP area have been analysed to determine likely future intersection requirements. These are two signalised intersections on Franklin Rd and Lakeview Road, and a 4-way roundabout on Franklin Road north of the rail station.

A comprehensive network of paths and on-road cycle lanes will be provided on the LSP area road network in accordance with *Liveable Neighbourhoods* policy guidelines. The two proposed signalised intersections on Franklin Road and Lakeview Road will assist pedestrians and cyclists crossing those arterial roads in the vicinity of the neighbourhood centre. Another appropriate pedestrian crossing facility should be planned on Franklin Road at the future rail station location and a guard-controlled school crossing would be anticipated on Lakeview Road at the K-12 school site, as well as other guard-controlled crossings around the two school sites in future.

Future bus routes are not known at this stage but all of the proposed neighbourhood connectors and integrator arterial roads in the LSP area would be of suitable standard to accommodate bus services, providing suitable options for future feeder bus routes to the station and neighbourhood centre to service this area. This allows suitable flexibility for the Public Transport Authority to plan future bus routes within this area.

Appendix A

LOCAL STRUCTURE PLAN

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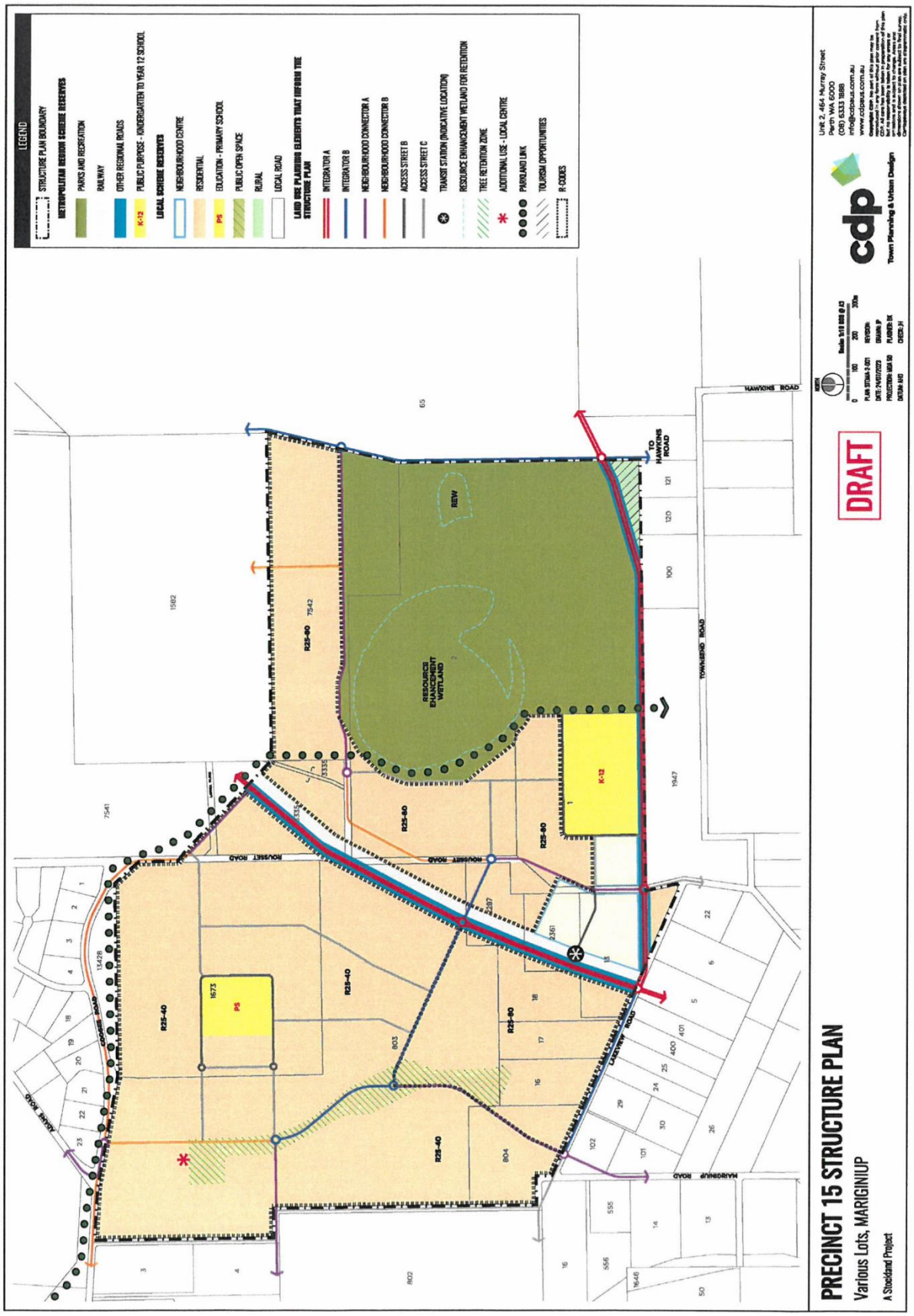
LEGEND
STRUCTURE PLAN BOUNDARY
METROPOLITAN REGION SCHEME RESERVES
PARKS AND RECREATION
RAILWAY
OTHER REGIONAL ROADS
K-12 PUBLIC PURPOSE - KINDERGARTEN TO YEAR 12 SCHOOL
LOCAL SCHEME RESERVES
NEIGHBOURHOOD CENTRE
RESIDENTIAL
PS EDUCATION - PRIMARY SCHOOL
PUBLIC OPEN SPACE
RURAL
LOCAL ROAD
LAND USE PLANNING ELEMENTS THAT INFORM THE STRUCTURE PLAN
INTEGRATOR A
INTEGRATOR B
NEIGHBOURHOOD CONNECTOR A
NEIGHBOURHOOD CONNECTOR B
ACCESS STREET B
ACCESS STREET C
TRANSIT STATION (INDICATIVE LOCATION)
RESOURCE ENHANCEMENT WETLAND FOR RETENTION
TREE RETENTION ZONE
ADDITIONAL USE - LOCAL CENTRE
PARKLAND LINK
TOURISM OPPORTUNITIES
R-CODES
DRAFT
PRECINCT 15 STRUCTURE PLAN
Various Lots, MARIGINIUP
A Stockland Project
cdp
Town Planning & Urban Design
Unit 2, 464 Murray Street
Perth WA 6000
(08) 6333 1888
info@cdpaus.com.au
www.cdpaus.com.au
HAWKINS ROAD
TOWNSEND ROAD
ROUSSET ROAD
LAKEVIEW ROAD
MARIGINIUP ROAD
ADAMS ROAD
COOGEE ROAD
RESOURCE ENHANCEMENT WETLAND
REW
K-12
PS
R25-40
R25-80
Page 27
t22074-rw-r01a.docx

Appendix B

TYPICAL ROAD CROSS-SECTIONS

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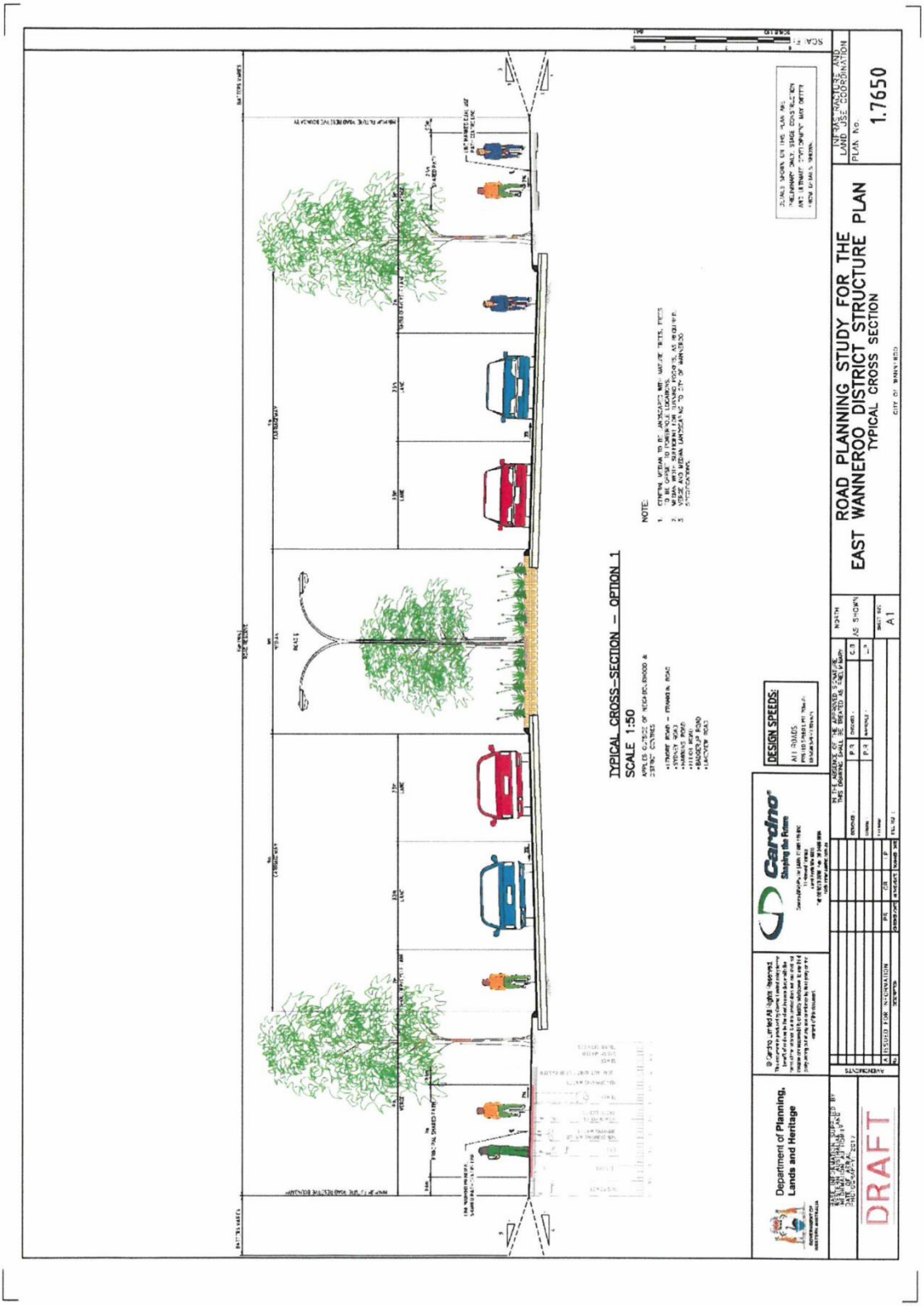
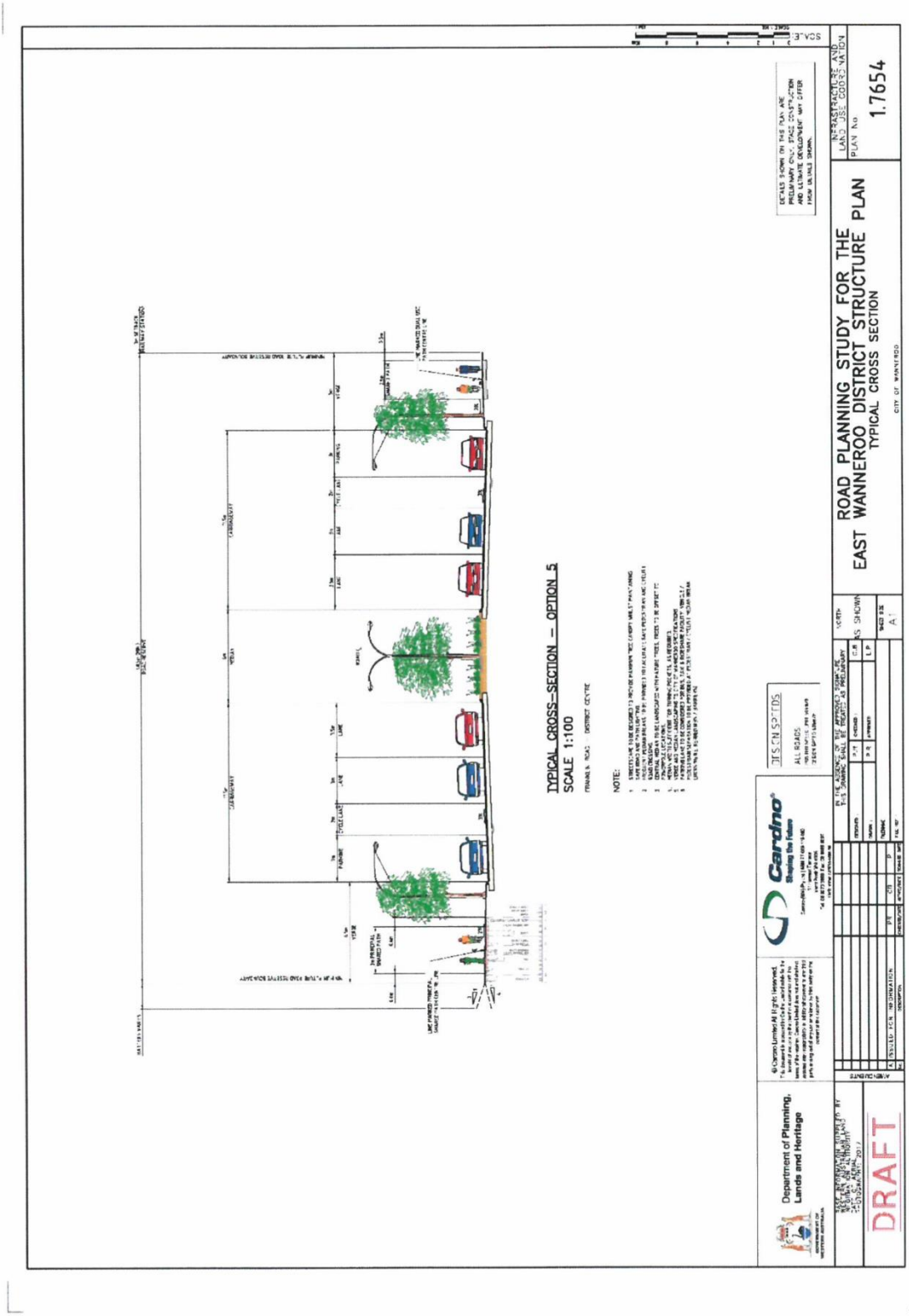

ROAD PLANNING STUDY FOR THE
EAST WANNEROO DISTRICT STRUCTURE PLAN
TYPICAL CROSS SECTION
1.7650
TYPICAL CROSS-SECTION – OPTION 1
SCALE 1:50
NOTE:
DESIGN SPEEDS:
Department of Planning, Lands and Heritage
Cardno
DRAFT


TYPICAL CROSS-SECTION – OPTION 5
SCALE 1:100
ROAD PLANNING STUDY FOR THE
EAST WANNEROO DISTRICT STRUCTURE PLAN
TYPICAL CROSS SECTION
CITY OF WANNEROO
1.7654
Department of Planning, Lands and Heritage
DRAFT

Integrator B - arterial streets

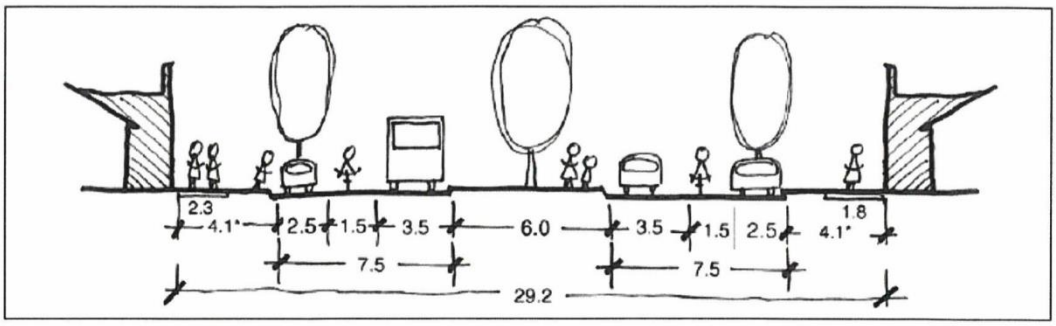


Figure 15: Integrator B – outside centres – 60 km/hr (up to 15 000 vehicles per day - see note 2).

Two lanes, central median, buses, cycle lanes and parking. Development fronting, forward vehicle exiting.

Note:
1. Central median may be reduced along sections where right-hand turn lanes are not required.
2. Traffic volumes up to 20 000 vehicles per day may be acceptable provided that detailed design addresses intersections, parking, access and bus movement (**table 1**).
3. The 6.0 m median is required for staged vehicle crossings and for clearance to trees.
4. The 2.5 m parking bays may be indented into the verge. If parking is indented, then the verge may be increased to 5.5 m minimum including parking, and reserve width may be decreased as a result, to 27 m.

* Where a wider shared path, extensive street furniture or provision for reversing into parking lane is required, the verge width will need to be widened. Typically verges may be up to 4.5 m and total reserve width 30 m.

Neighbourhood connector streets

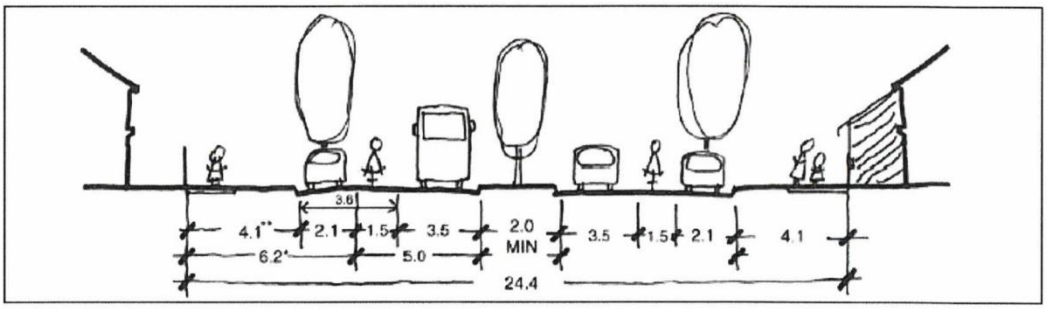


Figure 17: Neighbourhood connector A – 50 km/hr (up to 7000 vehicles per day, with >3000 vehicles per day preferred).

Central median, buses, cycle lanes and parking. Bus stops are normally in travel lane against kerb extensions in parking lane.

Note:
1. * For volumes less than 3000 vehicles per day and the street is not ever likely to be a bus route, the road pavement may be reduced from 5.0 m to 4.0 m with no marked cycle lane, and the total reserve width reduced to 22.4 m.
2. Reversing out from abutting dwellings is acceptable if less than 5000 vehicles per day. For 5000-7000 vehicles per day, protected reversing spaces may be used for larger lots using paired driveway crossovers with ability to reverse into the parking lane.
3. Median will need appropriately located breaks to allow U-turns to frontage-access properties.
4. ** Verge width (including parking) can often be reduced from 6.2 m to 5.5 m with indented parking, to reduce overall reserve width to 23.0 m.
5. For larger trees, central median widths of 2.5-4 m are preferred. For medians with drainage swales, a minimum median width of 6 m is suggested.
6. Where a visually narrower carriageway is needed to assist with speed control, or where parking turnover is high, the parking lane may be widened to 2.3 m and the cycle lane narrowed to 1.2 m.
7. In some circumstances the median may be omitted. On these sections, indented parking should normally be used to assist in visually narrowing the carriageway. If parking is indented, then the reserve width will be 22.4 m.

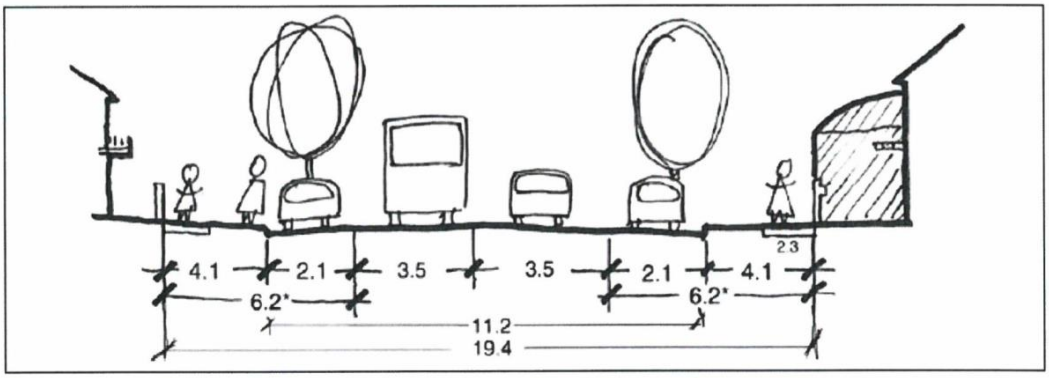


Figure 18: Neighbourhood connector B – 50 km/hr (<3000 vehicles per day).

Lower volume neighbourhood connector, bus route, no cycle lanes, parking. Typically a residential environment with low parking turnover. Detailing of design to visually narrow street (eg including trees in parking lane, painted parking line), together with other speed control mechanisms to limit typical operating speeds to less than 50 km/hr. Bus stops in travel lane against kerb extension in parking lane. A2-2.3 m shared path provided on at least one verge in lieu of on-street cycle lane.

Note: * Verge width (including parking) can often be reduced from 6.2 m to 5.5 m with indented parking, to reduce overall reserve width to 18.0 m.

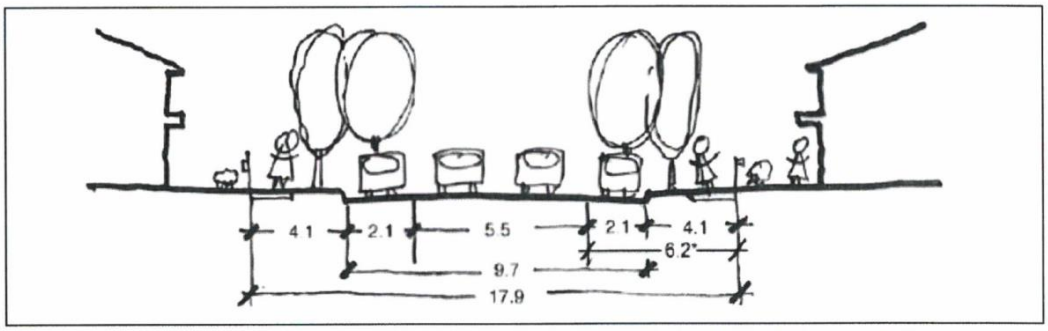


Figure 20: Access street B – wider access street Target speed 40 km/hr (< 3000 vehicles per day).

Wider access street suited to higher density residential areas (typically R30–R40+, or where dwelling density is greater than around 1 per 250 m²) with higher parking demand. Extensive parking, no bike lane, no buses, trees in verge, with additional trees in parking lane if required.

Note:
1. May reduce verge adjacent to park to 1.0 m when fronting public parkland.
2. Trees may be in verge and/or in parking lane.
3. * Verge and parking lane as shown (6.2 m) can often be reduced to 5.5 m if parking is indented, and total street width reduced to 16.5 m.

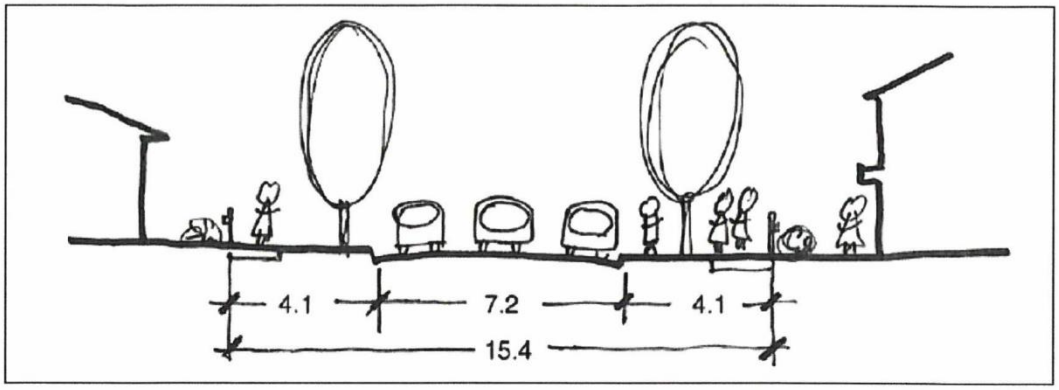


Figure 21: Access street C – yield (or give way) street – Target speed 40 km/hr (< 3000 vehicles per day).

Standard access street or yield (or give way) street. Relatively frequent parking on both sides of street (on the pavement) desirable and needed as part of speed control. No buses, no bike lane. This is likely to be the most common residential street in densities up to and often including R30 - R35 (or a typical lot size down to 250-300 m²).

Note: May reduce verge adjacent to park to 1.0 m when fronting public parkland.

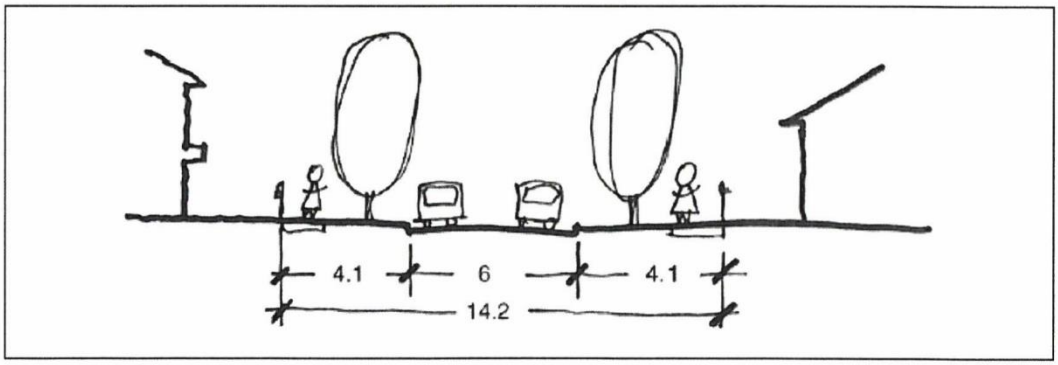


Figure 22: Access street D – narrow yield (or give way) street – Target speed 30 km/hr (< 1000 vehicles per day).

Narrower access street for shorter lengths, low parking demand, serving larger lots. No buses, no bike lanes, no indented parking. Staggered parking on both sides of street as part of speed control, low speed. Not through route, low traffic volume.

Note:
1. May reduce verge adjacent to park to 1.0 m when fronting public parkland.
2. Where the street is short and vehicle volume is less than 150 vehicles per day, pavement may be reconfigured as a slow speed, comprehensively-designed street, with a 3.4 m travel lane and 2.1 m embayed parking spaces. Passing bays are to be provided every 70-80 m, and maximum length 150 m. If a street is comprehensively designed and designated as a shared space for pedestrians and vehicles and target speed is <20 km/hr, no footpath may be required.
3. A pavement width of 5.5 m may be considered, subject to the agreement of the local authority. The reserve should remain at 14.2 m to allow for future flexibility.

Appendix C

SIDRA INTERSECTION ANALYSIS

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Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.

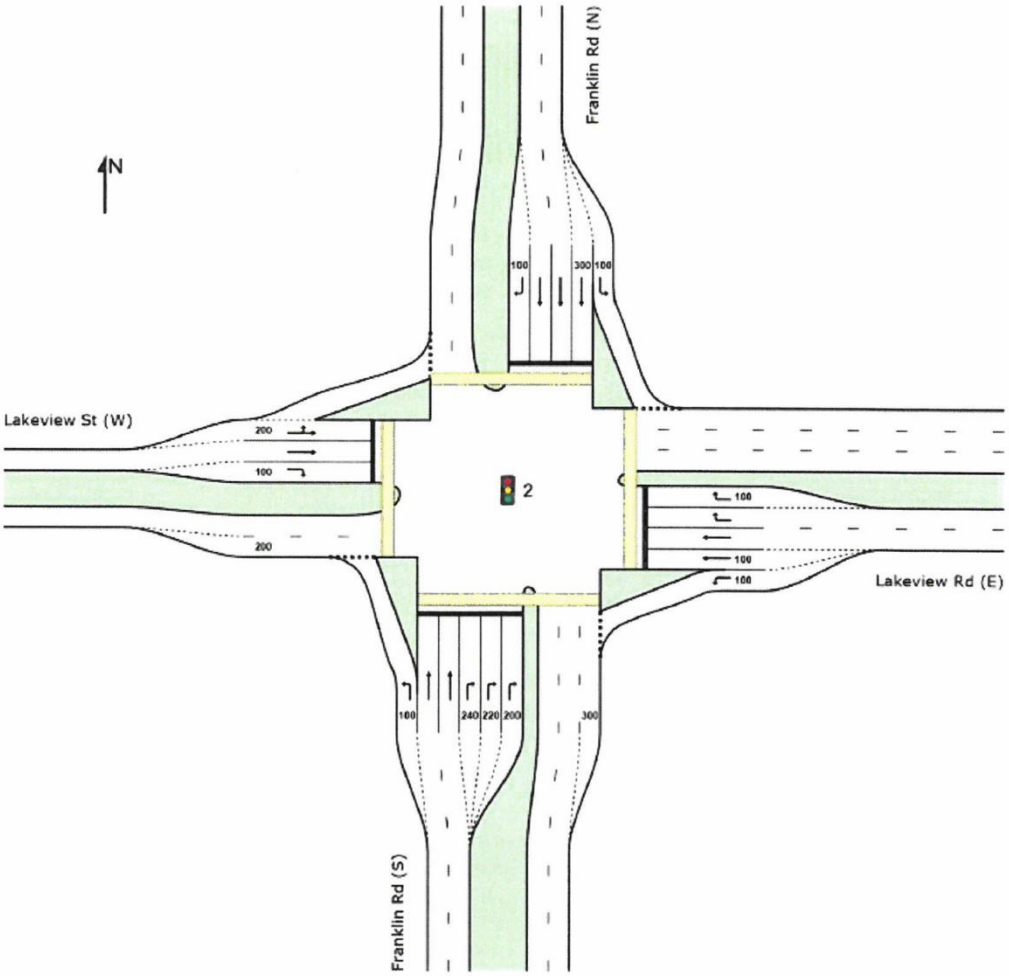


Figure C1. Franklin Rd / Lakeview Rd signalised intersection layout analysed in SIDRA

Table C1a. SIDRA results – Franklin Rd / Lakeview Rd signalised intersection – 2051 weekday 8-9AM peak

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h]	HV %	Arrival Flows [Total veh/h]	HV %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh]	[Dist m]	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Franklin Rd (S)															
10	L2	All MCs	42	3.3	42	3.3	0.032	9.2	LOS A	0.4	3.4	0.22	0.63	0.22	50.3
11	T1	All MCs	881	5.5	881	5.5	0.616	34.5	LOS C	22.4	174.7	0.87	0.76	0.87	31.0
12	R2	All MCs	856	5.5	856	5.5	*0.936	84.9	LOS F	29.0	226.8	1.00	1.07	1.37	17.1
Approach			1779	5.4	1779	5.4	0.936	58.1	LOS E	29.0	226.8	0.91	0.91	1.09	22.7
East: Lakeview Rd (E)															
1	L2	All MCs	364	5.5	364	5.5	0.313	13.2	LOS B	5.9	46.0	0.29	0.66	0.29	50.0
2	T1	All MCs	357	5.5	357	5.5	0.312	30.3	LOS C	6.9	54.1	0.65	0.65	0.65	35.9
3	R2	All MCs	232	5.5	232	5.5	0.854	77.3	LOS E	8.0	62.5	1.00	0.92	1.25	12.5
Approach			953	5.5	953	5.5	0.854	35.2	LOS D	8.0	62.5	0.60	0.72	0.66	33.0
North: Franklin Rd (N)															
4	L2	All MCs	346	5.5	346	5.5	0.496	37.4	LOS D	15.0	116.9	0.80	0.91	0.80	30.9
5	T1	All MCs	1053	5.5	1053	5.5	*0.944	78.3	LOS E	27.1	211.4	1.00	1.12	1.35	29.2
6	R2	All MCs	27	3.3	27	3.3	0.328	75.8	LOS E	1.8	13.7	1.00	0.72	1.00	27.1
Approach			1426	5.5	1426	5.5	0.944	68.3	LOS E	27.1	211.4	0.95	1.06	1.21	29.4
West: Lakeview St (W)															
7	L2	All MCs	84	3.3	84	3.3	0.934	35.2	LOS D	41.7	317.8	1.00	1.16	1.24	17.8
8	T1	All MCs	833	3.3	833	3.3	*0.934	74.9	LOS E	41.7	317.8	1.00	1.17	1.28	17.5
9	R2	All MCs	128	3.3	128	3.3	*0.924	85.5	LOS F	9.6	73.0	1.00	1.08	1.46	24.3
Approach			1045	3.3	1045	3.3	0.934	73.0	LOS E	41.7	317.8	1.00	1.16	1.30	18.7
All Vehicles			5203	5.0	5203	5.0	0.944	59.7	LOS E	41.7	317.8	0.88	0.97	1.09	25.4

Pedestrian Movement Performance

Mov ID	Crossing	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped]	[Dist m]	Prop. Que	Eff. Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Franklin Rd (S)											
P4	Full	53	51.9	LOS E	0.2	0.2	0.89	0.89	68.5	20.0	0.29
East: Lakeview Rd (E)											
P1	Full	53	59.3	LOS E	0.2	0.2	0.96	0.96	75.9	20.0	0.26
North: Franklin Rd (N)											
P2	Full	53	49.2	LOS E	0.2	0.2	0.87	0.87	65.9	20.0	0.30
West: Lakeview St (W)											
P3	Full	53	37.8	LOS D	0.1	0.1	0.76	0.76	54.4	20.0	0.37
All Pedestrians		211	49.5	LOS E	0.2	0.2	0.87	0.87	66.2	20.0	0.30

Table C1b. SIDRA results – Franklin Rd / Lakeview Rd signalised intersection – 2051 weekday 3-4PM peak

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h]	Demand Flows [HV %]	Arrival Flows [Total veh/h]	Arrival Flows [HV %]	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh]	95% Back Of Queue [Dist m]	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Franklin Rd (S)															
10	L2	All MCs	72	3.3	72	3.3	0.064	33.2	LOS C	1.4	10.9	0.33	0.66	0.33	47.9
11	T1	All MCs	951	5.5	951	5.5	*0.724	49.0	LOS D	30.4	237.4	0.93	0.82	0.93	26.8
12	R2	All MCs	611	5.5	611	5.5	0.687	70.7	LOS E	14.7	114.6	0.99	0.84	1.01	19.5
Approach			1633	5.4	1633	5.4	0.724	56.4	LOS E	30.4	237.4	0.93	0.82	0.93	24.4
East: Lakeview Rd (E)															
1	L2	All MCs	762	5.5	762	5.5	0.617	13.5	LOS B	13.0	101.8	0.33	0.73	0.33	50.8
2	T1	All MCs	846	5.5	846	5.5	0.632	29.2	LOS C	20.0	155.9	0.70	0.71	0.70	36.7
3	R2	All MCs	431	5.5	431	5.5	*0.704	73.5	LOS E	15.3	119.7	1.00	0.85	1.02	13.0
Approach			2039	5.5	2039	5.5	0.704	32.7	LOS C	20.0	155.9	0.62	0.75	0.63	34.7
North: Franklin Rd (N)															
4	L2	All MCs	260	5.5	260	5.5	0.263	17.9	LOS B	8.4	65.2	0.50	0.73	0.50	43.6
5	T1	All MCs	869	5.5	869	5.5	0.668	57.2	LOS E	19.3	150.7	0.97	0.82	0.97	34.8
6	R2	All MCs	56	3.3	56	3.3	*0.662	88.4	LOS F	4.3	33.0	1.00	0.80	1.11	24.9
Approach			1185	5.4	1185	5.4	0.668	50.1	LOS D	19.3	150.7	0.87	0.80	0.87	35.0
West: Lakeview St (W)															
7	L2	All MCs	41	3.3	41	3.3	0.699	22.1	LOS C	22.7	173.3	0.96	0.91	0.96	19.4
8	T1	All MCs	645	3.3	645	3.3	*0.699	59.9	LOS E	22.7	173.3	0.96	0.87	0.96	20.1
9	R2	All MCs	81	3.3	81	3.3	0.612	80.5	LOS F	6.0	46.0	1.00	0.80	1.03	25.1
Approach			767	3.3	767	3.3	0.699	60.0	LOS E	22.7	173.3	0.97	0.87	0.97	20.8
All Vehicles			5624	5.2	5624	5.2	0.724	47.0	LOS D	30.4	237.4	0.81	0.80	0.81	29.7

Pedestrian Movement Performance

Mov ID	Crossing	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped]	AVERAGE BACK OF QUEUE [Dist m]	Prop. Que	Eff. Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Franklin Rd (S)											
P4	Full	53	49.7	LOS E	0.2	0.2	0.82	0.82	66.4	20.0	0.30
East: Lakeview Rd (E)											
P1	Full	53	63.6	LOS F	0.2	0.2	0.92	0.92	80.3	20.0	0.25
North: Franklin Rd (N)											
P2	Full	53	60.0	LOS E	0.2	0.2	0.90	0.90	76.7	20.0	0.26
West: Lakeview St (W)											
P3	Full	53	44.2	LOS E	0.2	0.2	0.77	0.77	60.8	20.0	0.33
All Pedestrians		211	54.4	LOS E	0.2	0.2	0.85	0.85	71.0	20.0	0.28

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.

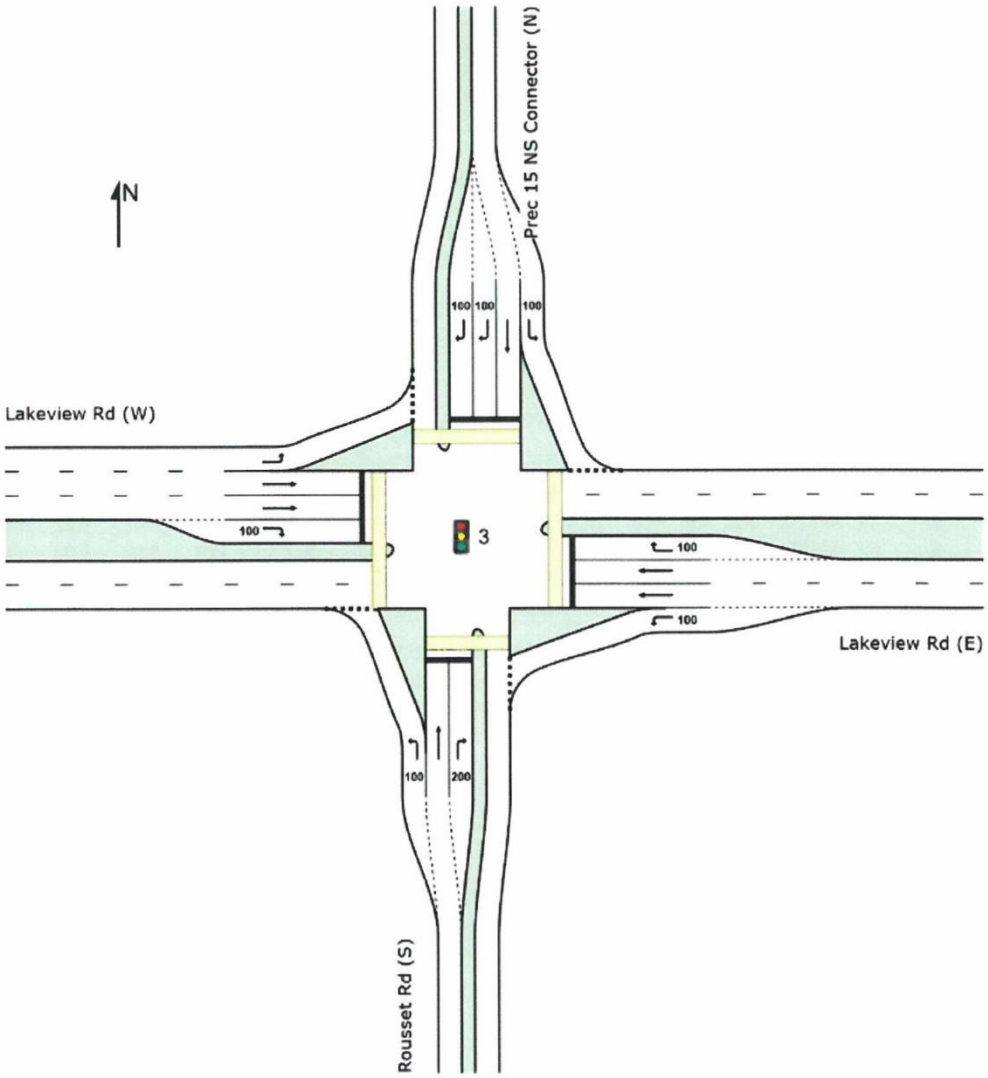


Figure C2. Lakeview Rd / Precinct 15 north south connector signalised intersection layout analysed in SIDRA

Table C2a. SIDRA results – Lakeview Rd / Precinct 15 NS connector signalised intersection – 2051 weekday 8-9AM peak

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h]	HV [ ] %	Arrival Flows [Total veh/h]	HV [ ] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh]	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Rousset Rd (S)															
10	L2	All MCs	92	3.3	92	3.3	0.073	9.5	LOS A	1.2	8.9	0.27	0.65	0.27	51.7
11	T1	All MCs	87	3.3	87	3.3	0.271	51.1	LOS D	4.9	37.1	0.91	0.72	0.91	35.6
12	R2	All MCs	143	3.3	143	3.3	*0.858	78.9	LOS E	10.0	76.4	1.00	0.95	1.29	27.2
Approach			322	3.3	322	3.3	0.858	51.6	LOS D	10.0	76.4	0.77	0.80	0.90	32.1
East: Lakeview Rd (E)															
1	L2	All MCs	54	3.3	54	3.3	0.034	7.0	LOS A	0.2	1.6	0.12	0.61	0.12	57.5
2	T1	All MCs	777	5.5	777	5.5	0.405	22.8	LOS C	14.8	115.9	0.66	0.69	0.66	37.9
3	R2	All MCs	101	3.3	101	3.3	*0.808	78.4	LOS E	7.0	53.1	1.00	0.90	1.25	27.3
Approach			932	5.1	932	5.1	0.808	27.9	LOS C	14.8	115.9	0.66	0.71	0.69	36.5
North: Prec 15 NS Connector (N)															
4	L2	All MCs	11	3.3	11	3.3	0.018	33.8	LOS C	0.4	3.3	0.67	0.66	0.67	40.6
5	T1	All MCs	25	3.3	25	3.3	*0.082	49.9	LOS D	1.4	10.4	0.88	0.64	0.88	36.0
6	R2	All MCs	83	3.3	83	3.3	0.272	68.9	LOS E	2.6	19.5	0.97	0.74	0.97	19.7
Approach			119	3.3	119	3.3	0.272	61.8	LOS E	2.6	19.5	0.93	0.71	0.93	25.1
West: Lakeview Rd (W)															
7	L2	All MCs	400	3.3	400	3.3	0.275	5.8	LOS A	3.3	25.0	0.18	0.56	0.18	50.1
8	T1	All MCs	1618	5.5	1618	5.5	*0.889	58.6	LOS E	53.8	419.8	1.00	0.96	1.07	28.3
9	R2	All MCs	16	3.3	16	3.3	0.189	78.6	LOS E	1.0	7.3	0.93	0.68	0.93	24.4
Approach			2034	5.1	2034	5.1	0.889	48.4	LOS D	53.8	419.8	0.84	0.88	0.89	30.9
All Vehicles			3406	4.8	3406	4.8	0.889	43.5	LOS D	53.8	419.8	0.79	0.82	0.84	31.9

Pedestrian Movement Performance

Mov ID	Crossing	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped]	Dist] m	Prop. Que	Eff. Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Rousset Rd (S)											
P4	Full	53	21.1	LOS C	0.1	0.1	0.57	0.57	37.8	20.0	0.53
East: Lakeview Rd (E)											
P1	Full	53	59.3	LOS E	0.2	0.2	0.96	0.96	75.9	20.0	0.26
North: Prec 15 NS Connector (N)											
P2	Full	53	24.1	LOS C	0.1	0.1	0.61	0.61	40.7	20.0	0.49
West: Lakeview Rd (W)											
P3	Full	53	59.3	LOS E	0.2	0.2	0.96	0.96	75.9	20.0	0.26
All Pedestrians		211	40.9	LOS E	0.2	0.2	0.77	0.77	57.6	20.0	0.35

Table C2b. SIDRA results – Lakeview Rd / Precinct 15 NS connector signalised intersection – 2051 weekday 3-4PM peak

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Rousset Rd (S)															
10	L2	All MCs	100	3.3	100	3.3	0.141	34.8	LOS C	4.5	34.3	0.67	0.73	0.67	30.5
11	T1	All MCs	52	3.3	52	3.3	0.177	59.7	LOS E	3.3	25.1	0.91	0.69	0.91	32.9
12	R2	All MCs	80	3.3	80	3.3	0.415	75.7	LOS E	5.6	42.8	0.98	0.77	0.98	27.8
Approach			232	3.3	232	3.3	0.415	54.5	LOS D	5.6	42.8	0.83	0.73	0.83	29.8
East: Lakeview Rd (E)															
1	L2	All MCs	129	3.3	129	3.3	0.090	46.8	LOS D	1.6	12.2	0.22	0.64	0.22	56.0
2	T1	All MCs	1585	5.5	1585	5.5	*0.925	74.1	LOS E	62.4	487.4	1.00	1.02	1.12	23.1
3	R2	All MCs	97	3.3	97	3.3	0.670	102.4	LOS F	7.3	55.3	1.00	0.82	1.06	26.5
Approach			1812	5.2	1812	5.2	0.925	73.7	LOS E	62.4	487.4	0.94	0.99	1.06	25.2
North: Prec 15 NS Connector (N)															
4	L2	All MCs	34	3.3	34	3.3	0.048	22.0	LOS C	1.1	8.4	0.50	0.68	0.50	46.7
5	T1	All MCs	97	3.3	97	3.3	*0.332	61.5	LOS E	6.4	48.6	0.94	0.74	0.94	32.3
6	R2	All MCs	354	3.3	354	3.3	*0.918	94.8	LOS F	14.9	113.3	1.00	0.99	1.34	15.5
Approach			484	3.3	484	3.3	0.918	83.1	LOS F	14.9	113.3	0.95	0.92	1.20	20.3
West: Lakeview Rd (W)															
7	L2	All MCs	240	3.3	240	3.3	0.160	6.7	LOS A	3.6	27.6	0.29	0.53	0.29	49.3
8	T1	All MCs	1147	5.5	1147	5.5	0.644	49.3	LOS D	37.0	288.8	0.96	0.74	0.96	31.3
9	R2	All MCs	128	3.3	128	3.3	*0.889	104.7	LOS F	10.2	77.9	1.00	0.94	1.20	20.3
Approach			1516	5.0	1516	5.0	0.889	47.3	LOS D	37.0	288.8	0.86	0.72	0.88	31.7
All Vehicles			4043	4.8	4043	4.8	0.925	63.8	LOS E	62.4	487.4	0.91	0.86	0.99	27.2

Pedestrian Movement Performance

Mov ID	Crossing	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Eff. Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Rousset Rd (S)											
P4	Full	53	24.7	LOS C	0.1	0.1	0.57	0.57	41.4	20.0	0.48
East: Lakeview Rd (E)											
P1	Full	53	69.3	LOS F	0.2	0.2	0.96	0.96	85.9	20.0	0.23
North: Prec 15 NS Connector (N)											
P2	Full	53	25.9	LOS C	0.1	0.1	0.59	0.59	42.5	20.0	0.47
West: Lakeview Rd (W)											
P3	Full	53	69.3	LOS F	0.2	0.2	0.96	0.96	85.9	20.0	0.23
All Pedestrians		211	47.3	LOS E	0.2	0.2	0.77	0.77	63.9	20.0	0.31

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.

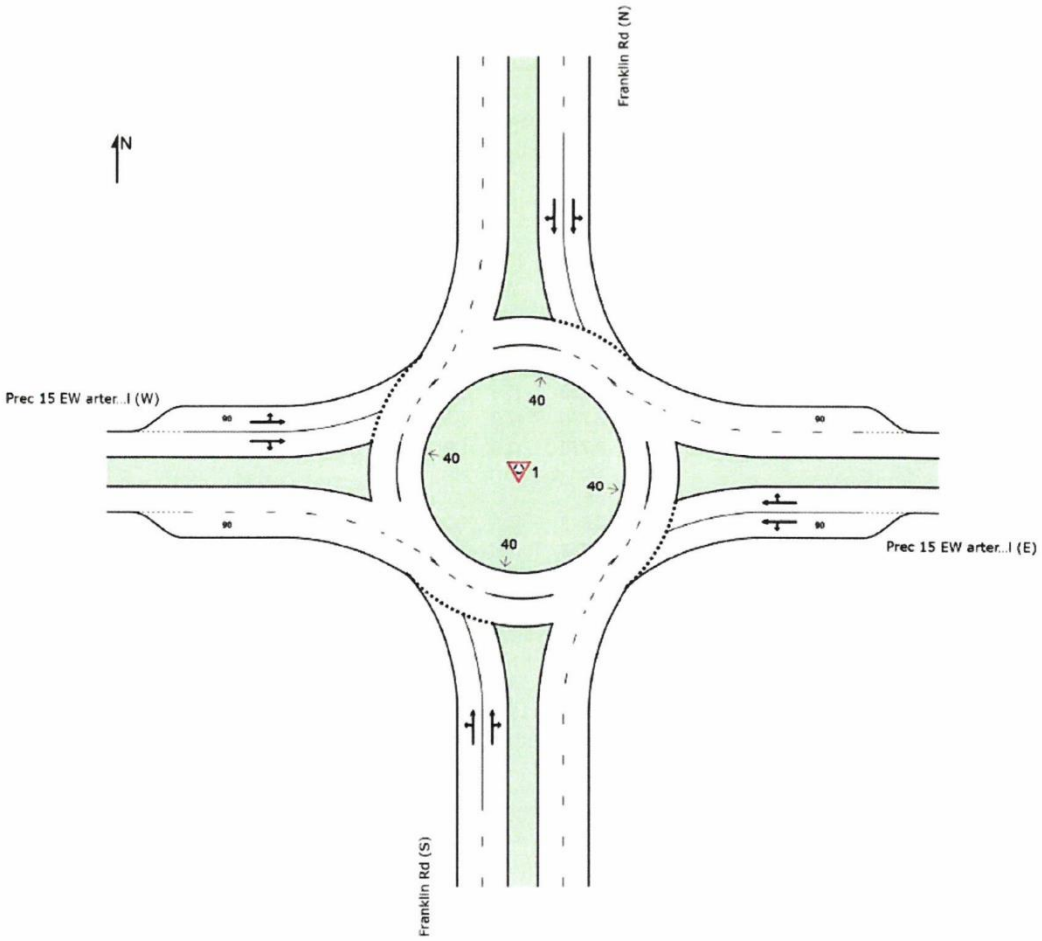


Figure C3. Franklin Rd / Precinct 15 east west arterial roundabout layout analysed in SIDRA

Table C3a. SIDRA results – Franklin Rd / Precinct 15 EW arterial roundabout – 2051 weekday 8-9AM peak

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Franklin Rd (S)															
10	L2	All MCs	206	3.3	206	3.3	0.645	8.8	LOS A	4.4	34.3	0.68	0.73	0.80	52.0
11	T1	All MCs	893	5.5	893	5.5	0.645	7.7	LOS A	4.4	34.3	0.69	0.77	0.82	57.7
12	R2	All MCs	97	3.3	97	3.3	0.645	14.8	LOS B	4.0	31.0	0.70	0.80	0.84	50.7
Approach			1196	4.9	1196	4.9	0.645	8.5	LOS A	4.4	34.3	0.69	0.76	0.82	56.0
East: Prec 15 EW arterial (E)															
1	L2	All MCs	101	3.3	101	3.3	0.548	9.2	LOS A	3.5	26.8	0.85	0.92	1.08	41.0
2	T1	All MCs	663	3.3	663	3.3	0.770	11.1	LOS B	7.9	60.2	0.93	1.07	1.39	43.3
3	R2	All MCs	132	3.3	132	3.3	0.770	17.9	LOS B	7.9	60.2	0.96	1.14	1.54	46.1
Approach			896	3.3	896	3.3	0.770	11.9	LOS B	7.9	60.2	0.93	1.06	1.38	43.6
North: Franklin Rd (N)															
4	L2	All MCs	324	3.3	324	3.3	0.813	14.3	LOS B	8.6	66.6	0.95	1.07	1.49	48.6
5	T1	All MCs	871	5.5	871	5.5	0.813	13.9	LOS B	8.6	66.6	0.94	1.08	1.50	47.0
6	R2	All MCs	13	3.3	13	3.3	0.813	21.3	LOS C	7.4	58.0	0.93	1.09	1.50	47.3
Approach			1207	4.9	1207	4.9	0.813	14.1	LOS B	8.6	66.6	0.94	1.08	1.49	47.6
West: Prec 15 EW arterial (W)															
7	L2	All MCs	14	3.3	14	3.3	0.517	6.3	LOS A	3.1	23.9	0.77	0.72	0.91	50.5
8	T1	All MCs	619	3.3	619	3.3	0.726	6.8	LOS A	6.7	51.0	0.82	0.83	1.03	45.0
9	R2	All MCs	455	3.3	455	3.3	0.726	12.9	LOS B	6.7	51.0	0.88	0.98	1.20	39.6
Approach			1087	3.3	1087	3.3	0.726	9.4	LOS A	6.7	51.0	0.84	0.89	1.10	43.4
All Vehicles			4386	4.2	4386	4.2	0.813	10.9	LOS B	8.6	66.6	0.84	0.94	1.19	47.9

Table C3b. SIDRA results – Franklin Rd / Precinct 15 EW arterial roundabout – 2051 weekday 3-4PM peak

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Franklin Rd (S)															
10	L2	All MCs	463	3.3	463	3.3	0.882	15.0	LOS B	10.0	77.3	0.90	1.15	1.49	49.0
11	T1	All MCs	924	5.5	924	5.5	0.882	14.3	LOS B	10.0	77.3	0.91	1.15	1.53	53.7
12	R2	All MCs	36	3.3	36	3.3	0.882	21.6	LOS C	8.6	67.4	0.91	1.15	1.55	47.6
Approach			1423	4.7	1423	4.7	0.882	14.7	LOS B	10.0	77.3	0.90	1.15	1.51	51.9
East: Prec 15 EW arterial (E)															
1	L2	All MCs	100	3.3	100	3.3	0.551	6.7	LOS A	3.3	25.3	0.79	0.80	0.96	42.7
2	T1	All MCs	633	3.3	633	3.3	0.774	7.6	LOS A	7.3	55.6	0.85	0.93	1.15	44.7
3	R2	All MCs	367	3.3	367	3.3	0.774	13.7	LOS B	7.3	55.6	0.90	1.05	1.30	47.4
Approach			1100	3.3	1100	3.3	0.774	9.6	LOS A	7.3	55.6	0.86	0.96	1.18	45.5
North: Franklin Rd (N)															
4	L2	All MCs	233	3.3	233	3.3	0.662	9.7	LOS A	5.2	40.4	0.85	0.82	1.05	50.7
5	T1	All MCs	838	5.5	838	5.5	0.662	8.8	LOS A	5.2	40.4	0.84	0.86	1.05	51.6
6	R2	All MCs	21	3.3	21	3.3	0.662	15.9	LOS B	4.7	36.5	0.84	0.88	1.06	49.9
Approach			1092	5.0	1092	5.0	0.662	9.1	LOS A	5.2	40.4	0.84	0.85	1.05	51.3
West: Prec 15 EW arterial (W)															
7	L2	All MCs	16	3.3	16	3.3	0.590	10.3	LOS B	4.2	31.8	0.89	0.95	1.16	48.7
8	T1	All MCs	688	3.3	688	3.3	0.829	13.3	LOS B	10.4	79.2	0.95	1.12	1.51	42.2
9	R2	All MCs	246	3.3	246	3.3	0.829	21.7	LOS C	10.4	79.2	1.00	1.26	1.80	34.8
Approach			951	3.3	951	3.3	0.829	15.5	LOS B	10.4	79.2	0.96	1.15	1.58	40.9
All Vehicles			4565	4.1	4565	4.1	0.882	12.3	LOS B	10.4	79.2	0.89	1.03	1.34	47.5

3. LOCAL SENSE OF PLACE STATEMENT

A Local Sense of Place Statement has been developed for Precinct 15 and reflects the vision and the District Sense of Place Statement for East Wanneroo that has been developed by the City of Wanneroo. The Local Sense of Place Statement outlines how protection of the environmental, cultural and historical elements of Precinct 15 will be balanced with future development to establish a sense of place.

3.1 PRECINCT 15 CHARACTERISTICS

Precinct 15 is characterised by connections to bush and green spaces and a rural history of agriculture, cattle grazing and cultivating the land. The area has a village, small country town feel underpinned by a laid back lifestyle. The existing natural environment will be critical to create the sense of place, significant existing trees will be protected, topography will be retained and connections to wetlands will be strengthened.

The land has a gentle undulating landform with a predominant north-south ridgeline located on the western portion of the site. On the eastern portion of the site, the land is characterised by two low lying areas.

An existing ridgeline in the western area of Precinct 15, populated with large Jarrah trees, will be largely retained as public open space. The topography and significant existing trees (some in excess of 20m tall) will make this a prominent aspect of the development and will offer views and vantage points to the eastern wetland and Mariginiup Lake. Amongst the ridge line it is proposed to develop multiple shelters and picnic opportunities for community gatherings as well as playgrounds targeted at all age groups. The ridge line will be a feature of the development, offering opportunities for various user groups within a natural setting. The development will be connected through a network of pedestrian and dual-use paths, promoting an active lifestyle and integrating the development across both sides of the railway reserve.

The eastern side of the development is characterized by a large wetland that will be enhanced through revegetation while retaining a number of significant Flooded Gum and Melaleuca trees. Surrounding the wetland will be a regional scale sporting complex, offering a unique setting and opportunity for interaction and education The connection to the wetland will be celebrated, with boardwalks, loose gravel trails and interpretive signage explaining the history of the site from an Indigenous and colonial perspective as well as educational signage regarding native flora and fauna. This ensures the development has a strong connection with the surrounding existing environment both visually and culturally.

Sustainability will be a major component of the design over Precinct 15. This will be visually evident in the development through water management and conservation of the natural assets. As the new development introduces a range of modern materials these will be underpinned with a palette of earthy tones and the use of materials that reference the natural environment. Material choices will strongly reflect the existing Mariginiup character, use of crushed limestone, recycled timber and rural materials salvaged from site throughout the public realm shall compliment existing trees and landforms being retained.

The planting palette will contain predominately native and endemic species, the species will be selected in the context of the existing environment. The site also contains thousands of Grass Trees, which will be retained where possible and if not possible will be transplanted within public open space. This will create a sense of character within the development, reflective of the natural landscape.

The Structure Plan responds to the relevant place outcomes identified by EWDSP including:

- Parkland link,
- Regional playing fields,
- Large wetland feature,
- Neighbourhood centre,
- Railway and rail station, and
- High school.

The Parkland Link is part of a network that is of critical importance to East Wanneroo to ensure the wetlands, native vegetation and land forms are retained, and tell the story of the place. The Parkland Link in Precinct 15 will connect Lake Adams to the north with Lake Jandabup to the south. To maximise sense of place, the parkland links is proposed to be separate from on-road networks and connected to the open space network, however they may be adjacent to the road where this supports vegetation retention alongside road reserves.

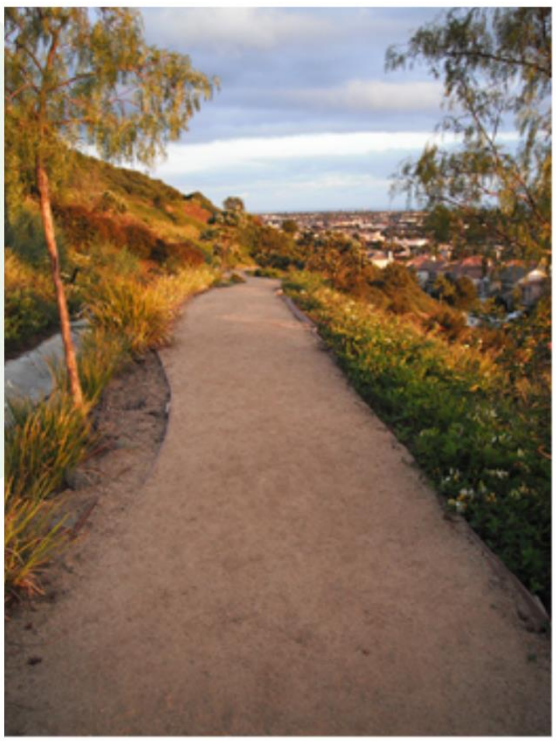
The Structure Plan proposes the co-location of many community facilities – rail station, neighbourhood centre, high school and regional playing fields. Co-located community facilities tell the story of the local place through its design and surrounding public realm. These facilities and places will be focal points for the community and will deliver the sense of place for the area.

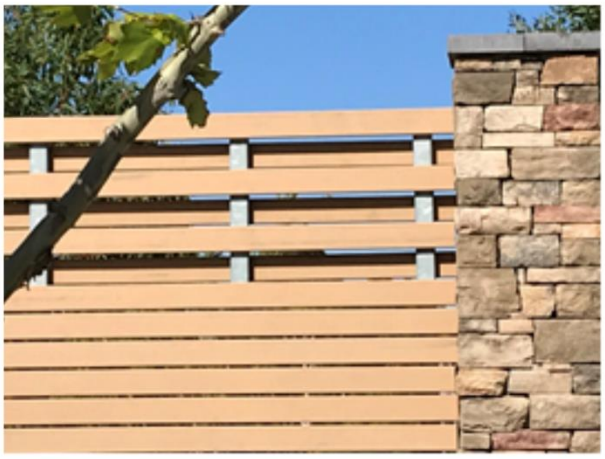
The Structure Plan incorporates the following elements that will contribute to the creation of a strong sense of place:

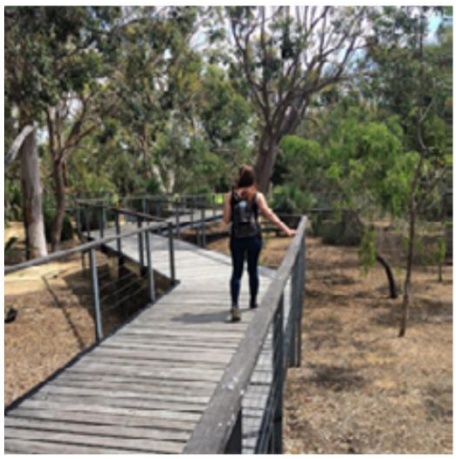
- Integrating POS with legibility, recreation, movement networks, tree and habitat conservation and WSUD
- Providing a range of recreational experiences through a hierarchy of POS and integrated with green links.
- Responding to key environmental and topographical features of the site,
- Design to create distinctive neighbourhoods/ villages defined by:
    - Clear edges and boundaries;
    - Distribution of POS provision;
    - Landscaping and tree retention; and
    - Built form and density.

























HORIZON
HERITAGE MANAGEMENT

OPEN REPORT WITH EXCEPTIONS

Precinct 15 Central Mariginiup Local Structure Plan Aboriginal Heritage Desktop Assessment Report

August 2023

Damien Lafrentz

WARNING

THIS REPORT CONTAINS THE NAME OF A DECEASED ABORIGINAL PERSON.

PAGES 31 AND 32 CONTAIN RESTRICTED PLACE AND BOUNDARY INFORMATION.

Recognition of People & Country

Horizon Heritage Management acknowledges and pays respect to the Whadjuk Noongar Traditional Owners and community of the land and sea of this '*boodja*' (country). We pay respect to the Elders past, present and emerging who hold the memories, traditions, culture and hopes for the future.

Confidentiality

This is an open report with exceptions for restricted information on pages 31 – 32. The site information for 22160 Marrynginup is restricted with the DPLH. Horizon Heritage Management has permission from the original site informant's family to use this information publicly within this LSP desktop assessment report.

Disclaimer

This heritage desktop assessment report is being supplied to Stockland so it can manage its requirements and responsibilities under the Western Australia *Aboriginal Cultural Heritage Act* (2021) (ACHA) and to be aware of and minimise risks to Aboriginal heritage and culture associated with the Precinct 15 Central Mariginiup Local Structure Plan (LSP).

Aboriginal places and objects are afforded protection under the ACHA. Any heritage impacts without consultation, agreement and consent with the Whadjuk People could be an offence under Part 5 of the ACHA.

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Acknowledgements

Horizon Heritage Management acknowledges the assistance of Emerge Associates for supplying GIS spatial information for this desktop assessment report.

Abbreviations

ACHC	Aboriginal Cultural Heritage Council
ACHA	*Aboriginal Cultural Heritage Act (2021)*
DPLH	Department of Planning, Lands and Heritage
GIS	Geographic Information System
GPS	Global Positioning System
LSP	Local Structure Plan
MGA	Map Grid of Australia
NTC	Native Title Claimant Group
SWALSC	South West Aboriginal Sea and Land Council
WGS	World Geodetic System

Spellings

The Waugal is the major spirit for Noongar People and central to their beliefs and customs. Waugal has many different spellings including *Waakal, Wagyl, Wawgal, Woggal* and *Waagal*.

Horizon Heritage acknowledges there are alternative spellings of Noongar (*Nyungar, Nyoongar, Nyoongah, Nyungah, Nyugah* and *Yunga*) however Noongar has been used as an inclusive representation of the Noongar societies.

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Executive Summary

Horizon Heritage Management was engaged to undertake a desktop assessment to understand the extent and characteristics of any known and likely Aboriginal heritage values within the Precinct 15 Central Mariginiup Local Structure Plan area (LSP desktop assessment area).

Horizon Heritage Management makes the following conclusions:

- The key Aboriginal stakeholder group for the LSP desktop assessment area is the Whadjuk 'Noongar' People.
- Potentially important landscape features like lakes, swamps and wetlands connected with mythological associations are present within the Central Mariginiup LSP desktop assessment area. Lake Adams is such a feature and is located along the northern boundary of the LSP desktop assessment area. Jandabup Lake is another such a feature and is located along the southern boundary of the LSP desktop assessment area. Further landscape features Little Mariginiup Lake and Mariginiup Lake are located immediately west and southwest of the Precinct 15 Central Mariginiup LSP desktop assessment area.
- One (1) ACH Directory Place 22160 Marrynginup has a closed and restricted boundary which intersects the LSP desktop assessment area and is afforded protection under the *Aboriginal Cultural Heritage Act (2021).*
- The key Whadjuk Custodian for 22160 Marrynginup is Esandra Colbung. Her father (now deceased) was the original site informant.
- No specific Aboriginal heritage surveys (ethnographic or archaeological) have been undertaken within the LSP desktop assessment area.
- No registered archaeological sites are within the LSP desktop assessment area. It is possible surface expressions of *in situ* cultural material (artefacts) could be present. Care should be taken in those areas with some potential to contain cultural material. These are around the margins of landscape features like lakes, swamps, wetlands, and any sand hill features that maybe within the LSP desktop assessment area.
- Numerous Noongar fringe camps have previously been identified within proximity of the numerous freshwater lakes found in the broader Wanneroo area, potential remains for contemporary Whadjuk People to hold knowledge of any possible Whadjuk land use of the LSP desktop assessment area.

Horizon Heritage Management makes the following recommendations:

1. Horizon Heritage Management recommends that any future development within the LSP area includes consultation with the Whadjuk Aboriginal Corporation and Aboriginal heritage ethnographic and archaeological heritage surveys with the Whadjuk People.
2. Horizon Heritage Management recommends that consultation is undertaken with Esandra Colbung (Whadjuk Site Custodian) for 22160 Marrynginup regarding the LSP desktop assessment area and this significant Aboriginal site.
3. Horizon Heritage Management recommends 22160 Marrynginup is an ACH Directory Place and is afforded protection under the *Aboriginal Cultural Heritage Act (2021).* To use the land which Aboriginal Places are on the proponent/landowner must engage with the Whadjuk Aboriginal Corporation.
4. Horizon Heritage Management recommends an Aboriginal Cultural Heritage Management Plan (developed with input and consent from the Whadjuk People and endorsed by the new ACH Council) will likely be needed to satisfy the *Aboriginal Cultural Heritage Act (2021)*.

1 PROJECT BRIEF

Horizon Heritage Management was engaged to undertake a desktop assessment to understand the extent and characteristics of any known and likely Aboriginal heritage values within the Precinct 15 Central Mariginiup Local Structure Plan area.

2 PROJECT BACKGROUND

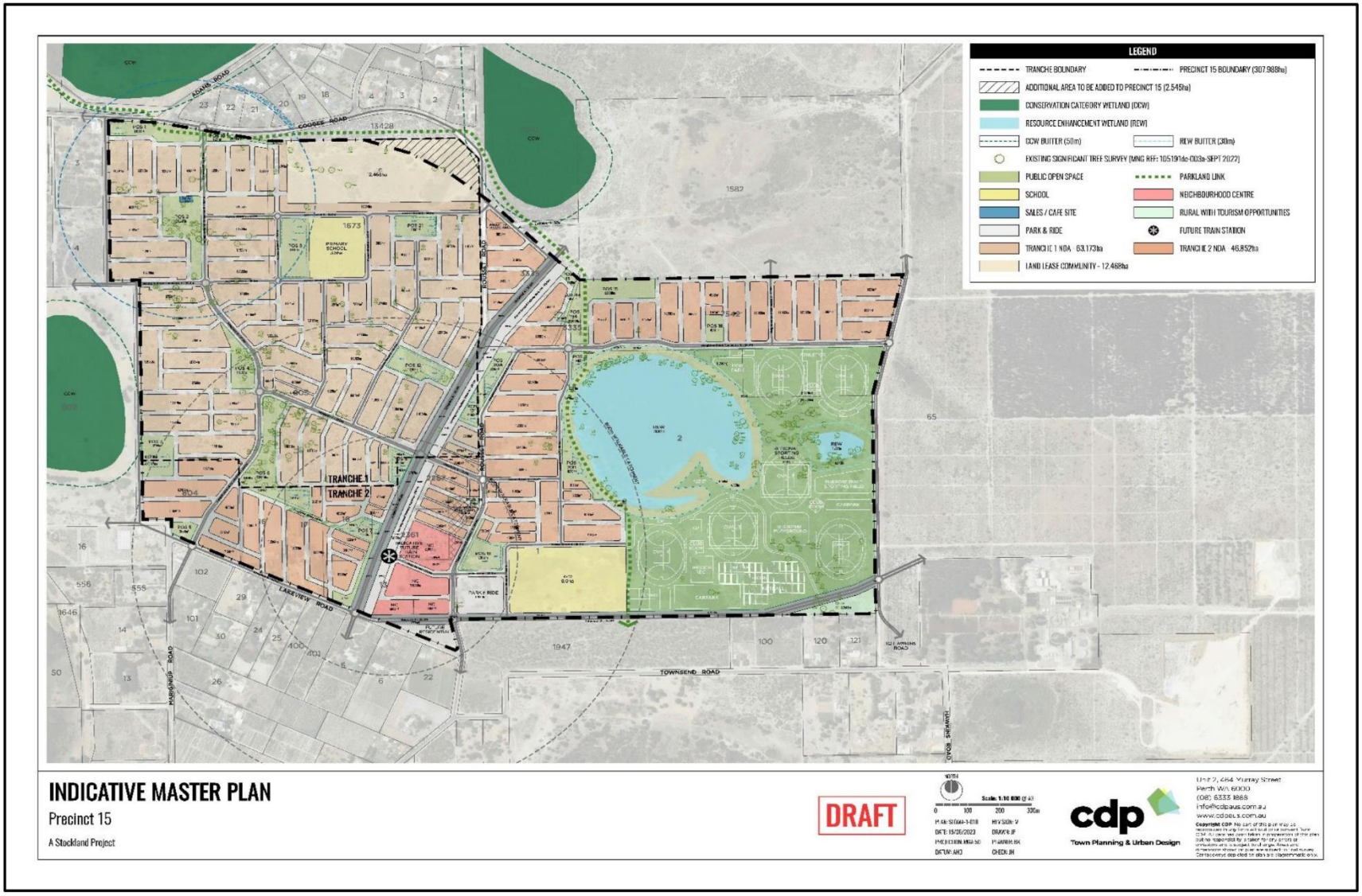
Stockland requires an Aboriginal Heritage Desktop Assessment report as a technical appendix to the Central Mariginiup LSP submission.

The Central Mariginiup precinct is an Urban Expansion Area in the North-West Sub-regional Planning Framework. It is generally flat except for a ridgeline along its western boundary marking the transition from the Bassendean to the Spearwood dunal system. The precinct currently contains market gardens, homesteads, and equestrian facilities.

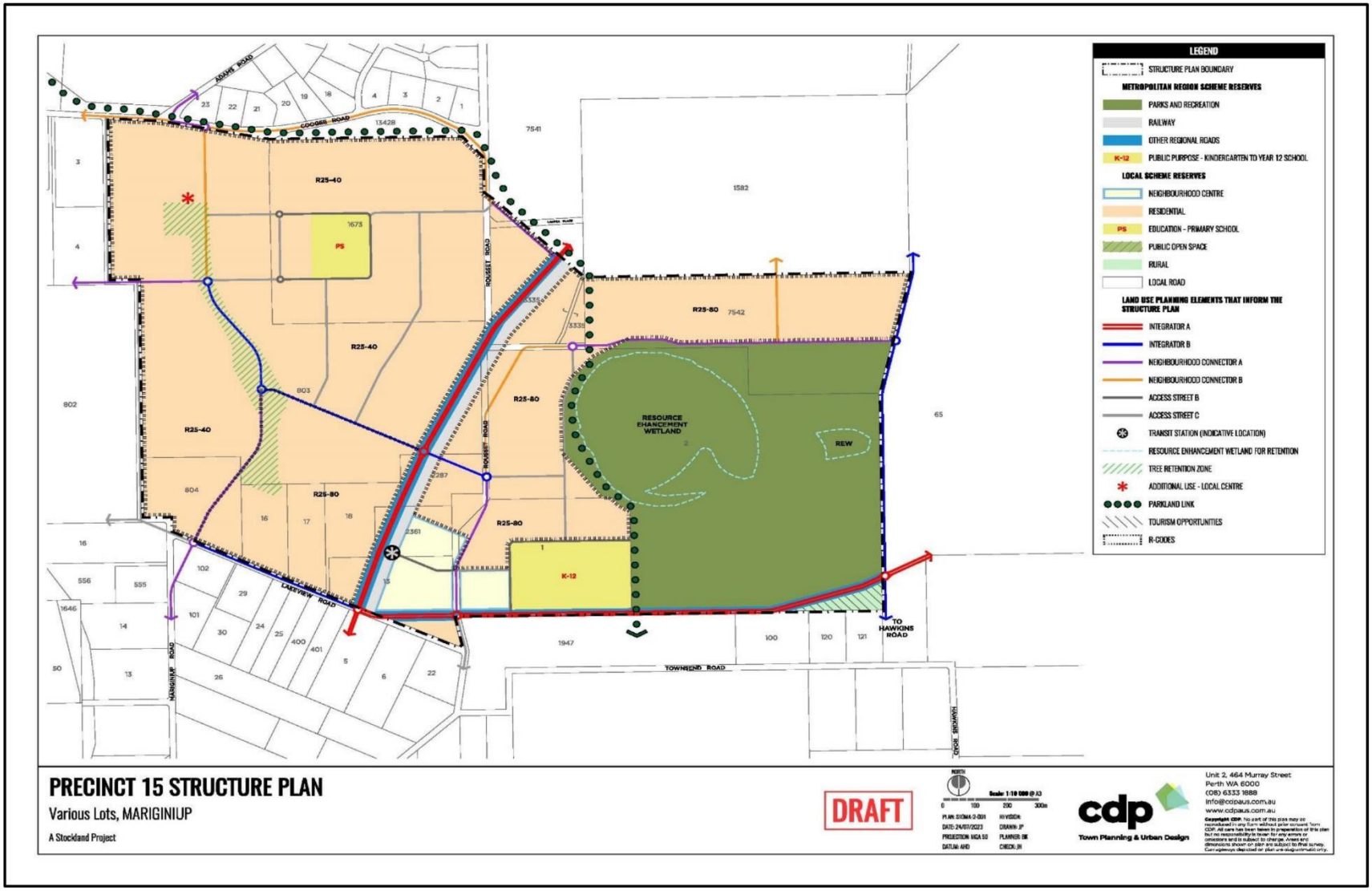
The Resource Enhancement wetland to the east of Rousset Road contains extensive natural vegetation and I of high scenic value. It provides the opportunity to utilize a landmark natural feature as part of the character and sense of place created for this precinct.

The precinct contains an important Aboriginal heritage place 22160 Marrynginup comprising several cultural components and has historical and ongoing contemporary significance to Whadjuk People.

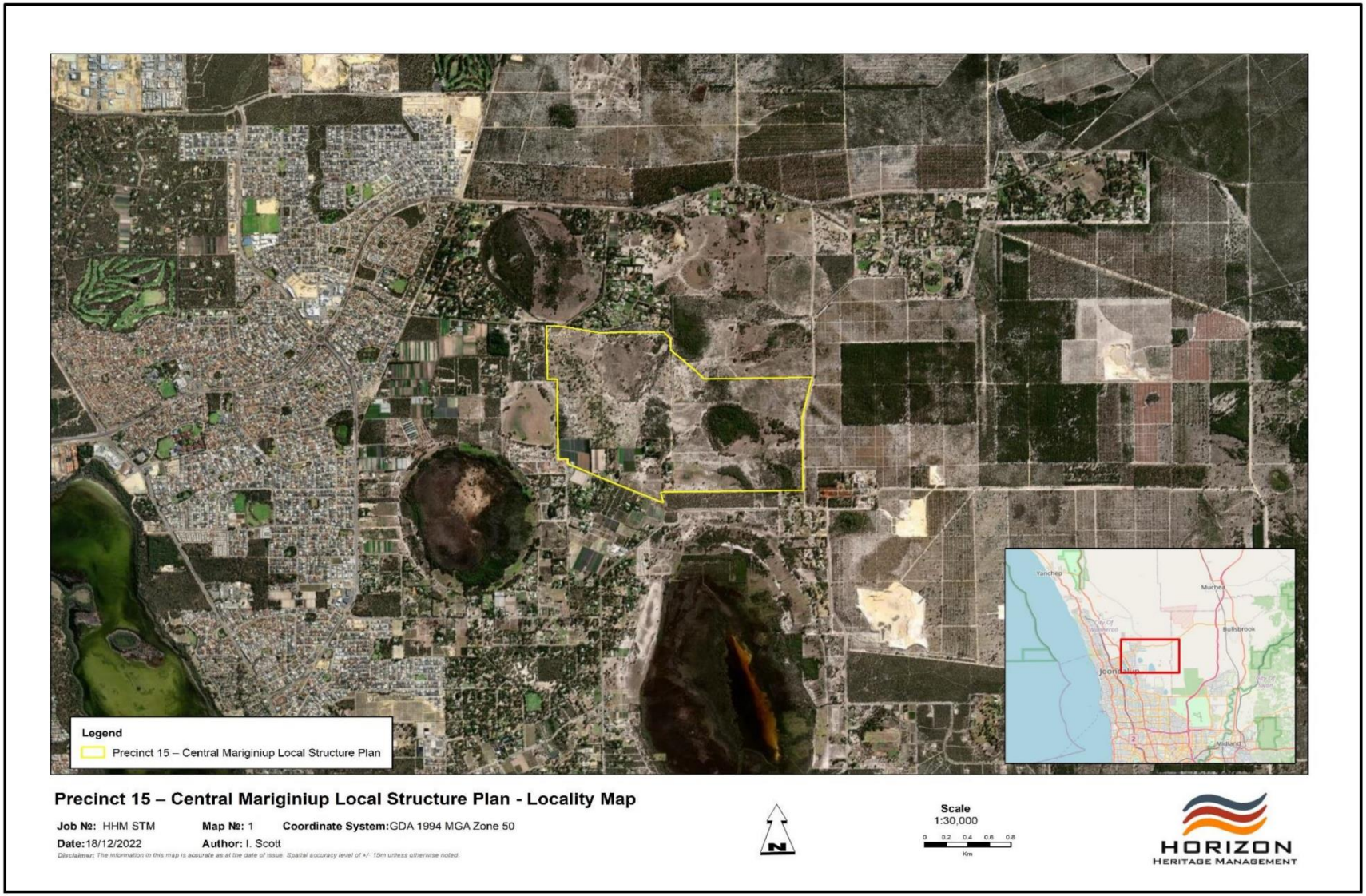
Map 1: Precinct 15 Indicative Master Plan - Central Mariginiup Map



Map 2: Precinct 15 Structure Plan - Central Mariginiup Map



Map 3: Precinct 15 Central Mariginiup LSP area Locality Map



3 ABORIGINAL CULTURAL HERITAGE ACT 2021

Aboriginal Heritage Legislation Requirements

The *Aboriginal Cultural Heritage Act 2021* (ACH Act) provides a modern framework for the recognition, protection, conservation, and preservation of Aboriginal cultural heritage while recognising the fundamental importance of Aboriginal cultural heritage to Aboriginal people. It represents a significant step towards achieving equity in the relationship between Aboriginal people, industry, and Government by replacing outdated Aboriginal cultural heritage laws in favour of agreement making with Aboriginal people.

The Aboriginal Cultural Heritage Act 2021 came into operation on the 1st of July 2023. The Government has developed the regulations, statutory guidelines, and operational policies to support the new Act and ensure it will have its intended effects.

Local Aboriginal Cultural Heritage Services (LACHS) are established under the *Aboriginal Cultural Heritage Act 2021* to provide Aboriginal people with a statutory role in managing and protecting local Aboriginal cultural heritage, and to devolve decision making to Aboriginal people at a local level. The ACHA will increase the Aboriginal voice by decentralising decision making to local Aboriginal organisations with authority over their Aboriginal cultural heritage.

The ACH Council will grant Aboriginal Cultural Heritage Permits and approve agreed Aboriginal Cultural Heritage Management Plans where the proponent has complied with all its obligations to interested Aboriginal parties (such as consultation and ensuring informed consent).

4 WHADJUK NOONGAR PEOPLE

4.1 Identified Aboriginal Stakeholder Group

The table below outlines the Whadjuk (Noongar) People:

Table 1: Aboriginal group identified as a key stakeholder in the LSP desktop assessment area

STAKEHOLDER GROUP	CONTACT	NATIVE TITLE
Whadjuk (Noongar) People	Whadjuk Aboriginal Corporation c/o South West Aboriginal Sea and Land Council (SWALSC)	South West Native Title Settlement

The South West Native Title Settlement in the form of six Indigenous land use agreements (ILUAs) was negotiated between the Whadjuk Noongar People and the WA Government. The Settlement commenced on 25 February 2021. From 13 April 2021 the native title act ceased to apply over the Settlement area - meaning future act processes no longer occur.

A fundamental component of the Settlement is the recognition of the Noongar people as the Traditional Owners of the south west region of Western Australia. On 6 June 2016, the Noongar people were recognised, through an Act of the WA Parliament, as the Traditional Owners of the south west region of Western Australia.

The Whadjuk Noongar peoples' connection to the land and the desire to improve access and protect places of significance, were key elements in the negotiation of the Settlement.

Whadjuk People

Whadjuk are the people of the Swan River plains, whose country is now occupied by the greater metropolitan area of Perth.

The Whadjuk People cover the: City Of Armadale, City Of Bayswater, City Of Belmont, City Of Canning, City Of Cockburn, City Of Fremantle, City Of Gosnells, City Of Joondalup, City Of Melville, City Of Nedlands, City Of Perth, City Of South Perth, City Of Stirling, City Of Subiaco, City Of Swan, City Of Vincent, City Of Wanneroo, Shire Of Beverley, Shire Of Chittering, Shire Of Gingin, Shire Of Kalamunda, Shire Of Mundaring, Shire Of Northam, Shire Of Peppermint Grove, Shire Of Toodyay, Shire Of York, Town Of Bassendean, Town Of Cambridge, Town Of Claremont, Town Of Cottesloe, Town Of East Fremantle, Town Of Mosman Park and the Town Of Victoria Park.

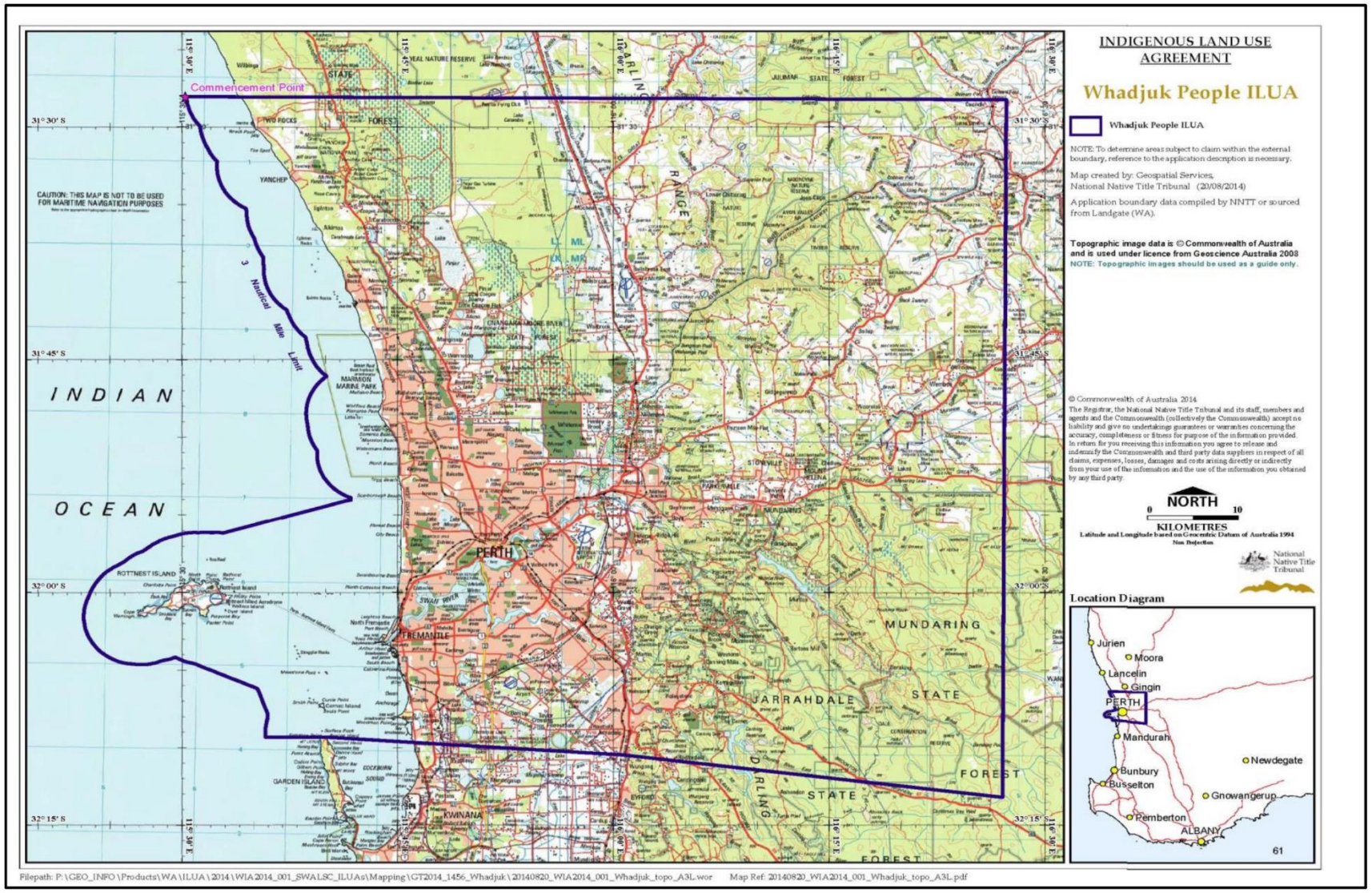
Whadjuk Cultural Advice Committee

The Whadjuk Regional Corporation will have a Cultural Advice Committee (CAC) made up of Elders who consider matters relevant to culture and make decisions to promote and protect their cultural interests.

Matters that may be decided by the committee may include:

- Determining what cultural connection exists, or could exist, to support a piece of land being considered 'Cultural Lands' as part of the Noongar Boodja Trust.
- Determining those people who have most knowledge of relevant lands for surveys to be properly conducted.
- Determining how cultural knowledge should be recorded, and when and how it is shared with others.
- Determining how Noongar cultural protocols and practices should be acknowledged, valued, honoured, and respected, including through welcome to country practices.

Map 4: Whadjuk People ILUA Map



5 ETHNOGRAPHIC BACKGROUND

Introduction: Place, Antiquity, People

Place

The City of Wanneroo is part of a traditional Aboriginal network of communication routes and occupation camps (usually near water sources). According to Jacobs (in Costello, 2002-3; cited in McDonald et al. 2005: 24), the name of Wanneroo comes from the digging stick or *wonner* (*wan-na, wanna, wonna,* etc. Bindon and Chadwick, 1992: 172, 254). The Wanneroo area is part of a string of lakes that run north-south and is characterised as a wetland:

> Thus we see family groups, before European intrusion, centred on the rich alluvial soils along the Swan, particularly in the spring and autumn; moving freely eastward into the hills, mainly in winter and westward to the wetlands of the Wanneroo area, particularly in the summer and autumn (Hallam, 1998: 94, cited in McDonald et al. 2005: 20).

The Swan Coastal Plain has been divided into several 'physiographic elements' starting from the Darling Fault Scarp: a Piedmont Zone of alluvial sediments, a gently undulating Sandy Plain with swampy areas in low-lying land between the dunes, characterised by a string of lakes running north and south, and Coastal Limestone, the Shore Line, shallow waters, and islands and reefs (Jutson, 1950: 89-90). A classification paralleling that of Jutson a decade later appears to be preferred among archaeologists. It is cited by Sylvia Hallam from a CSIRO publication for 1960 using local names of suburbs: Ridge Hill Shelf: the foothills of the Darling Scarp, Pinjarra Plain: the piedmont alluvial plain, Bassendean Dunes: the coastal sand plain, Spearwood Dunes: aeolian limestone, and Quindalup Dunes: the coastal dunes (McArthur and Bettenay, 1960; cited in Hallam 1975: 51). All of these ecological niches are important to the Indigenous people. This profile with its focus on Wanneroo takes in the coastal dunes, and the geomorphic elements of the Swan Coastal Plain close to the dunes, the sea to the west and the lakes to the east.

People

According to Tindale, the traditional territory of the 'Whadjuk' of the Perth Metropolitan area (*see* Plate 2) includes:

> Swan River and northern and eastern tributaries inland to beyond mount Helena; at Kalamunda, Armadale, Victoria Plains, south of Toodyay, and western vicinity of York; at Perth; south along coast to near Pinjarra (Tindale, 1974: 242-243).

The Whadjuk People spoke one of the Noongar languages (dialects). The Noongar language family is classified as belonging to the 'Nyunga Subgroup' and to the Pama-Nyungan Family of Aboriginal languages (Oates and Oates, 1970: xiii). Thieberger (1996) finds eleven languages of the South West: Yuwat, Balardung, Wajuk, Binjarub, Wiilman, Kaniyang, Wardandi, Bibbulman, Minang, Goreng, and Wudjaarri that are today subsumed under the name 'Nyungar.' Drawing upon twenty-five documented sources, Bindon and Chadwick (1992) in their Nyoongar wordlist include variations between these languages, but they are

often differences of pronunciation as recorded by European listeners of the time. Noongar people hear the differences too.

Thieberger (1996) indicates that the Whadjuk were one of eleven languages belonging to the Nyoongah language family. Since the 1930's, the Aboriginal people of the South West began to identify themselves as Nyoongah, the generic term for person ('man').

Antiquity

The Archaeological evidence for Indigenous occupation in the coastal strip from Mandurah through Wanneroo to Yanchep indicates a minimum of some thousands of years of occupation:

> Several hundred artefacts of Eocene fossiliferous chert, a rock known from offshore drill-holes, are exposed in Late Pleistocene and early Holocene archaeological horizons along the lower west coast and offshore islands. Chert artefacts are also known from excavations at Devil's Lair, Tunnel Cave, Arumvale, Quninup Brook, Dunsborough, and Walyunga … fossiliferous chert was quarried from outcrops distributed along now-submerged parts of the coastal plain off the lower west coast; thus most chert artefacts pre-date Mid-Holocene seal-level stabilisation, 6500 years BP (Mulvaney & Kamminga, 1999: 295).

Fossiliferous chert artefacts have been recorded in the Pinjarra area by AIC archaeologists. For the islands offshore from Rockingham:

> The many exhaustive surveys by Charlie Dortch on the islands near Fremantle revealed only a few artefacts of fossiliferous chert, mostly on adjacent Garden Island. All these finds must precede the islands' formation. The few artefacts from Rottnest Island, nineteen kilometres offshore, are older than 7000 years BP (Mulvaney & Kamminga, 1999: 338).

In broader terms:

> detailed observations of Aboriginal life, documenting the enormous variety of plant and animal foods that the local Nyoongar people obtained from many environments … One of the most important Holocene sites in southwestern Australia is Walyunga, 40 kilometres north of the Swan River near Perth … In the early phase, from 8000 to 4500 years BP … in the later phase, which continues after 3200 years BP' (Mulvaney and Kamminga, 1999: 293-294).

There is further evidence of antiquity in the Perth region. In particular:

> The Upper Swan River site near Perth has the distinction of having its age of about 38 000 years old accepted by almost all leading archaeologists … It is an extensive, open-air camp site on an ancient floodplain bordering the upper Swan River between Perth and Walyunga' (Flood, 1995: 106).

While entertaining doubts about those dates of 32,000 to 38,000 years BP – on questions of radiocarbon dating and insufficient details about the artefacts – Mulvaney and Kamminga are satisfied with other dates for the Perth area: 29,000 years BP for Helena Valley and 10,000 years BP for Minim Cove on the Swan River (Mulvaney and Kamminga, 1999: 137-138, 178).

In the Yanchep area some twenty-five kilometres north of Wanneroo, Hallam found that the 'Orchestra Shell' cave in the Aeolian limestone belt, midway between Perth and Yanchep: 'has on its roof slope straight grooves, a single splayed and many meandering snake-like markings … and evidence of fire from about 4,500 B.C. to 200 A.D. (Hallam1975: 83; citing earlier work, 1971).

Putting these dates into perspective, the 'height of the last ice age' came a little before 20, 000 years BPE (Before the Present Era), meaning that around 29,000 years BPE – the Late Pleistocene – the world was gripped in an ice age; figures such as 10,000 BP, 8,000 BP, and 4,500 BP belong to the Holocene or Recent Period, after the last ice age, when the Australian climate became as it is today (Flood, 1983/1995: 28). People occupied the Perth region during much of the Late Pleistocene and throughout the Holocene.

The localities of Yanchep, Wanneroo, Fremantle and Mandurah lie along a coastal strip that is of continued significance to Noongar people. Traditionally, they were points on a route connecting the population centres of the coastal plain:

> A strip of the twenty-mile wide coastal plain stretching north halfway towards the next centre of population in the Moore River-Gingin district, and south halfway towards the concentration around the Serpentine-Murray-Harvey estuaries … Eastward it would stop short of the separate groups in the York-Toodyay area. One wonders, however, whether the aggregation Stirling described did not include the Murray men, the Gingin folk, or even the York people, for these are certainly mentioned from time to time as visiting Perth, or having kin there (Hallam, 1975: 108).

Wanneroo lies on the old north-south communication route connecting Aboriginal groups with others down the coast and inland, including along the Swan River, called the Derbal Yaragan by Noongar people (*der-bal* = an estuary; *yaragan* = river; Bindon & Chadwick, 1992: 43, 187):

> The Warndoolier, nearer to Perth became the Swan and combined downstream with the Dyarlgarro or Canning River; all then flowing as one to the coast to empty into the Derbal Naral, the expanse of sheltered water that includes the whole of Cockburn Sound from Mangles Bay to the northernmost tip of Rottnest Island (Green, 1984: 2)

The Wanneroo area has this broader context.

Contact & Settlement

Settlement History

The Swan River Colony was proclaimed on the 12th August 1829, the year in which Captain James Stirling arrived in the ship *Parmelia*. The city of Perth was named after Perth city in Scotland, which was the birthplace of the Secretary of State George Murray (Aplin, 1987: 452). Rockingham is named after a ship belonging to Thomas Peel that was wrecked on the coast in the area in 1830 (Aplin, 1987:453-454). Garden Island, about five kilometres off Rockingham, received its name from Governor James Stirling probably around 1829 when he offloaded settlers from the HMS *Parmelia* before going on to the mainland and proclaiming the colony (Aplin, 1987: 450). The name of Mandurah has an Aboriginal origin, meaning 'watering place,' or 'meeting place of tribes' (Aplin, 1987: 451). For much of its history, Rottnest about twenty kilometres offshore was a prison island. In 1696 Willem de Vlamingh named Rottnest Island after seeing the nests of Quokkas, small short-tailed wallabies he took for rats (Aplin, 1987: 454). Yanchep comes within the northern boundary of the City of Wanneroo. It was established as a tourist park in 1957. The website for the City of Wanneroo contains the following short history:

> The City Of Wanneroo, with 48 kms of coastline, covers an area of 786 sq kms and has its southern boundary about 16 kms north of central Perth. In the early days of the Swan River Colony, the district represented an "outer" region and it was not until 1834 [five years after settlement of the Swan River Colony] than an excursion into the area by any explorers or settlers is recorded. In that year, a party of four, led by John Butler, travelled about 35 kms north from Perth to search for lost cattle, and passed through the area just east of Lake Joondalup. Four years later, renowned explorer George Grey also made an excursion northwards from Perth and passed along the shores of Lake Joondalup where the township of Wanneroo is now located … The well-watered fertile land around the lakes near Wanneroo, though isolated, presented an attractive prospect. A partnership of Thomas Hester, James Dobbins and John Connoly took up the first holding in the district, around the southern shore of Lake Joondalup, in 1837-38 … Other settlers to land in the area in the 1840's [sic] were William Rogers, Samuel Moore, George Shenton and James Cockman - but the development was confined to a narrow strip of about 2 miles width around the lakes ... There was little development other than farming close to the lakes until 1906, when the Government aquired land on the shores of Lake Joondalup and subdivided it into blocks of 80-100 acres, and also declared it a townsite. Three years earlier, a Road Board, set up under an Act relating to the roads outside municipal districts, was established initially as a road making authority. Its powers grew accordingly and remained in force until the Wanneroo Shire Council was created on July 5th, 1961 (City of Wanneroo, 2002).

Contact History

In the early 1830s, the official Native Interpreter, Francis Armstrong, made population estimates for some of the local Indigenous groups of the Perth coastal plain:

> The total number, including women and children, who are in the habit of visiting Perth, Fremantle, Guildford and Kelmscott, are estimated at nearly 700; of whom the Interpreter can recognise, at sight, 400 at least. He averages a tribe to every ten miles square of country (Armstrong, 1836).

The 'weakening' of these local groups noted by Armstrong appears to have come about from a combination of disease and violence, the latter sometimes described in the oral tradition as 'massacres.' In 1832 whooping cough was prevalent, followed in 1833 by cholera (Green, 1979: 95). Green's table itemising 'Aboriginal and Settler Conflict in Western Australia, 1826-1852' in Green (1979: 75) has the following entries for one year alone, 1833:

> 30th of April Canning John & William Velvick speared at Bull Creek on High Road ... 1st of May Swan Barracks 9 unarmed Aborigines shot at by soldiers. Soldiers shoot 1 Aborigine and take 3 prisoners ... 5th of May Murray A brother of Midgegooroo shot by Hunts posse searching for Yagan ... May Midgegooroo captured along Helena River and executed in Perth ... June Upper Swan Yagan & Heegan shot by Keates brothers. William Keates speared.

Robert Menli Lyon arrived at the Swan River Colony in 1829 and took up land on the Swan River for a short time before leaving the colony in 1834. His description of Aboriginal 'tribal districts' in the region from 1832-1833 is among the first to be documented for the Perth coastal plain (Green, 1979: 141-142). Some of the local groups are acknowledged in present-day nomenclature, for example, 'Beeliar' for a major road running east from the Mitchell Freeway, Murray for the Murray River further south (*see* Attachments II: reproductions of Lyon's map).

Tindale writes that R. M. Lyon (1833) 'when dealing with the people in the immediate vicinity of Perth … recognized groups on a hordal basis … As he considered groups further away where he had less information, he recognized the larger units that are called tribes' (Tindale, 1974: 142). The 'horde' in anthropological usage usually denotes a local group, that is, 'the small group that owned and occupied a certain defined territory.' It was exogamous, that is, marrying out, and a number of hordes together may be called a tribe (Tindale, 1974: 16-17). The use of the word tribe by Armstrong and Lyon in this context appears to refer to the local group. Armstrong's observations were made within eight years after the establishment of the Swan River Colony, so we can be confident that he was reporting on pre-contact Aboriginal culture. Arguably the Noongar families that figure in the present-day in Heritage surveys, as Native Title applicant groups, and local associations or in cultural centres represent equivalents of the local group.

From the beginning, the Swan River and other watercourses were of vital importance to both the new settlers and Indigenous people as a communication route, and to the Indigenous people for whom it exerted strong spiritual significance as well, which value holds today.

> Not only in a general sense, by utilising the same tracts of country, but in a very specific sense, by using the same network of nodes (at water sources) linked by tracks, the European pattern of land use was based on (and modified) the Aboriginal pattern (Hallam, 1975: 67).

J. E. Hammond uses a metaphor from the cattle industry by calling them 'pads':

> All through the South-West there were pads of natives, like cattle pads, and just as plain … If you take the present site of Perth as the starting point you will find that one pad led along the north bank of the river to where North Fremantle is

> to-day. There was very shallow water for more than halfway across the river and only a short distance to swim. The pad continued from this crossing to Bibra Lake, and through Rockingham to Mandurah, and then pads led up both sides of the Murray River to the ford over the river, above the present site of Pinjarra. It was at this ford that the battle of Pinjarra was fought (Hammond, 1933/1980: 17, 19).

Hammond wrote about Aboriginal-European rapprochement when his parents moved to Pinjarra to live in 1863: 'At this period all fear of natives had passed away and good friendship had been established' (Hammond 1933/1980: 11). But before then the settlers' activities severely restricted Indigenous movement and disrupted their traditional fishing areas, to the extent that early hostilities and shootings soon became commonplace. In 1833, two Aboriginal men were shot by firing squad, and in 1834 the South Perth mill was attacked (Green, 1984: 92).

Wanneroo & Yanchep Territory

Lyon's map, reproduced in Green (1984: 50), locates traditional Indigenous country taking in the Wanneroo and Yanchep areas as: 'Mooro, Yellowgonga's Territory.' In a chapter titled 'Yellagonga's Territory,' Neville Green asserts that:

> Yellagonga's territorial boundaries were the Indian Ocean to the west, Melville water and the Swan River to the south, Ellen's Brook to the east, and to the north Gyngoorda which is probably the Moore River (Green, 1984: 49).

Green is evidently paraphrasing Lyon, including the *Gyngoorda* reference that is glossed also as the Moore River by Hallam and Tilbrook. Hallam and Tilbrook write that:

> Yellowgonga headed the group which ranged over a wide area bounded on the west by the sea, on the southwest by the estuary of the Swan River, on the east by the swan from Perth northwards towards Guildford, and relatively indeterminate on the north … the focal area of the group's resources lay along the ridge where the city centre of Perth now stands …. Lyon saw YELLOWGONGA as an important peacemaker (Hallam and Tilbrook, 1990: 349-350).

Yellowgonga is one of several notable Aboriginal family leaders (such as Midgegooroo, Munday and Yagan) with whom Armstrong, Lyons and other colonial figures had dealings in the 1830s. Daisy Bates records him as the father of her key informant Joobaitch:

> There was Joobaitch of the kangaroo of Perth, a *Wordungmat* or crow-man, who had been born in Stirling's time, and was the son of that Yalgunga who ceded his spring on the banks of the Swan to Lieutenant Irwin (Bates, 2004: 64).

Yalgunga is also noted under the spelling of 'Yalgoonga' as Ya'-gan's brother (Bates, cited in Carter & Nutter, 2005: 22). However, Hallam and Tilbrook (1990: 349) observe that Bates provides no source for this knowledge. Armstrong records Yellowgonga as frequently visiting the ration depot stationed below Mount Eliza between 1836 and 1837 (Hallam and Tilbrook, 1990: 353), and in 1837 a man identified by Moore as Yellowgonga was said to have died from multiple spearing and to have received a large funeral. But an obituary in

1843 ascribed Yellowgonga's death to drowning after falling from the river bank (Hallam and Tilbrook, 1990: 353-354).

Continuities of the Sacred

The Rainbow Snake

The Swan River, the Canning River and their tributaries, as well as the Murray River further south, the Moore River to the north and the strings of coastal lakes interconnected through the water table, are regarded as sacred to the Rainbow Serpent, the *Wagyl*, by present-day Noongars. Belief in the Rainbow Snake as a creative Dreamtime being is widespread in Aboriginal Australia.

Sylvia Hallam points to the rich complex of associations between the *Wagyl* (which is the name of the Rainbow Serpent in the Noongar South West) and the chief physical elements of nature - fire, water, the sky, the earth - saying that, 'the connection of the serpent with water and also with dark caverns, are themes seen as recurring within and without the South-west of Australia' (Hallam, 1975:82). Descriptions of the Rainbow Serpent have a common core of beliefs about its qualities. It dwells deep within watercourses, waterholes, rivers and rock pools, and maintains the quantity and the quality of the drinking water. If a site closely associated with the Rainbow Snake is desecrated in any manner - and that includes virtually all places where there is water in significant quantities or, in arid areas, water courses albeit dry for most of the year - the persons responsible are in literal physical danger and the land itself is depleted, for the Rainbow Snake will go away.

Dreaming Tracks & Stories

The waterways are interconnected too with the Dreaming tracks of other beings. Dreaming tracks – sometimes called story lines – have been identified throughout the South West. A story line, as the term implies, usually concerns one or more creative spirit ancestor (and other human and non-human beings) that travelled across the landscape. During those travels, the ancestral spirits had encounters with one another and created land features such as the river systems, waterholes, hills and other natural features. The Dreaming story as told by Ken Colbung (dec) of the fight between Shark and Crocodile in Cockburn Sound: 'leaving the marks of their great battle in the landscape' (Colbung in Hill, 2006: 10-13) is a case in point. That tale with other characters (Whale, Waugal, Bush Turkey, Kangaroo, Emu) extends up the coast to the Yanchep area and on to the north (*see* below).

In Aboriginal Australia, a story line or Dreaming track often passes through the territories of local groups that together comprise 'tribes' or language groups, and is not known in its entirety by the people of any one place – except perhaps by knowledgeable senior men. The known 'episode' 'belongs' to one elder or more who reserve the right to tell/sing the story. Episodes of a longer story are shared during group meetings (connected with Law, ceremonial and ritual) during which one elder after another will sing/recite the part of the story that is their right. This means that although individuals may have a good knowledge of an episode, several episodes, or even a whole Dreaming story, they are not entitled to tell it to another without permission and formal performance because they do not 'own' it. This would have applied in the instances recorded by Daisy Bates.

The sea too has significance to Indigenous people. Daisy Bates notes that:

> The Aborigines along the whole line of Western coast believe that when the body dies, the spirit goes away westward through the sea to some country far away, 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* of spirit went away over the sea to another country, called Koorannup or Woordanung (Bates, 1985: 222).

The Wanneroo area should be seen in a wider context as not only part of nearby stretches of coastline north and south or with the river and lake systems such as that of the Swan and lakes Joondalup and Neerabub (Neerabup), but also as associated intrinsically with the sea and the seabed. Cockburn and other Indigenous centres lie on the east-west route between the world of the living and that of the dead. In 'Legend of the Christmas Bush,' Daisy Bates writes:

> A winding tribal road lay from their kalleep (home, ground) to the sea's edge and all along the ground under the sea to a point on the Kurannup shore where the spirits of their people who had preceded them lived and dwelt under the same conditions as they had lived in their earthly kalleep, except that all their Kurannup people were white (Bates, 1992:153; my emphasis).

According to Bates's interpretation, Dreaming tracks in the mythology about an afterlife literally cross the seabed.

A Dreaming story, summarised by Moore, recounts how the islands were cut off from the mainland by the sea:

> The natives have a tradition that Rottnest, Carnac, and Garden Island, once formed part of the mainland, and that the intervening ground was thickly covered with trees; which took fire in some unaccountable way, and burned with such intensity that the ground split asunder with a great noise, and the sea rushed in between, cutting off these islands from the mainland (Moore, 1884: 8, cited in Hallam, 1975:112).

In this creation tale, Hallam suggests the 'echo' of rising sea levels that took place around 5000 years ago (ibid.). But Mulvaney and Kamminga, while finding the Rottnest Island story 'intriguing' and 'attractive to prehistorians,' are sceptical about whether such creation myths can be taken as 'factual records of environmental changes' hundreds of generations back. They imply that oral traditions are closer to the present day, their purpose being to instruct younger generations (Mulvaney and Kamminga, 1999: 121).

One can add that to the storytellers and their listeners such accounts may be received as fact. Dreaming stories are an integral part of the Indigenous belief system about the nature of the world and of existence. What these examples tell us is that, as well as the sea westwards being associated with the Land of the Dead, Dreaming tracks extend to the offshore islands. According to Green's map showing 'Place names and territories as told to Robert Lyon by Yagan in 1832,' Garden Island was called Meeandip, Carnac Island

Ngooloormayup, Rottnest Island Wadjemup, and Fremantle Walyalup (Green, 1984: 50). (*See* Plate 1).

Present-day Noongar oral history confirms the importance of the coast, the sea and the islands. Several Noongar elders recount Dreaming stories for the coast from Fremantle to Yanchep. In one version Crocodile, Shark and Whale encountered one another. Their fighting altered different parts of the landscape. Whale is associated with sand dunes at Leighton Beach. Shark and Crocodile fought in Coburn Sound until the Creation Snake 'Waugal' intervened. Crocodile on Waugal's advice travelled to Yanchep where he metamorphosed into Emu (Waitj). (Colbung in Hill, 2006:10-13). In another Dreaming story, a fight between Crocodile and Waugal broke up the land and created Rottnest, Garden and Carnac islands (Wilkes in Hill, 2006: 14-15). The Waugal is regarded as having created the sand dunes that follow the coast, as for all land features:

> The Waugal created the water systems, the rivers, the swamps, the soaks and springs and the big body of water that lies under the ground. These were created to keep the swamps and springs and waterholes wet during the dry part of the year. During the wet season the rains falling around York, Toodyay, Northam and the other places further up in the wheat belt comes back into the Swan River plain and replenishes the underground water which then keeps the springs, soaks, wetlands and waterholes going in the metropolitan area (Albert Corunna in Hill, 2006: 18).

Concerning lakes and caves in the coastal zone that takes in Wanneroo, Yanchep and other nearby areas, there is additional evidence from European observers for their importance in other examples, cited by Hallam. In the first decades of European settlement the lakes and swamps of the coastal plain were heavily exploited as food sources by the local Aboriginal people:

> Grey adds to the products of the full and late summer to early autumn several which would take the Aborigines regularly to the lakes and swamps which occur in lines through the inter-dunal valleys of the Aeolian limestone belt, and behind in the sandplain zone. Freshwater tortoises were in high season in December and January when the lakes had shrunk. Fish abounded. Large flocks of waterfowl were skilfully felled with throwing sticks or spears – Lake Neerabub was 'covered with wildfowl' at this season. Frogs and 'freshwater shellfish' from the size of 'a prawn to a large crayfish' (Grey here intends crustaceans, not molluscs) were most easily taken 'when the swamps are nearly dried up …' (Grey 1841:I, 292-7). (Hallam, 1975:39).

In regard to Indigenous spiritual beliefs, Hallam states that: 'For the area around Perth Landor recounts tales of two spirits, one associated specifically with the pools and limestone caverns of the Yanchep area' (Hallam, 1975: 83).

> Beside *Chingi*, the evil spirit who haunts the woods, there is another in the shape of an immense serpent, called *Waugal*, that inhabits solitary pools … One day, whilst bivouacking in a lonely and romantic spot, in a valley of rocks, or Abode of Dogs, I desired a native to lead my horse to a pool, and let him drink.

> The man, however, declined with terror (Landor, 1847: 210-211; cited in Hallam, ibid.).

Another citation comes from George Grey reporting for December 1838. It corroborates (and predates) the first:

> I left the main party with two natives, and travelled up a swampy valley, running nearly in the same line as the chain of lakes we had followed in going [north]. The natives insisted on it, that these lakes were all one and the same water; and when, to prove to the contrary, I pointed to a hill running across the valley, they took me to a spot in it, called Yun-de-lup, where there was a limestone cave, on entering which I saw, about ten feet below the level of the bottom of the valley, a stream of water running strong from S. to N. in a channel worn through the limestone. There were several other remarkable caves about here, one of which was called Doorda Mya, or the Dog's house (Grey, 1841: I, 308-309).

Contemporary Context

The Wanneroo area was widely used in pre-contact times and in the immediate years following contact. The Dreaming stories associated with the many natural features of the coast from Mandurah to Yanchep are highly significant and the subject of the struggle to protect and preserve Noongar heritage.

Spiritual connections are just as important now as they were in the past, Noongar people today maintain connection to the Wanneroo area, as well as for many other areas in the Perth Coastal Plain. They continue to hunt and gather bush food, continue to pass on knowledge to the younger generations, and continue to revisit certain locales for spiritual refreshment and to look after the land.

There are continuing associations between Noongar families and the areas where they have lived for generations, as well as their homelands. They still consider waterways as highly significant, continue to pass on cultural knowledge to the younger generations maintain cultural practices.

Mariginiup

This suburb is named after Mariginiup Lake. The lake name was recorded by surveyors in 1844, and in 1904 a townsite was declared here. This Aboriginal name is said to possibly mean "to pull out flag leaved flax". It was named as a locality in 1982 (Landgate).

Plate 1: Robert Lyon's Map with Place Names given by Yagan to Lyon in 1832 (*see* Green, *Broken Spears*, 1984: 50).

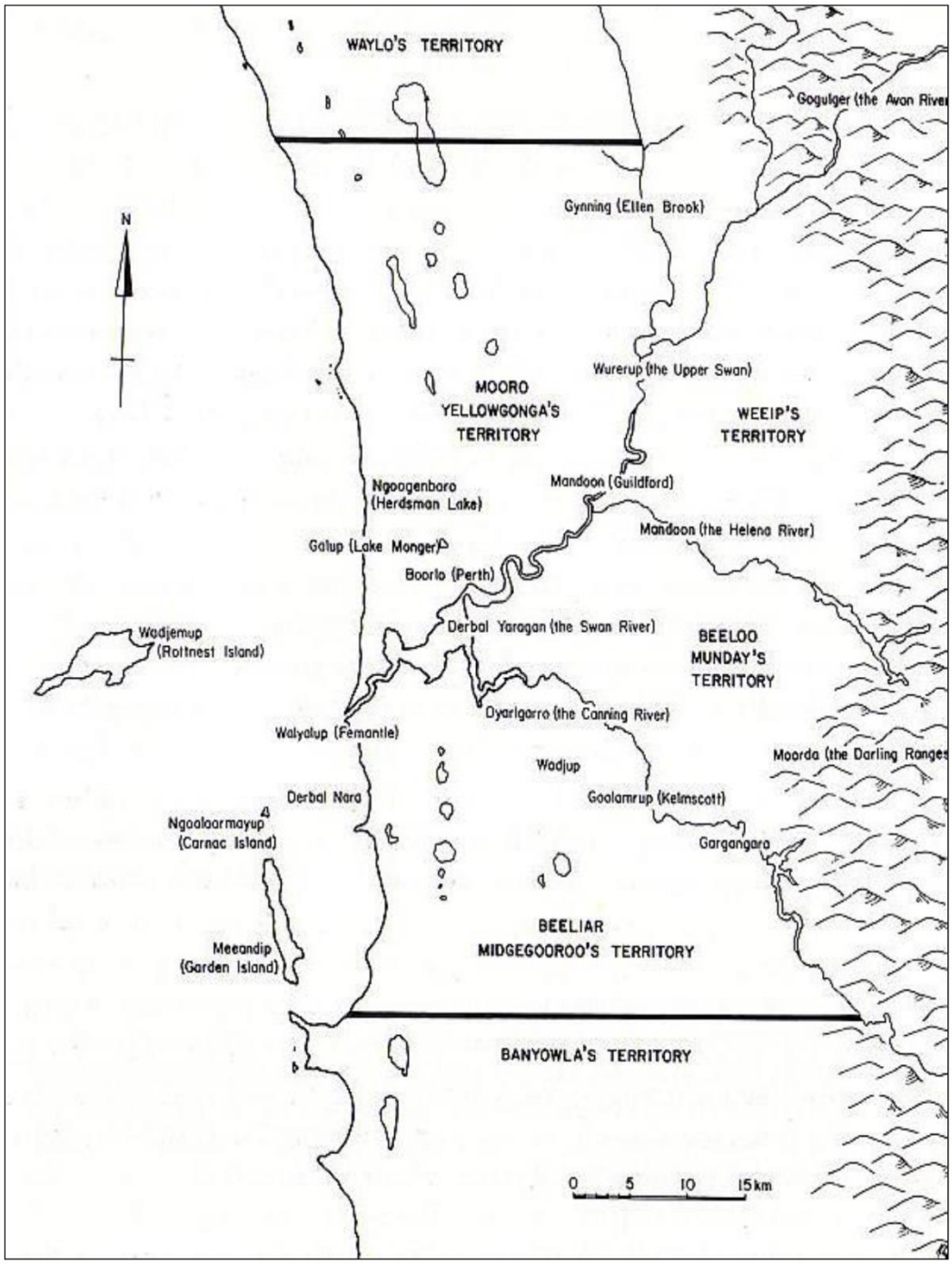
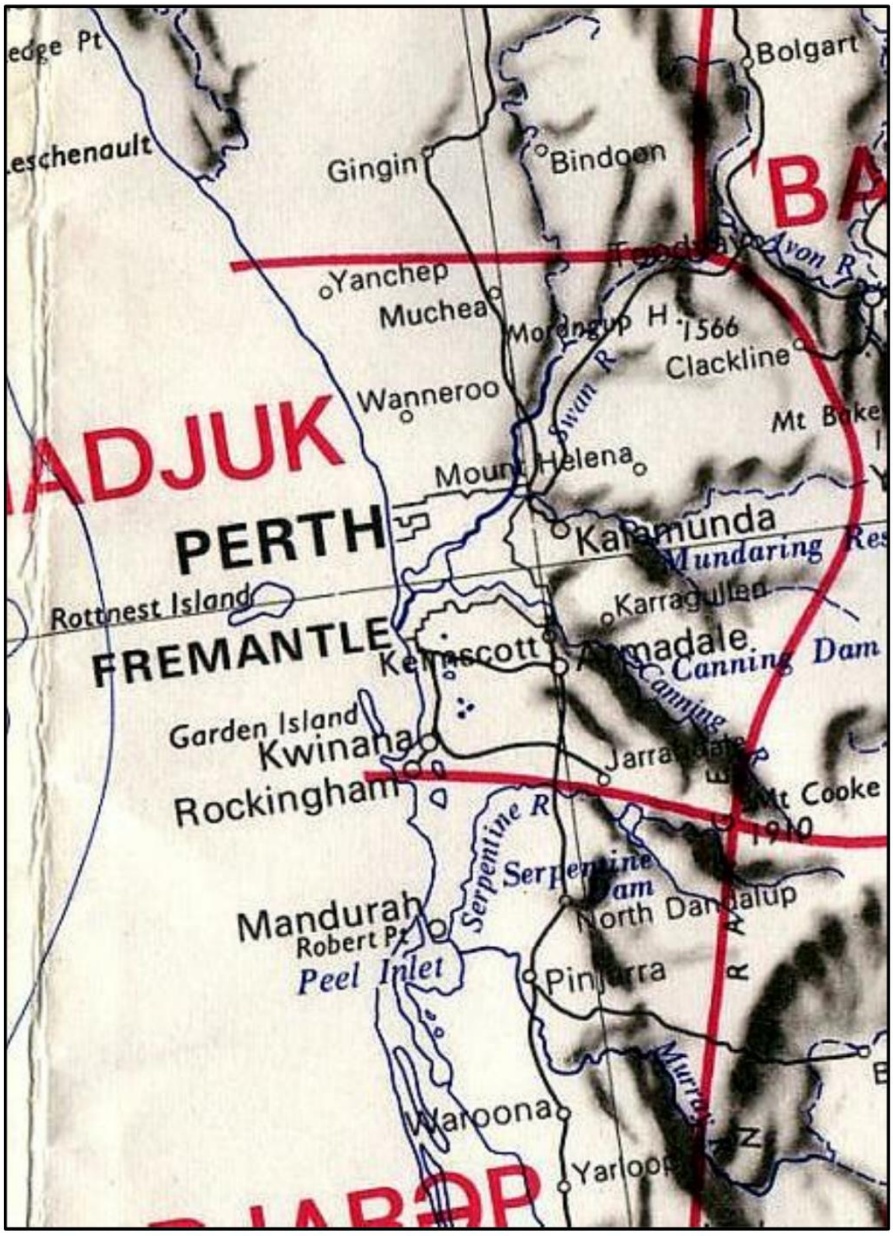


Plate 2: Tindale: The Swan Coastal Plain



6 ARCHAEOLOGICAL BACKGROUND

The increased rate of urbanisation in the Perth metropolitan area has resulted in substantial disturbance to original environmental contexts. This directly affects the likelihood of locating further intact surface archaeological material. Despite this, an indication of potential Aboriginal heritage within the vicinity of development may be derived from examining the original environmental context and ascertaining what sites have previously been reported from such land units, as well as what has been reported by previous research conducted in the surrounding area.

The primary source of archaeological information for Perth and the surrounding areas comes from the Perth Archaeological Survey undertaken by Hallam in the 1970s which covered a section of Perth from the coast to the Darling Scarp (Hallam 1986). Over 380 sites were located and the survey remains the most extensive research yet undertaken for the area.

The survey attempted to explain the variations in occupation patterns of pre-contact Aboriginal groups. Four phases of usage were suggested for the plain:

- **Early**: low numbers of sites with artefacts including steep scrapers and the use of Eocene fossiliferous chert. This period extended from the Pleistocene to 5,000 years BP.
- **Middle**: from 5,000 BP to 500 years ago. Sites usually found close to permanent water. Artefacts are made of quartz and chert and include backed blades, adzes, scrapers and flakes.
- **Late**: from 500 years ago. Sites cluster on the coastal plain. Bipolar cores and artefacts manufactured on quartz dominate assemblages.
- **Historic**: from 1829 onwards. Assemblages include artefacts made on post-contact material such as glass, pottery and ceramics.

The study suggested some initial patterning of site locations in the metropolitan area. Few sites were found on the coastal dunes or in the limestones west of the Spearwood Dunes. The majority of sites were found on elevated dunes or sandy ridges near the margins of creeks, swamps and wetlands associated with the Bassendean Sands. The wealth of natural resources associated with these environments was the focus of seasonal attention. Most sites were surface scatters of artefacts (commonly made of quartz), usually found in open sands near water sources.

Strawbridge (1988:34) developed a model of occupation for the Swan Coastal Plain on the basis of this research, which indicated that:

- Archaeological sites are likely to be situated on sandy well-drained dune ridges (the Bassendean Sands or thin Bassendean Sands over Guildford Formation);
- Archaeological sites are likely to be found within 350 m of a potential water source;

- Archaeological sites are unlikely to be located in low-lying, poorly drained or seasonally inundated areas; and
- Archaeological sites are unlikely to be located more than 350 m away from a potential water source.

The lakes and wetlands of the Swan Coastal Plain and the Swan River itself clearly provided an abundant supply of food and resources for the Noongar people. The records of the early settlers (Hammond 1933; Grey 1841) indicate that the chain of lakes which extended from Geraldton to Mandurah formed a major highway of movement for people along which a rich social and ceremonial life was enacted at the appropriate time of year.

Although few sites in the metropolitan area have been dated, most of them are located in the Swan Valley and Darling Scarp area (Walyunga, Helena Valley, and Brigadoon). Dates of between 32,000 and 38, 000 years BP have been claimed for terraces on the Upper Swan River (Pearce and Barbetti 1981). A date of 9,930 years BP was obtained from Minim Cove on the Swan River (Clarke and Dortch 1977). More recent mid to late Holocene dates with a range of 6,000-1,000 years BP, have also been derived from the Bassendean Sands (Pearce 1977).

7 ABORIGINAL CULTURAL HERITAGE INQUIRY SYSTEM RESEARCH

A search of the Department of Planning, Lands and Heritage (DPLH) online Directory of Aboriginal Places; the Aboriginal Cultural Heritage Inquiry System (ACHIS) was conducted on the 19th of July, 2023. This search was used to provide contextual Aboriginal heritage information for inclusion and evaluation within the LSP desktop assessment area.

The research determined both the ethnographic and archaeological Aboriginal places within the project area and the nature and frequency of Aboriginal heritage surveys undertaken. In turn, the potential impact of the LSP upon these places and the likelihood of identifying additional places, values and heritage issues were assessed in preparation of this desktop research.

7.1 DPLH Aboriginal Cultural Heritage Inquiry System Results

Terminology

Access and Restrictions:
Boundary Reliable (Yes/No): Indicates whether the location and extent of the ACH boundary is considered reliable.
Boundary Restricted = No: ACH location is shown as accurately as the information submitted allows.
Boundary Restricted = Yes: To preserve confidentiality the exact location and extent of the place is not displayed on the map. However, the shaded region (generally with an area of at least 4km²) provides a general indication of where the ACH is located.
Culturally Sensitive = No: Availability of information that the Department of Planning, Lands and Heritage holds in relation to the ACH is not restricted in any way.
Culturally Sensitive = Yes: Some of the information that the Department of Planning, Lands and Heritage holds in relation to the ACH is restricted if it is considered culturally sensitive information. This information will only be made available if the Department of Planning, Lands and Heritage receives written approval from the people who provided the information.
Culturally Sensitive Nature:

- **No Gender / Initiation Restrictions:** *Anyone* can view the information.
- **Men only:** Only *males* can view restricted information.
- **Women only:** Only *females* can view restricted information.

Status:
· **ACH Directory**: Aboriginal cultural heritage place or cultural landscape.
· **Pending**: Aboriginal cultural heritage place or cultural landscape with information in a verification stage.
· **Historic**: Aboriginal heritage places determined to not meet the criteria of Section 5 of the Aboriginal Heritage Act 1972. Includes places that no longer exist as a result of land use activities with existing approvals.

ACH Type:
· **Cultural Landscape:** a group of areas interconnected through the tangible elements of Aboriginal culture heritage present.
· **Place**: an area in which tangible elements of Aboriginal cultural heritage are present.

Place Type: The type of Aboriginal cultural heritage place. For example, an artefact scatter place or engravings place.

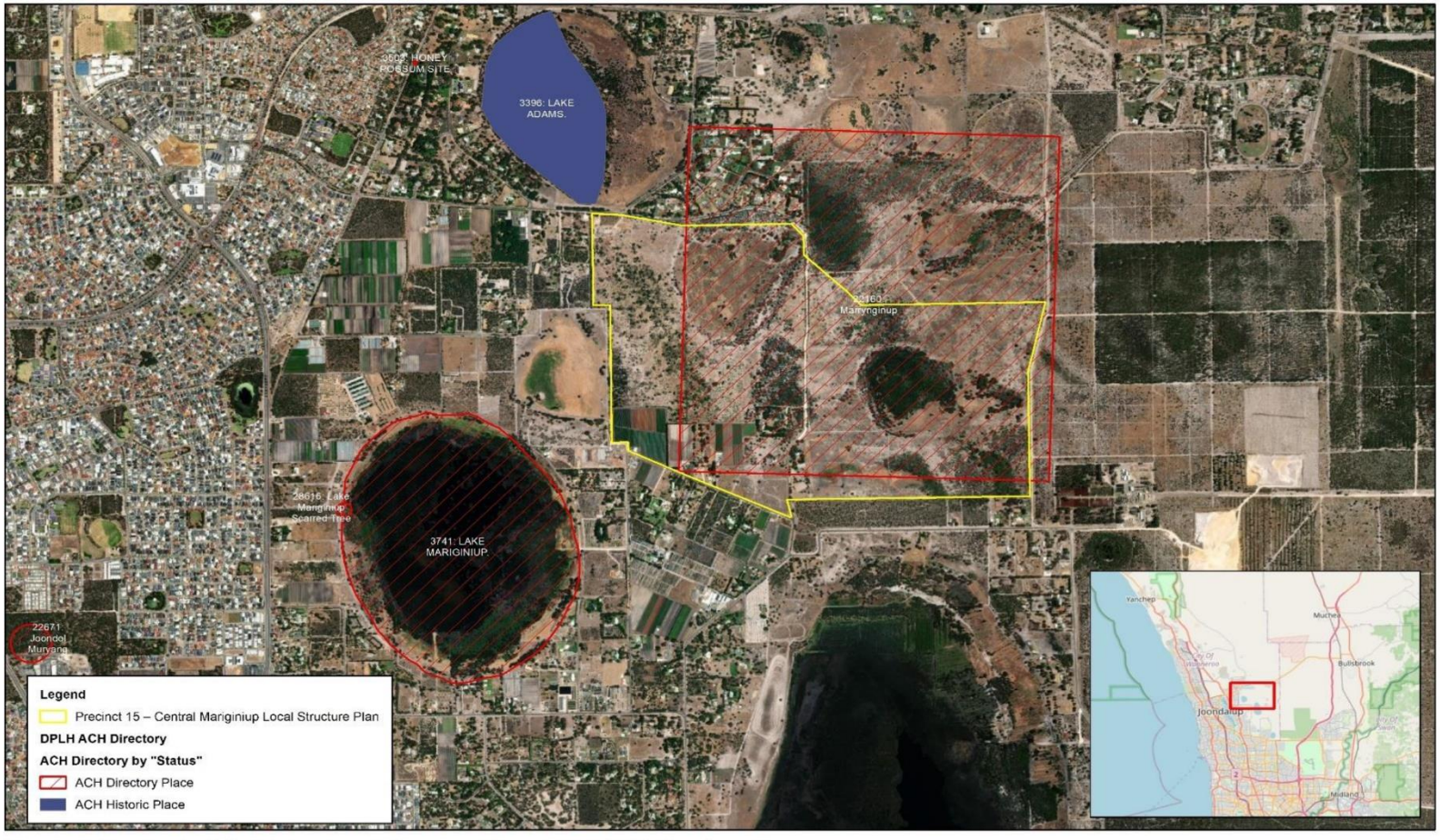
Legacy Place Status: A status determined under the previous *Aboriginal Heritage Act 1972*:
· **Registered Site:** the place was assessed as meeting Section 5 of the *Aboriginal Heritage Act 1972.*
· **Lodged:** Information was received in relation to the place, but an assessment was not completed to determine if it met section 5 of the *Aboriginal Heritage Act 1972.*
· **Stored Data/Not a Site:** The place was assessed as not meeting Section 5 of the *Aboriginal Heritage Act 1972.*

Legacy ID: This is the former unique number that the former Department of Aboriginal Sites assigned to the place.

There is one Place identified on the DPLH ACHIS (see Section 11) as potentially being located within the Precinct 15 Central Mariginiup LSP desktop assessment area. 22160 Marrynginup has a large, closed polygon which restricts publicly displaying its reliable location and place boundary (see Map 4). Esandra Colbung (site custodian) gave Horizon Heritage permission to access and reveal the actual site boundary as administered under the ACHA for 22160 Marrynginup (see Maps 5 & 6).

The location of places on the ACHIS is sometimes unreliable. Many places were originally located prior to the availability of Global Positioning Systems. Conversion from imperial to metric mapping coordinates and the recording of coordinates via map grid to the nearest kilometre has introduced further possibilities for error. Also, human error with inputting or converting data accurately is another risk.

Map 5: 22160 Marrynginup restricted location boundary intersecting LSP area



DPLH ACH Directory Places

The eight ACH Directory (Aboriginal cultural heritage place or cultural landscape) Places detailed below have been chosen for inclusion in this desktop to demonstrate that important Aboriginal cultural places, features, and materials are still found within heavily developed and urbanised residential areas.

The following eight ACH Directory Places are located within proximity to the Precinct 15 Central Mariginiup LSP desktop assessment area:

Table 3: DPLH ACH Directory Places within proximity to the LSP desktop assessment area

DPLH PLACE ID	PLACE NAME	PLACE TYPE	STATUS	LOCATION
3741	Lake Mariginiup	Mythological, Hunting Place	ACH Directory	387858mE 6489483mN [Reliable]
3503	Honey Possum Site	Mythological	ACH Directory	387422mE 6493112mN [Reliable]
3657	Wanneroo Scarred Tree	Modified Tree, Other:	ACH Directory	386149mE 6486487mN [Reliable]
3316	Lake Joondalup West	Artefacts / Scatter	ACH Directory	383972mE 6488885mN [Reliable]
3740	Lake Joondalup	Mythological, Camp, Hunting Place	ACH Directory	384995mE 6486531mN [Reliable]
3532	Joondalup Caves	Mythological	ACH Directory	Not available when location is restricted
17498	Waugal Cave, Neil Hawkins Park	Modified Tree, Mythological, Water Source, Other: Cave	ACH Directory	384284mE 6487403mN [Reliable]
28616	Lake Mariginiup Scarred Tree	Modified Tree	ACH Directory	387238mE 6489695mN Zone 50 [Reliable]

3741 Lake Mariginiup

3741 Lake Mariginiup is protected under the ACHA. The ACHIS lists the place type as Mythological and Hunting Place. Wetlands across the Swan Coastal Plain are spiritually significant to the Whadjuk Noongar People as Waugal connections and were used extensively in traditional times. Many lakes and swamps were used as hunting (turtle and wildfowl) and gathering areas for flora and fauna.

Lake Mariginiup has mythological (*Waugal* association) and shows connection to the subterranean Gnangara mound. Lake Mariginiup was formed by the creative activities of the *Waugal* whose spiritual essence still exists there. The significance of water to Whadjuk Noongar People has been well documented in heritage surveys in the Perth Metropolitan area and broader south-west region, with numerous rivers (and often their tributaries), creeks, brooks, wetlands and swamps having been recorded as sites. Lake Mariginiup is a significant mythological, landscape and camping area to the Whadjuk Noongar People.

3503 Honey Possum Site

3503 Honey Possum Site is protected under the ACHA. The ACHIS lists the place type as Mythological. The site is a mythological storied place regarding the Honey Possum (noolbenger) a tiny marsupial and associated with the banksia vegetation (10 hectares) where it lives.

3657 Wanneroo Scarred Tree

3657 Wanneroo Scarred Tree is protected under the ACHA. The ACHIS lists the place as a Modified Tree. The Wanneroo Scarred Tree is a Jarrah tree with two scars near its base. There was doubt as to whether the scars are from Aboriginal or non-Aboringal origin.

3316 Lake Joondalup West

3316 Lake Joondalup West is protected under the ACHA. The ACHIS lists the place type as an Artefact Scatter. It was recorded by S Hallam in 1973 while undertaking the Swan Area Archaeological Survey. A total sample (salvage) of all 18 artefacts was undertake at the time of recording, with the majority comprising quartz. Gary Quartermaine investigated the site in 1989 and reported 17 artefacts noted within 25 m of the lake shore and that they were likely uncovered by erosion since Hallam's collection from the site. Thus, the site has some potential for sub-surface cultural material.

3740 Lake Joondalup

3740 Lake Joondalup is protected under the ACHA. The ACHIS lists the place type as Mythological, Camp and Hunting Place. Lake Joondalup is a permanent lake in the northern suburb of Joondalup in Perth. It is known to have been a favoured Noongar camping area in traditional and more recent times. It was also a resource area where turtle and wildfowl were hunted.

Lake Joondalup was formed by the creative activities of the *Waugal* whose spiritual essence still exists there. The significance of water to Whadjuk Noongar People has been well documented in heritage surveys in the Perth Metropolitan area and broader south-west

region, with numerous rivers (and often their tributaries), creeks, brooks, wetlands and swamps having been recorded as sites. Lake Joondalup is a significant mythological, landscape and camping area to the Whadjuk Noongar People.

The area around Lake Joondalup was called Joondal (crayfish) and the area was a significant place mainly because there was plenty of food and covering for winter. A Noongar story is also associated with Malup Island within Lake Joondalup.

3532 Joondalup Caves

3532 Joondalup Caves is protected under the ACHA. The ACHIS lists the place type as Mythological. The caves lie 80 m west of Lake Joondalup and are believed to be the result of the Waugal and could connect to the ocean. The caves are within the Yellagona Regional Park. It was speculated that the deposit in the cave floor may contain cultural material.

17498 Waugal Cave, Neil Hawkins Park

17498 Waugal Cave, Neil Hawkins Park is protected under the ACHA. The ACHIS lists the place type as Mythological, Modified Tree, Water Source and Other: Cave. The cave is believed to be the result of the Waugal and could connect to the ocean.

28616 Lake Mariginiup Scarred Tree

28616 Lake Mariginiup Scarred Tree is protected under the ACHA. The ACHIS lists the place type as Modified Tree. The tree is an old eucalypt tree with an oval shaped scar on the trunk. The Aboriginal representatives present requested the tree be recorded although the archaeologists had doubts to its origin.

DPLH Historic Places

The following two Historic (Aboriginal heritage places determined to not meet the criteria of Section 5 of the Aboriginal Heritage Act 1972. Includes places that no longer exist because of land use activities with existing approvals) Places detailed below have been chosen for inclusion in this desktop to demonstrate that important Aboriginal cultural places, features and materials are still found within heavily developed and urbanised residential areas.

The following two Historic Places are located within a reasonable proximity to the Central Mariginiup LSP desktop assessment area:

Table 4: DPLH Historic Places within proximity to the LSP desktop assessment area

DPLH ID	PLACE NAME	PLACE TYPE	STATUS	LOCATION
3396	Lake Adams	Mythological, Hunting Place, Plant Resource, Water Source	Historic Stored Data / Not A Site	388348mE 6492052mN Zone 50 [Unreliable]

3514	Payne Road	Artefacts / Scatter	Historic Stored Data / Not A Site	395439mE 6491349mN [Reliable]

3396 Lake Adams

3396 Lake Adams is a historic place under the ACHA. It was assessed under Section 5 of the old AHA and had a status as Stored Data / Not a Site. The ACHIS lists the place type as Mythological, Hunting Place, Plant Resource and Water Source. Lake Adams is associated with the Black Cockatoo Dreaming and was reported to have a plentiful supply of turtles and other fauna and flora resources.

3514 Payne Road

3514 Payne Road is a historic place under the ACHA. It was assessed under Section 5 of the old AHA and had a status as Stored Data / Not a Site. This place was a small low density quartz artefact scatter situated on the margins of a small swamp area within the Gnangara Pine Plantation. The site dimensions are 20 x 40 m with only 3 quartz artefacts recorded. The site did have some potential for sub-surface cultural material.

DPLH Heritage Survey Reports:

No specific Aboriginal heritage surveys have been undertaken within the Precinct 15 Central Mariginiup LSP desktop assessment area. There are three heritage survey reports lodged with the DPLH which are considered relevant to the LPS desktop assessment area and are detailed below:

Table 5: DPLH Heritage Survey Reports

DPLH HSR ID	REPORT TITLE	AUTHOR
102670	Preliminary Report on the Survey of Aboriginal Areas of Significance in the Perth Metropolitan and Murray River Regions.	O'Connor, R., Bodney, C. and Little, L
104379	Final Report on the Project: Prehistoric Aboriginal Populations on the Swan Coastal Plain, WA.	Hallam, S. J
104505	Aboriginal Sites in the Perth Metropolitan Area: a Management Scheme.	Strawbridge, L

DPLH HSR 102670

O'Connor, R., Bodney, C. and Little, L. 1985 *Preliminary Report on the Survey of Aboriginal Areas of Significance in the Perth Metropolitan and Murray River Regions*. Unpublished report for the Department of Aboriginal Sites.

This report was part of a project to produce a management plan concerning Aboriginal sites in the Perth metropolitan region. The project involved an analysis of the existing body of archaeological data by Strawbridge (HSR 104505) and this report, which outlined the ethnographic survey. The ethnographic component discussed significant sites in terms of

their importance to Aboriginal groups today and/or their potential contribution to an understanding of Aboriginal culture. The aim of the project was to provide guidelines for development in the belief that aims of development and conservation of Aboriginal sites (archaeological and ethnographic) need not be directly opposed. This report discusses the mythology and significance of DPLH 3692 Bennett Brook: in toto and DPLH 3840 Bennett Brook: Camp Area, as well as details the location of DPLH 3744 Marshalls Paddock. It is closed due to the sensitive information contained about these and other ceremonial and mythological sites in the Perth metropolitan region.

DPLH HSR 104379

Hallam, S. J. 1986. *Final Report on the Project: Prehistoric Aboriginal Populations on the Swan Coastal Plain, WA*. Unpublished report for Australian Research Grants Scheme.

This study was funded under the Australian Research Grants Scheme. The objective of the study was to examine patterns of Aboriginal occupancy of the Swan River area 'as successive states within an ongoing system' (1986: 1) in particular, relating population to resources. To this end, rather than utilising a site-centred approach, patterns of occupancy over wide areas and their changes over time were emphasised. Based on lithological and typological criteria, Hallam divided the phases into four: Early, Middle, Late and Final. The Early phase was characterised by the presence of bryozoan chert marking a time before sea levels rose to their current levels (approximately 5,000 years ago). The Middle phase was determined by the presence of backed-blades which led to the Late phase marked by numerous, quartz-rich assemblages featuring all the technological characteristics. The Final phase is represented by the use of European materials such as glass and ceramic. As a result of the study, Hallam concluded that the coastal plain is 'extremely rich in sites' with the bulk of sites located around the lakes and swamps of the coastal sand plain. Environmental change over time impacted upon occupancy patterns in each phase.

DPLH HSR 104505

Strawbridge, L. 1988 *Aboriginal Sites in the Perth Metropolitan Area: a Management Scheme*. Unpublished report for the Department of Aboriginal Sites.

This report consists of the archaeological component of a study of the Aboriginal sites in the Perth Metropolitan area (the ethnographic component is O'Connor, *et. al.* 1985). The predictive model resulting from this study demonstrated that sites in the Perth area were most commonly located on sandy and well-drained dunes located on the Bassendean Sands, within approximately 350 m of water sources. Following a review of research on the Swan Coastal Plain, Strawbridge (1988) proposed a series of archaeological research questions relating to themes of site formation processes, site distribution and environmental changes, and changes in stone tool technology.

7.2 Summary Discussion

No Aboriginal heritage surveys have been conducted within the Precinct 15 Central Mariginiup LSP desktop assessment area. Numerous heritage surveys have been undertaken within the broader City of Wanneroo. The increased rate of urbanisation in the Perth area and connected developments has resulted in great disturbance to the original

environmental contexts. This directly affects the likelihood of locating further surface Aboriginal cultural material (archaeological). The natural environment has been heavily disturbed with vegetation clearing and the development of the broader City of Wanneroo area.

Despite this, an indication of potential Aboriginal heritage within the LSP area may be derived from looking at the local environment and ascertaining what sites have previously been reported from such land units, as well as what previous research conducted in the surrounding area has reported.

The rivers, pools and wetlands were a consistent source of food and water which also often linked campsites along walking tracks and places of mythological and spiritual significance. In the South West of Western Australia the Rainbow Serpent or *Waugal* is central to Noongar cultural beliefs. Noongars believe that the *Waugal* is both a creative force, shaping the landscape during *Nyittiny* (creation times) and a retributive force having the ability to harm, particularly against those who offend it by not carrying out their cultural responsibilities in protecting country, especially water sources. Creation time stories remain in the oral tradition of many Whadjuk Noongar families. It is these set of associations that concern contemporary Whadjuk Noongar people.

Lake Mariginiup (3741) as a natural feature, water source and mythological associations with the *Waugal* makes it a highly significant place. Its maintenance and protection is vital to help preserve Whadjuk cultural heritage values. The rivers, pools and wetland areas of the Perth metropolitan area was part of an extensive communication network that linked Aboriginal groups across the Swan Coastal Plain with other Noongar groups to the north (Yued), south (Gnaala Karla Boodja) and east (Ballardong).

Whadjuk Noongar people have concerns that their culture cannot continue if the natural environment is destroyed. Natural resources are integral to the maintenance, continuance, and transmission of Whadjuk Noongar culture. The Whadjuk Noongar's close connection with *boodja* (country) forms the foundation for much of their culture, spirituality, and identity.

Through ethnographic research Mariginiup was an important area for Aboriginal People both in prehistoric times through mythological sites and after colonisation as occupation areas. This area would have most likely been utilised by Whadjuk people to exploit the natural resources found in and around Lake Mariginiup. There is numerous ethnographic evidence that the broader area was also utilised as a camping area by families due to its proximity to wetlands and lakes.

The desktop research shows that the Mariginiup area is an important area for Aboriginal people both historically and in the present. Mariginiup is a very important mythological area to the Noongar people and a resource that provided both food and water and therefore an important area for camping and occupation. The area also became important historically as during the development of the Perth, Aboriginal people were forced out of the metropolitan area and into areas like the Wanneroo. The numerous lakes and wetlands (Little Mariginiup Lake, Lake Mariginiup, Jandabup Lake, Lake Adams, Little Dunbar Swamp, and Lake

Joondalup) were areas in Wanneroo where Aboriginal people could live and conduct traditional practices. Previous reports have indicated that the broader areas all around Mariginiup were used traditionally for camping and hunting. Numerous Noongar fringe camps have previously been identified within Wanneroo; potential remains for contemporary Whadjuk people to hold knowledge of any possible Whadjuk land use of the LSP desktop assessment area.

The archaeological results of this desktop assessment do not accurately reflect the historic and prehistoric Aboriginal occupation of the Mariginiup area and instead reflects the somewhat disturbed (rural land use) nature of the area. The types of archaeological sites that may have been in the area prior to its disturbance based on sites identified in similar but undisturbed areas would be small artefact scatters mainly consisting of quartz and possibly fossiliferous chert on the banks of the waterways or sand dune features. The results of the surveys tend to suggest that the area surrounding the LSP area was occupied on an ephemeral basis for task specific activities rather than long term habitation. Past Aboriginal usage of the broader area concentrated on the lakes and nearby wetlands. Remnant material from Noongar fringe camps could be in areas of less disturbance.

The waterways and lake systems and their surrounding land found in the broader City of Wanneroo area were exploited by the Whadjuk Noongar People in pre-contact times and by both Whadjuk Noongar People and Europeans in the years following contact. These places are associated with natural resource utilisation, and it has been suggested are often found near to or linked with traditional Noongar campsites. The lack of any major surface expression artefacts or stone tools is not surprising considering the development of the Wanneroo area.

Ethnographic surveys with Aboriginal groups in the Perth metropolitan region have shown the importance of the Wanneroo area. Some surveys have been conducted over significantly disturbed land and still the importance of the area is stressed by the Aboriginal people. The prospect of more development in the areas around lakes and wetlands is generally unwanted as this is an important place and damage to the water system could result in dire consequences for the Noongar people involved, including death or injury to themselves or family members. While the previous heritage survey reports suggest that Noongar people are unhappy about the developments in the broader area, as they feel that they cannot stop developments and therefore ask for several conditions to be honoured to minimise the impact to their sites. From the previous reports the most common conditions are minimise impacts on sites where possible, ensure no damage to waterways and banks, and the employment of monitors during ground clearance to identify sub-surface material and to ensure contractors stay away from certain sites or areas.

The Aboriginal heritage implications of the proposed Precinct 15 Central Mariginiup LSP area must be considered with representatives from the Whadjuk People both as a courtesy and to comply with state legislation. 22160 Marrynginup is an ACH directory Place and is afforded protection under the *Aboriginal Cultural Heritage Act (2021).* Consultation with the Whadjuk People should be done early with any future development proposal to allow sufficient time to consider the heritage views of the Whadjuk People and to apply for consent under the *Aboriginal Cultural Heritage Act (2021)* if required.

8 LANDSCAPE FEATURES

Landscape features can often be predictors of areas of likely cultural activity. On the Swan Coastal Plain landscape features associated with water; like rivers, creeks, brooks, and wetlands are highly significant to Whadjuk People. They are a source of food and water, they were used as camping places and they have mythological heritage values; many Whadjuk People consider waterways to be spiritual repositories, particularly as they are associated with creation stories and are home to many living creatures and plant resources.

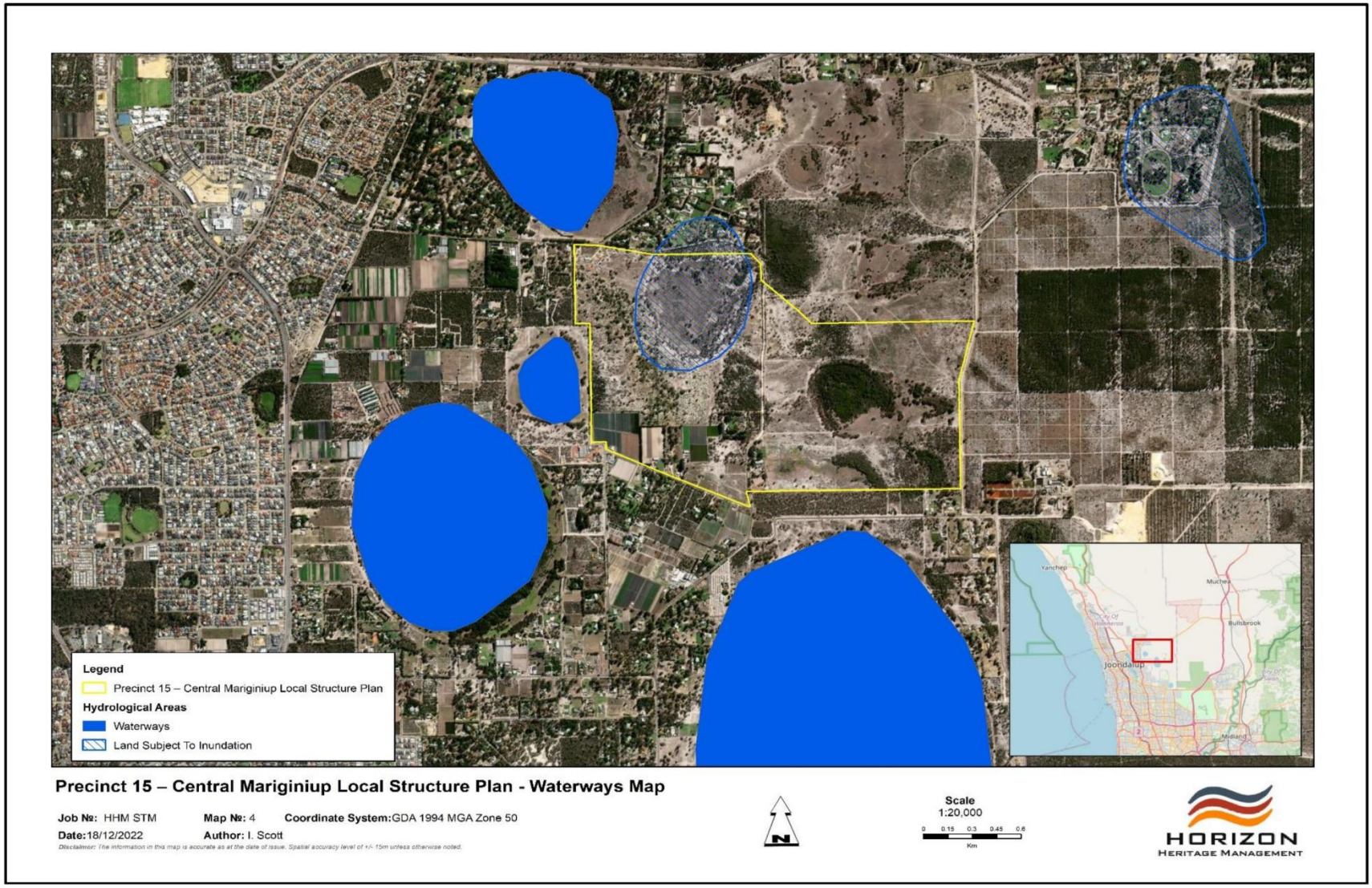
Aboriginal groups would travel along the reaches of waterways, hunting and gathering food while moving from camps in the Guildford area to Lake Gnangara, then beyond to the freshwater chain of wetlands that extend from Lake Goollelal to Yanchep.

The Precinct 15 Central Mariginiup LSP desktop assessment area is surrounded by a landscape that exhibits likely used landscape features that align with Aboriginal cultural features and associations. Most wetlands (like Mariginiup Lake and Little Mariginiup Lake) are of Aboriginal significance for the following reasons:

- they are interconnected,
- they are part of the Gnangara Mound (ground water),
- they are a source of food and water;
- they were used as camping and hunting places;
- they have mythological heritage values.

The LSP desktop assessment area although not formally recognised as having an official water body present within its boundary is subject to inundation of the land post heavy rainfall and does have several ephemeral looking swampy areas.

Map 8: Water Landscape Features within and nearby to the LSP area



9 DESKTOP CONCLUSIONS

Horizon Heritage Management makes the following conclusions:

- All Aboriginal heritage places are afforded protection under the *Aboriginal Cultural Heritage Act (2021).*
- The key Aboriginal stakeholder group for the LSP desktop assessment area is the Whadjuk 'Noongar' People.
- Potentially important landscape features like swamps and wetlands connected with mythological associations are present within the LSP desktop assessment area.
- Important landscape features connected with resource utilisation and mythological associations are noted adjacent to the LSP desktop assessment area. Lake Adams is such a feature and is located along the northern boundary, Jandabup Lake is another such a feature and is located along the southern boundary. Further landscape features Little Mariginiup Lake and Mariginiup Lake are located immediately west and southwest.
- The ACH Directory Place 22160 Marrynginup has a closed and restricted boundary which intersects the LSP desktop assessment area and is afforded protection under the *Aboriginal Cultural Heritage Act (2021).*
- The key Whadjuk Custodian for 22160 Marrynginup is Esandra Colbung. Her father (now deceased) was the original place informant.
- No specific Aboriginal heritage surveys (ethnographic or archaeological) have been undertaken within the LSP desktop assessment area.
- No known archaeological sites are within the LSP desktop assessment area. It is possible surface expressions of *in situ* cultural material (artefacts) could be present. Care should be taken in those areas with some potential to contain cultural material. These are around the margins of landscape features like lakes, swamps, wetlands, and any sand hill features that maybe within the LSP desktop assessment area.
- Numerous Noongar fringe camps have previously been identified within proximity of the numerous freshwater lakes found in the broader Wanneroo area, potential remains for contemporary Whadjuk People to hold knowledge of any possible Whadjuk land use of the LSP desktop assessment area.

10 RECOMMENDATIONS

Horizon Heritage Management makes the following recommendations:

1. Horizon Heritage Management recommends that any future development within the LSP area includes consultation with the Whadjuk Aboriginal Corporation and Aboriginal heritage ethnographic and archaeological heritage surveys with the Whadjuk People.
2. Horizon Heritage Management recommends that consultation is undertaken with Esandra Colbung (Whadjuk Site Custodian) for ACH Directory Place 22160 Marrynginup regarding the LSP desktop assessment area and this significant Aboriginal place.
3. Horizon Heritage Management recommends 22160 Marrynginup is an ACH Directory Place and is afforded protection under the *Aboriginal Cultural Heritage Act (2021).* To use the land which Aboriginal Places are on the proponent/landowner must engage with the Whadjuk Aboriginal Corporation.
4. Horizon Heritage Management recommends an Aboriginal Cultural Heritage Management Plan (developed with input and consent from the Whadjuk People and endorsed by the new ACH Council) will likely be needed to satisfy the *Aboriginal Cultural Heritage Act (2021)*.

11 DPLH ACHIS RESULTS

Department of **Planning, Lands and Heritage**

Aboriginal Cultural Heritage Inquiry System

List of Aboriginal Cultural Heritage (ACH) Directory

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Search Criteria

1 Aboriginal Cultural Heritage (ACH) Directory in Shapefile - Mariginiup_Site_Boundary_20221207

Disclaimer

The *Aboriginal Cultural Heritage Act 2021 (Act)* recognises, protects, conserves, and preserves Aboriginal cultural heritage (ACH), and recognises the fundamental importance of ACH to Aboriginal people and its role in Aboriginal communities past, present and future. The Act recognises the value of ACH to Aboriginal people as well as to the wider Western Australian community.

Aboriginal cultural heritage in Western Australia is protected, whether or not the ACH has been reported to the ACH Council or exists on the Directory.

The information provided is made available in good faith and is predominately based on the information provided to the Department of Planning, Lands and Heritage by third parties. The information is provided solely on the basis that readers will be responsible for making their own assessment as to the accuracy of the information. If you find any errors or omissions in our records, including our maps, it would be appreciated if you email the details to the Department at AboriginalHeritage@dplh.wa.gov.au and we will make every effort to rectify it as soon as possible.

South West Settlement ILUA Disclaimer

Your heritage enquiry is on land **within or adjacent to** the following Indigenous Land Use Agreement(s): Whadjuk People Indigenous Land Use Agreement.

On 8 June 2015, six identical Indigenous Land Use Agreements (ILUAs) were executed across the South West by the Western Australian Government and, respectively, the Yued, Whadjuk People, Gnaala Karla Booja, Ballardong People, South West Boojarah #2 and Wagyl Kaip & Southern Noongar groups, and the South West Aboriginal Land and Sea Council (SWALSC).

The ILUAs bind the parties (including 'the State', which encompasses all State Government Departments and certain State Government agencies) to enter into a Noongar Standard Heritage Agreement (NSHA) when conducting Aboriginal Heritage Surveys in the ILUA areas, unless they have an existing heritage agreement. It is also intended that other State agencies and instrumentalities enter into the NSHA when conducting Aboriginal Heritage Surveys in the ILUA areas. It is recommended a NSHA is entered into, and an 'Activity Notice' issued under the NSHA, if there is a risk that an activity will 'impact' (i.e. by excavating, damaging, destroying or altering in any way) an Aboriginal heritage site. The Aboriginal Heritage Due Diligence Guidelines, which are referenced by the NSHA, provide guidance on how to assess the potential risk to Aboriginal heritage.

Likewise, from 8 June 2015 the Department of Mines, Industry Regulation and Safety (DMIRS) in granting Mineral, Petroleum and related Access Authority tenures within the South West Settlement ILUA areas, will place a condition on these tenures requiring a heritage agreement or a NSHA before any rights can be exercised.

If you are a State Government Department, Agency or Instrumentality, or have a heritage condition placed on your mineral or petroleum title by DMIRS, you should seek advice as to the requirement to use the NSHA for your proposed activity. The full ILUA documents, maps of the ILUA areas and the NSHA template can be found at https://www.wa.gov.au/organisation/department-of-the-premier-and-cabinet/south-west-native-title-settlement.

Further advice can also be sought from the Department of Planning, Lands and Heritage at AboriginalHeritage@dplh.wa.gov.au.

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Terminology

ID: Reported ACH is assigned a unique ID by the Department of Planning, Lands and Heritage using the format: ACH-00000001. For ACH places on the former Register the ID numbers remain unchanged and use the new format. For example the ACH ID of the place Swan River was previously '3536' and is now 'ACH-00003536'.

Access and Restrictions:

- **Boundary Reliable (Yes/No):** Indicates whether the location and extent of the ACH boundary is considered reliable.
- **Boundary Restricted = No:** ACH location is shown as accurately as the information submitted allows.
- **Boundary Restricted = Yes:** To preserve confidentiality the exact location and extent of the place is not displayed on the map. However, the shaded region (generally with an area of at least 4km²) provides a general indication of where the ACH is located. If you are a landowner and wish to find out more about the exact location of the place, please contact the Department of Planning, Lands and Heritage.
- **Culturally Sensitive = No:** Availability of information that the Department of Planning, Lands and Heritage holds in relation to the ACH is not restricted in any way.
- **Culturally Sensitive = Yes:** Some of the information that the Department of Planning, Lands and Heritage holds in relation to the ACH is restricted if it is considered culturally sensitive information. This information will only be made available if the Department of Planning, Lands and Heritage receives written approval from the people who provided the information. To request access please contact AboriginalHeritage@dplh.wa.gov.au.
- **Culturally Sensitive Nature:**
  - **No Gender / Initiation Restrictions:** *Anyone* can view the information.
  - **Men only:** Only *males* can view restricted information.
  - **Women only:** Only *females* can view restricted information.

Status:

- **ACH Directory**: Aboriginal cultural heritage place or cultural landscape.
- **Pending**: Aboriginal cultural heritage place or cultural landscape with information in a verification stage.
- **Historic**: Aboriginal heritage places determined to not meet the criteria of Section 5 of the Aboriginal Heritage Act 1972. Includes places that no longer exist as a result of land use activities with existing approvals.

ACH Type:

- **Cultural Landscape:** a group of areas interconnected through the tangible elements of Aboriginal culture heritage present.
- **Place**: an area in which tangible elements of Aboriginal cultural heritage are present.

Place Type: The type of Aboriginal cultural heritage place. For example an artefact scatter place or engravings place.

Legacy Place Status: A status determined under the previous *Aboriginal Heritage Act 1972*:

- **Registered Site:** the place was assessed as meeting Section 5 of the *Aboriginal Heritage Act 1972*.
- **Lodged:** Information was received in relation to the place, but an assessment was not completed to determine if it met section 5 of the *Aboriginal Heritage Act 1972*.
- **Stored Data/Not a Site:** The place was assessed as not meeting Section 5 of the *Aboriginal Heritage Act 1972*.

Legacy ID: This is the former unique number that the former Department of Aboriginal Sites assigned to the place.

Coordinates

Map coordinates are based on the GDA 94 Datum.

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ID	Name	Boundary Restricted	Boundary Reliable	Culturally Sensitive	Culturally Sensitive Nature	Status	ACH Type	Place Type	Knowledge Holders	Legacy Place Status	Legacy ID
22160	Marrynginup	Yes	Yes	Yes	No Gender / Initiation Restrictions	ACH Directory	Place	Artefacts / Scatter; Camp; Ritual / Ceremonial; Historical; Hunting Place; Meeting Place; Midden; Modified Tree; Landscape / Seascape Feature; Other; Plant Resource; Water Source	*Registered Knowledge Holder names available from DPLH	Lodged	

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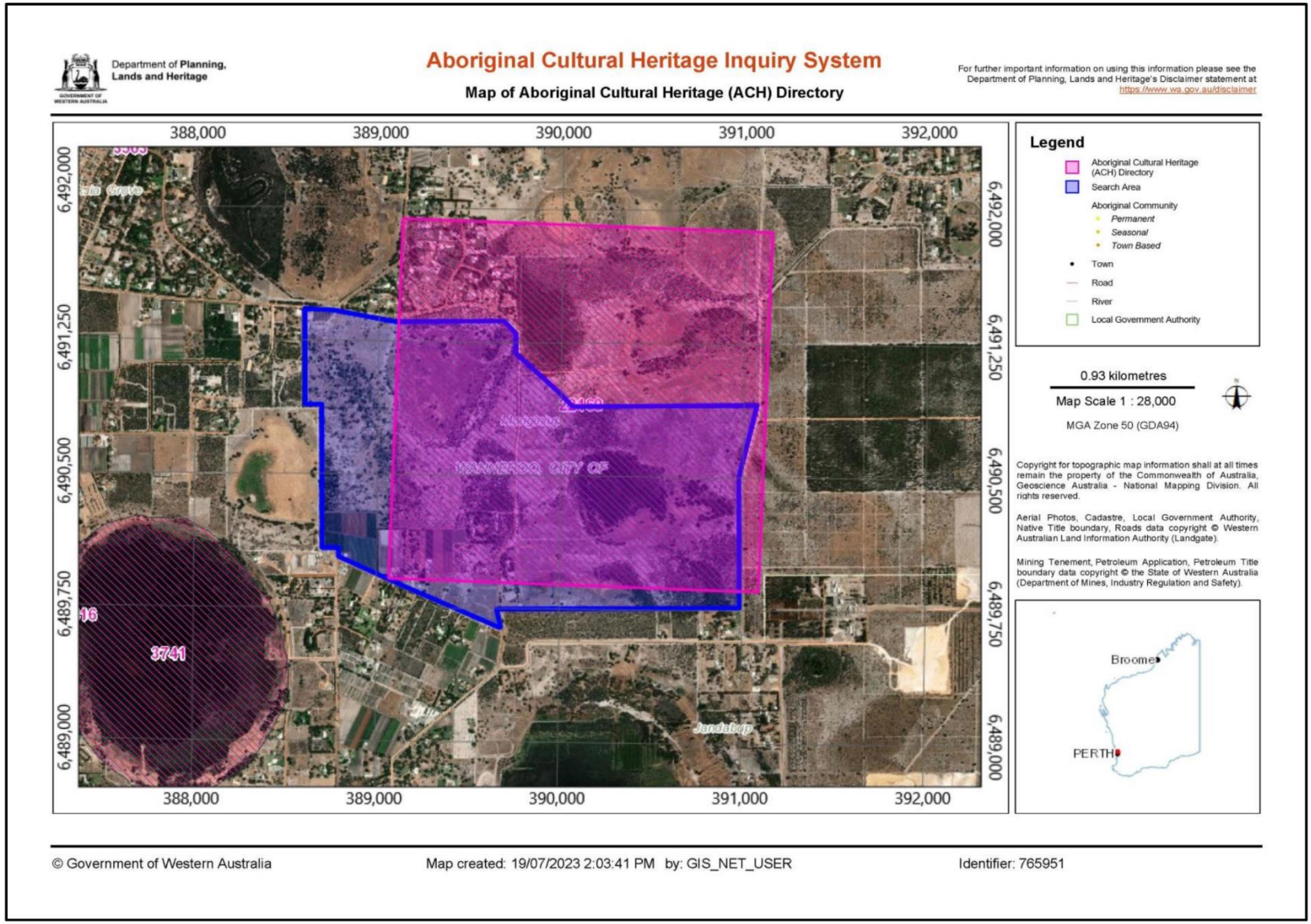
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PENTIUM WATER

LOCAL WATER MANAGEMENT STRATEGY

Mariginiup - Precinct 15

Document Number: STOMAR_01

Date: 22/08/2023



Document Status

Version	Purpose of document	Authored by	Reviewed by	Review Date
Rev 0	Final for submission	KatGre	GerEdw	22/08/2023

Approval for Issue

Name	Signature	Date
Shane McSweeney		22/08/2023

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Prepared For

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SUMMARY

Planning framework

This Local Water Management Strategy (LWMS) has been prepared to support the Mariginiup District Structure Plan (DSP) which comprises of 315.30 ha of passive rural land with a tenant running a small bobcat and site preparation business. The site is approximately 25 km North of Perth CBD and 6 km to Joondalup Train station/centre and freeway. The objective of this LWMS is to demonstrate that the land has the capacity to support the proposed land use change with best practice water management outcomes in terms of water supply, stormwater, surface water and groundwater management. This LWMS will recognise the principles, objectives, and requirements of total water cycle management as outlined in the *State Planning Policy 2.9 Water Resources* (Government of WA, 2006), *Liveable Neighbourhoods* (WAPC, 2007) and the *Stormwater Management Manual for WA* (DWER, 2004 – 2007), including the *Decision process for stormwater for stormwater management in WA* (DWER, 2017). The LWMS will also broadly state the water quantity and quality management objectives to be achieved.

The proposed development will include total water cycle management principles and objectives guided by the Better Urban Water Management Framework (WAPC 2008). This document also provides a synthesis of the project methodology and has been prepared to provide a detailed strategy to address all key issues associated with the project delivery, including Stockland's sustainability imperatives.

LWMS key elements

An inventory of the key elements for inclusion in the LWMS report, together with a cross-reference to the relevant section in this document, is presented in Table 1.

Table 1: Key LWMS reporting elements

LWMS elements	Design objectives/comments
Introduction (Section 1)	▪ Stockland Property Management Pty Ltd is seeking Structure Olan approvals for Precinct 15 which is a 315.30 ha passive rural land located in Mariginiup. ▪ The site is currently zoned 'Urban deferred' under the Metropolitan Region Scheme (MRS) and so a request will need to be lodged with the Western Australia Planning Commission to lift the Urban Deferment as part of the project delivery. ▪ A state-run MRS Amendment process is also required to reserve public land uses, namely reservation of Primary Distributor Roads, Integrator Arterial Roads, Parks and Recreation Reserves, Transit Corridors and High School reserves. ▪ The transit corridor will be the subject of further investigations and assessment by the Public Transport Authority before a final alignment and the exact positioning of stations is determined and land criteria reserved under MRS.
Topography (Section 2.3)	▪ The topography of this site is comprised of Spearwood and Bassendean low dune systems running north-south direction. ▪ Surface elevation, as shown by topographic contours, range from approximately 46 mAHD in low-lying wetlands to 59 mAHD along a north-south running dune.
Geology (Section 2.4)	▪ The site splits up between the western Spearwood sands which are pale and olive yellow, medium to coarse grained, subangular quartz with traces of feldspar of residual origin. ▪ The Eastern Bassendean sands which are very light grey at the surface, yellow at depth, fine to medium grained sub-rounded quartz of eolian origin.

	▪ These soils comprise of sands with high permeability but low nutrient retention which prevents the discharge of increased nutrient loads to the downstream environment. This presents implications for future development.
Groundwater (Section 2.11)	▪ The site is underlain by the Superficial, Leederville and Yarragadee aquifers. ▪ A monitoring program has been undertaken on site from July 2022 to now (August 2023) ▪ Maximum groundwater levels taken during this time ranged from 43.37 to 49.44 mAHD ▪ Depth to groundwater ranged from 0.86 m below ground level (mbgl) (MB8 in September 2022) to 8.63 mbgl (MB01 in July 2023). ▪ Groundwater flow is generally east to west. ▪ The average annual maximum groundwater level (AAMGL) for Precinct 15 ranges from approximately 43.5 to 48.5 mAHD.
Surface water (Section 2.12)	▪ The site has three depression areas which are the wetlands indicated by DWER. Surface water flows into these depression areas and does not have a defined drainage system that directs surface water out of the site area. The general surface water flow defined by the topography is in an eastward direction.
Wetlands (Section 2.9)	▪ Several wetlands are mapped within the site boundary, including Multiple Use wetland (MUW) in the north-eastern portion of the site and Resource Enhancement wetland (REW) and MUW located through the centre of the site. ▪ A number of wetlands are also located within close proximity of the site. ▪ Some of the wetlands located on site are associated with cultural heritage values.
Water source planning (Section 3)	▪ There is a Public Drinking Water Source Area (PDWSA) boundary running across the eastern part of the site and is under the MWSSD (Metropolitan Water Supply Sewerage and Drainage) Act 1909 or the Country Areas Water Supply Act 1947 enforced by DWER. ▪ Pentium Water has prepared two irrigation scenarios based on the Precinct 15 Land designation plan (STOMA-1-003B) provided by CDP. - Base case scenario: The total irrigation demand of 126,995 kL/yr with two primary schools including two co-located school ovals, one High school and Public Open Space. - Conservative scenario: The total irrigation demand of 443,895 kL/yr with two primary schools including two co-located school ovals, one High school, Public Open Space, and regional playing fields (located in the southeast corner of Precinct 15). ▪ No groundwater resources are available for allocation in the aquifers beneath Precinct 15 at present. ▪ Stockland will be required to transfer existing licences during the acquisition of new properties that contain existing licences or through trades for existing licences and land use changes across the precinct and district.
Water conservation strategies (Section 4)	▪ Landscape packages which adopt Waterwise principles will be encouraged. ▪ Detailed landscape plans for POS areas will be provided at subdivision stage which detail the proposed landscape treatments, plantings, community facilities and integration of drainage areas with the POS landscape design.
Stormwater management (Section 5)	▪ The following design criteria are adopted in the drainage strategy and concept drainage design: - The first 15 mm of rainfall to be infiltrated close-to-source or treated in bioretention basins within each catchment to mimic predevelopment conditions. - In larger storm events runoff will be managed within flood basins, or discharge into REW (UFI:15443), Little Mariginiup Lake or Lake Adams.

Groundwater management (Section 0)	▪ The proposed Controlled Groundwater Level (CGL) for the East Wanneroo DSP area is the 1986 to 1995 AAMGL, which is considered appropriate for Precinct 15 without adjustment. The DWMS specifies that subsoil drainage is to be at the CGL, and that the subsoil drainage pipework is to underlie the surface water infiltration basins. A clearance of at least 0.5 m from the basin invert to the CGL will therefore be required to allow for the subsoil drainage pipework to have an invert level at CGL and to allow for infiltration from the surface water basins.
Monitoring and reporting (Section 7)	▪ The monitoring completed so far has captured two winter peaks (2022 and 2023). A further five months of monitoring is required to fulfill the 18 months monitoring commitment as outlined in the DWMS (Urbaqua 2021). ▪
Potential future monitoring requirements (Section 8)	▪ Section 8 provides details of UWMP requirements and the roles and responsibilities related to implementation of the LWMS.

1. INTRODUCTION

1.1. Purpose

This LWMS has been prepared on behalf of Stockland to support the Mariginiup – Precinct 15 Local Structure Plan (LSP) of the Mariginiup landholding within the City of Wanneroo (the City) (Figure 1). LSP approval is being sought for the site which comprises approximately 315.3 ha of passive rural land and a tenant running a small bobcat and site preparation business in the suburb of Mariginiup.

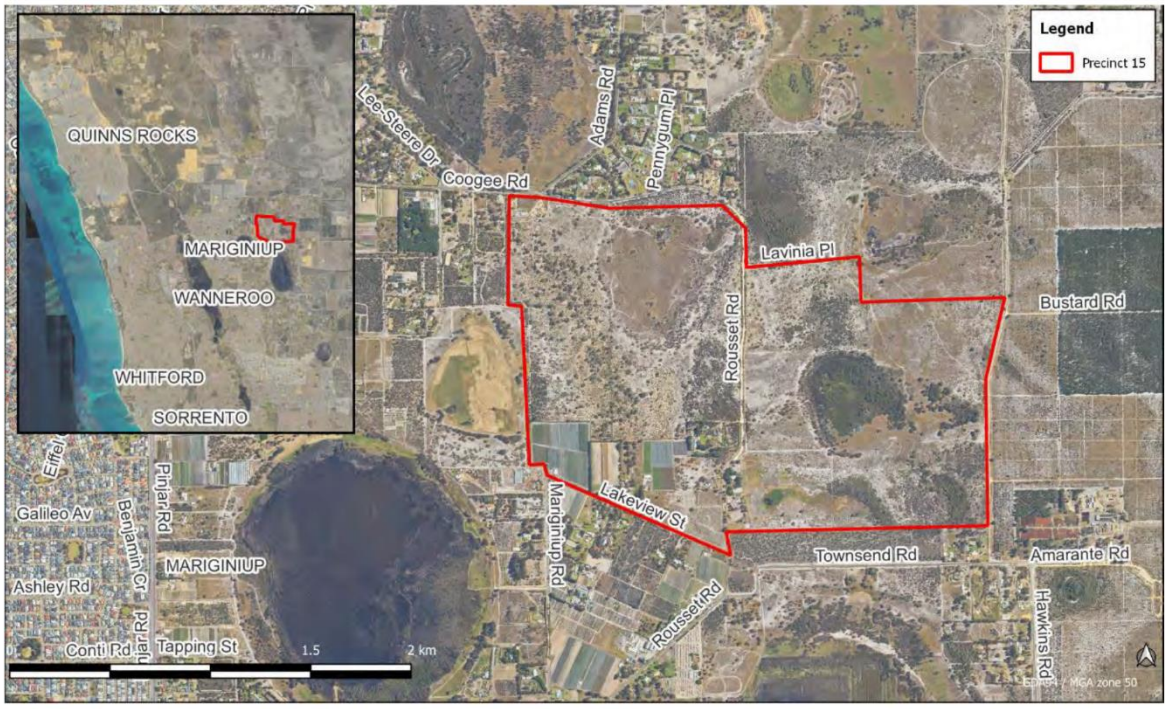

Figure 1: Site plan and location

1.2. Planning background

The LSP is part of the East Wanneroo District Structure Plan (DSP), which was prepared by Urbaqua on behalf of the Department of Planning, Lands and Heritage (DPLH). The DSP was prepared to guide land use planning and development of approximately 8,300 hectares (ha) across a small portion of Pinjar, most of Mariginiup and Jandabup, the eastern part of Wanneroo, Gnangara and south-west Lexia. The DSP was approved by the West Australian Planning Commission (WAPC) in August 2021.

1.3. Planning context

The subject site is zoned 'Urban Deferred' with the eastern parts of 2 lots (2 and 7542) termed 'rural water protection' under the Metropolitan Region Scheme (MRS). A request will need to be lodged with the Western Australia Planning Commission (WAPC) to lift the Urban Deferment (once the original reasons for deferral have been addressed) as part of the project delivery.

A state-run MRS Amendment process is also required to reserve public land uses, namely reservation of Primary Distributor Roads, Integrator Arterial Roads, Parks and Recreation Reserves, Transit Corridors and High School reserves. The transit corridor will be the subject of further investigations and assessment by the Public Transport Authority before a final alignment and the exact positioning of stations is determined and land criteria reserved under MRS.

1.4. Proposed structure plan

The LSP covers approximately 315.3 ha and will be developed to provide housing, a town centre, regional sporting fields, primary and high schools and public open space (POS). The LSP is shown in Figure 1.

1.5. Irrigation demand

The total final POS irrigation demand for Precinct 15 is currently estimated to be 443,895 k/yr over the total development area of 315.3 ha, including the 45 ha Regional Playing Fields outlined in the DSP. Stockland do not currently hold any groundwater licences for the project to date, however, will be looking to acquire allocations held by existing land users via trade.

This volume is considered sufficient to irrigate all proposed POS and future education precincts including the two primary schools including two co-located school ovals, one high school, POS and Regional Playing Fields (located in the southeast corner of Precinct 15).

An alternate water source being pursued for non-potable water supply for this development is subsoil drainage harvesting. Subsoil drainage harvesting is considered an environmentally sustainable and innovative solution as it is capitally inexpensive and easily collected via the standard subdivision drainage infrastructure. The water source is considered "new" as it is created by the change to the natural water balance caused by development.

1.6. Design objectives

This LWMS is in accordance with State Planning Policy 2.9: Water Resources (Government of WA 2007) and has been developed with reference to the following guidance documents:

- Interim: Developing a Local Water Management Strategy (Department of Water 2008)
- Better Urban Water Management (Department of Planning and Infrastructure 2008)
- Stormwater Management Manual for Western Australia (Department of Water 2004–2007)
- Liveable Neighbourhoods (Western Australian Planning Commission 2003)
- Water resource considerations when controlling groundwater levels in urban development (Department of Water 2013)
- Draft Specification separation distances for groundwater controlled urban development (IPWEA 2016)
- Decision Process for Stormwater Management in Western Australia (DWER 2017)

The LWMS details the integrated water management strategies to facilitate future urban water management planning. The LWMS will achieve integrated water management through the following design objectives:

- Protection of important environmental assets and water resources
- Deliver functional and integrated public open space
- Manage flooding and inundation risks to human life and property
- Ensure the efficient re-use of water resources

1.7. Key documents and previous studies

A number of on-site investigations have been completed and relied upon to prepare this LWMS including:

- District Water Management Strategy (Urbaqua, 2021)
- East Wanneroo District Structure Plan (DPLH, 2021)
- Assessment of Proposed Environmental Outcomes (Emerge, 2019)
- Engineering Servicing Report (Cossill & Webley, 2019)
- Environmental Assessment Study (Emerge Associates, 2018)
- Preliminary Environmental Assessment of Planning Investigation Areas (Emerge Associates, 2018)
- Strategic Bushfire Hazard Level Assessment – Bushfire Management Plan (BPAD, 2018)

2. EXISTING ENVIRONMENT

2.1. Site location and existing and historical land use

Precinct 15 is approximately 25 km North of Perth CBD and 6 km to Joondalup Train station/centre and freeway. The site is undeveloped and has scattered vegetation throughout. The site consists of the following lots:

- Lots 803 Mariginiup Road
- Lots 13, 16, 17, 18, 804 Lakeview Street
- Lots 1, 2, 1673, 2287, 2361, 3335 Rousset Road
- Lot 7542 McCaffrey Road

Table 2 is a summary of the main current land uses and structures, associated with the site and/or identified during the site walkover and from a review of available geographic information systems.

Table 2: Site land uses, structures and/or sensitive receptors

Lot	Industry/Land Use	Risk to water quality
2, 803, 1673, 3335 and 7542	Bush	No
1	Agistment, kennels, chicken farm	Yes
13, 16, 18, 804	Nursery, Horticulture, Turf farm	Yes
17, 2287	Residential	No

2.2. Climate and rainfall

2.2.1. Baseline

The site is typical of the Swan Coastal Plain being warm and dry during summer and cooler and wetter during the winter period. Baseline rainfall (1961-1990 as defined by DWER, 2015) at Mariginiup is 761 mm by using data drill output, which interpolates rainfall between nearby stations. Rainfall between 1990 to 2021 is 3.8% lower than the baseline rainfall at 732.4 mm.

Baseline pan evaporation (E_{pan}) for Mariginiup is approximately 1,800 mm based on BOM mapping (BOM 2022a). The potential evapotranspiration (PET) for Mariginiup is approximately 1,400 mm based on BOM mapping (BOM 2022b), which equates to ~0.78 E_{pan}.

Table 3: Climate and rainfall data

Weather statistic (mm/mt)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Annual
Baseline rainfall (1961-1990)	12.2	13.7	14.0	44.0	100.9	165.4	159.1	115.3	74.7	43.8	21.6	8.6	761
Rainfall (1990-2017)	15.2	15.6	19.5	36.0	90.7	135.4	148.2	119.4	78.5	40.3	24.3	9.3	732.4
Baseline pan evaporation (E_{pan})	1,800 mm annually												
Baseline potential evapotranspiration (PET)	1,400 mm annually												

2.3. Topography

Topographic contours indicate elevation across the site ranges from 46 metres above height datum (mAHD) in low lying wetlands on the western boundary of the site to 59 m AHD along a dune running north-south in the south-western portion of the site, as shown in Figure 2.

The topography of this site is comprised of Spearwood and Bassendean low dune systems running north-south direction.

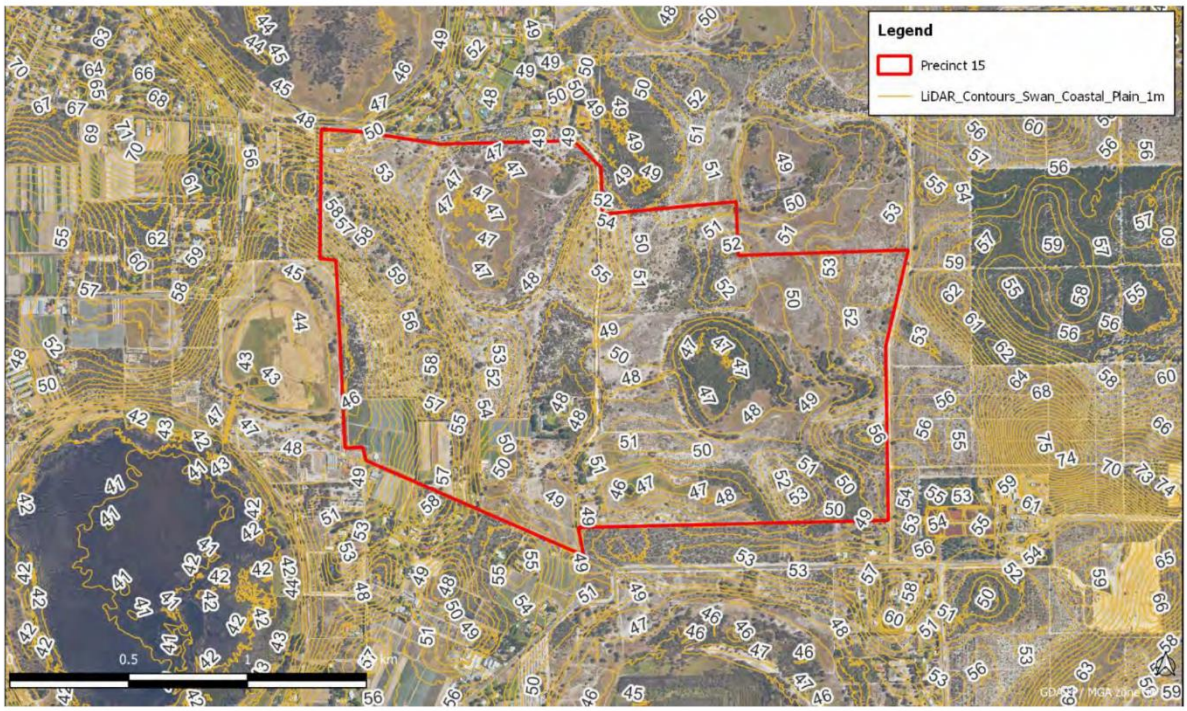

Figure 2: Topography

2.4. Geology

2.4.1. Regional Mapping

Geology mapping indicates the majority of the site is underlain by Spearwood sands (S7) in the western portion of the site and Bassendean Sands (S8 and S10) in the eastern portion (Figure 3) (Gozzard 1986). Spearwood sands typically consist of pale and olive yellow, medium to coarse grained, subangular quartz with traces of feldspar of residual origin. Bassendean sands (S8) are typically very light grey at the surface, yellow at depth, and comprised of fine to medium grained sub-rounded quartz of eolian origin, while Bassendean sands classified as sand over clay-sand/sandy clay (S10) are typified by light grey to yellow depth of aeolian origin and form as a thin veneer over strong, brown silts and clays. The lower elevation areas are mapped as being underlain by Peaty clay (Cps) of lacustrine origin typified by dark grey and black clays with variable sand content.

These soils comprise of sands with high permeability but low nutrient retention which prevents the discharge of increased nutrient loads to the downstream environment. This presents implications for future development.

The superficial formation is underlain by the Jandabup, Mariginiup subareas while the Wanneroo confined subarea as part of the Leederville and Yarragadee formation.

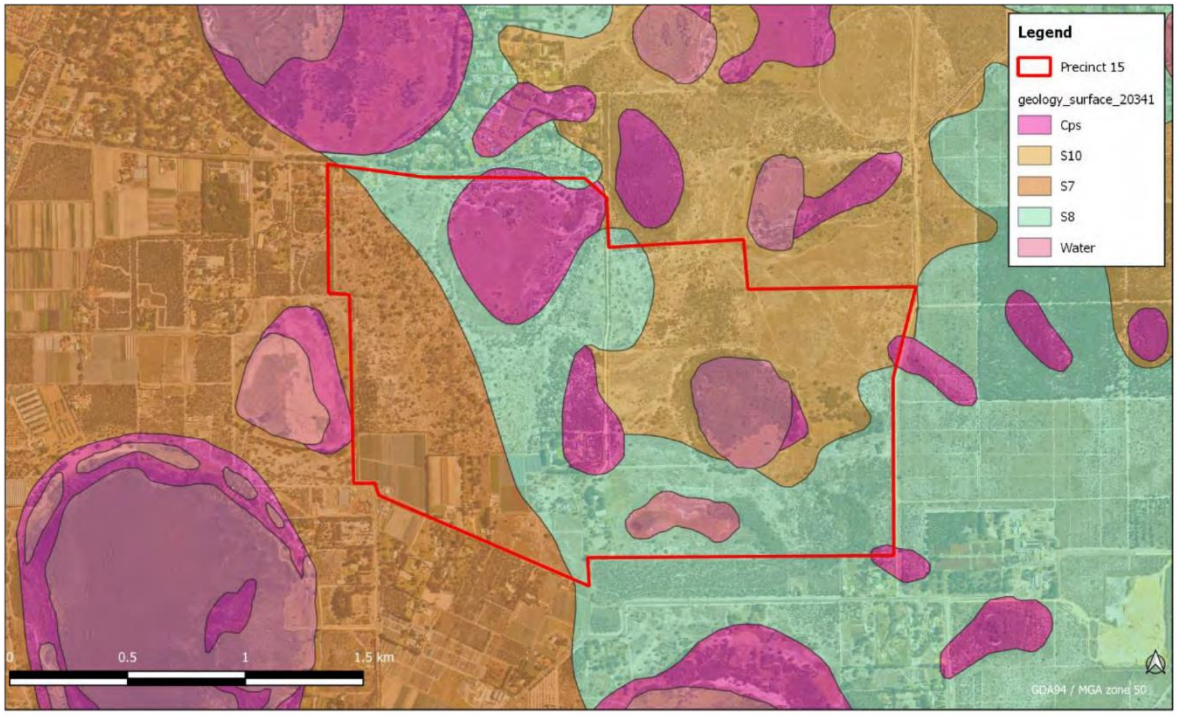

Figure 3: Geology

2.4.2. Site investigations

Douglas Partners was engaged by Stockland to undertake two preliminary geotechnical investigations across two different locations within the site in July 2022. Sand was intersected at surface in all locations. Groundwater was observed in two test pit locations: located on the westernmost edge of the site and at a depth of 3 m (42.9 mAHD, CPT53) and located in the south-eastern portion of the site at a depth of 2.3 m (45.4 mAHD, pit 116).

2.4.2.1. Infiltration rates

A total of 11 in situ infiltration tests were conducted across the two sites with the results summarized in Table 4. The results indicate a field permeability value of between 7 m/day and greater than 20 m/day.

Refer to Appendix A for both reports (Douglas Partners 2022a and Douglas Partners 2022b). The Engineering Service Report has been included in Appendix B.

Table 4: Infiltration testing results (Douglas Partners, 2022a and Douglas Partners, 2022b)

Test Location	Depth (m)	Measured Permeability (m/day)	In situ ground conditions at testing site
Lot 803 Coogee Road and Lot 1673 Rousset Road			
55	0.5	>20	SAND SP, trace silt, loose to medium dense
56	0.5	7	SAND SP, trace silt, medium dense
57	0.5	13	SAND SP, trace silt, medium dense
58	0.5	>20	SAND SP, trace silt, loose
59	0.5	>20	SAND SP, trace silt, medium dense
60	1.5	>20	SAND SP, trace silt, medium dense

61	0.5	>20	SAND SP, trace silt
Rousset Road report			
123	1.0	>20	SAND SP, trace silt, medium dense
124	1.0	>20	SAND SP, trace silt, medium dense
125	1.0	12	SAND SP, trace silt, medium dense
126	1.0	>20	SAND SP, trace silt, loose

2.5. Acid sulphate soils

The eastern section of the site is identified as having a 'High to Moderate Risk' of Acid Sulphate Soils (ASS) as per ASS risk mapping as shown in Figure 4 (DWER, 2017). Areas of ASS cannot be confirmed or removed at this stage of the development and will need to be determined by an ASS investigation, potentially with sampling the site. Due to this risk, there will be a requirement for an ASS Management Plan to be prepared as part of the development and subdivision of the site.

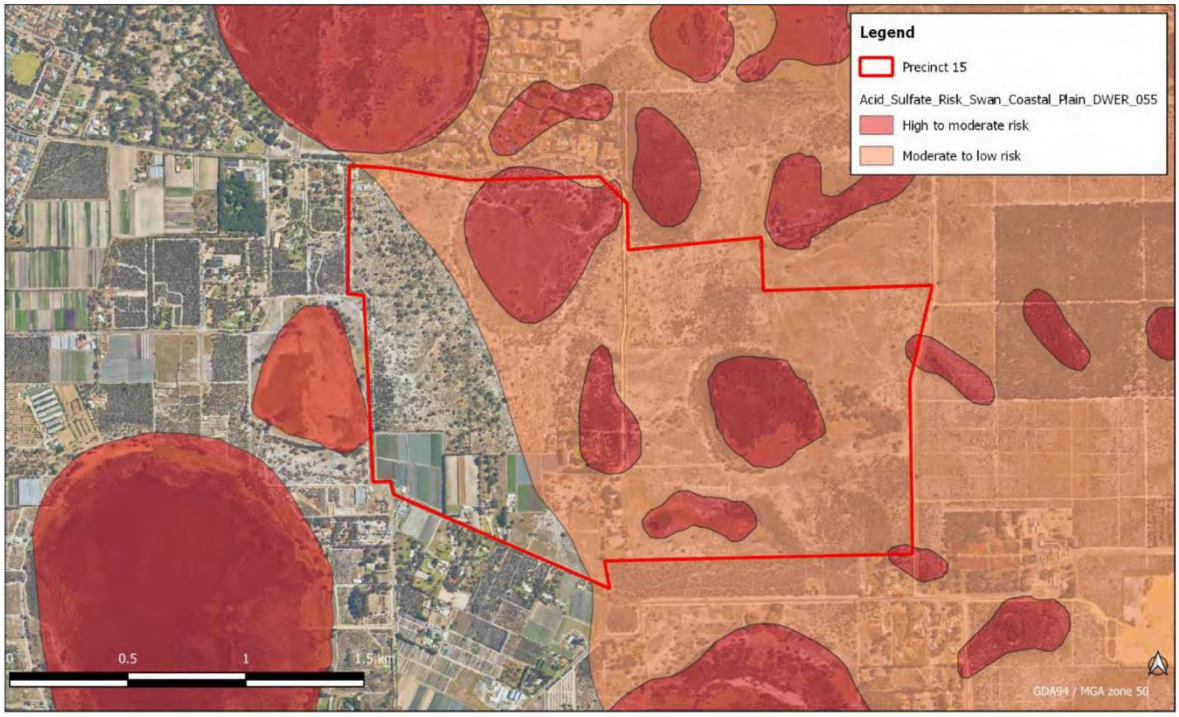

Figure 4: Acid Sulfate Soils

2.6. Contaminated sites

A review of the DWER a Contaminated Sites Register did not identify any known contaminated site under Section 11 of the Act within the Site or in the immediate surrounds. There are a number of sites where the former land use presents a contamination risk.

Further investigations are likely to be required to determine the extent of contaminated soil and/or groundwater, particularly where indicated as possible, as a result of current or past land use.

2.7. Aboriginal Heritage

The North-eastern section of the subject site is identified as an Aboriginal Heritage site (ID 22160). A heritage enquiry of the site identifies that the subject site is on the land within or adjacent to the Whadjuk People Indigenous Land Use Agreement. An Aboriginal desktop heritage assessment of the site and surrounding area was undertaken by Horizon Heritage Management in January 2023. The assessment concluded that no registered archaeological sites are located within the site; however, it is possible that surface expressions of in situ cultural material (artefacts) could be present (Horizon 2023). These were noted to be potentially located around the margins of landscape features like lakes, swamps, wetlands and any sand features that may occur within the site.

Place ID 22160 was determined to be largely associated with CCW UFI 14241 to the north of the site and found to only slightly intersect in the north central portion of the site. It was determined to be a very significant and sensitive area (healing area) important for Aboriginal spiritual health and cultural well-being (Horizon 2023). Horizon recommended Place ID 22160 is afforded protection under the *Aboriginal Heritage Act 1972*, and that an Aboriginal Heritage Management Plan (AHMP) should be prepared and implemented prior to vegetation clearing and other ground disturbance works occur during development of the site (2023).

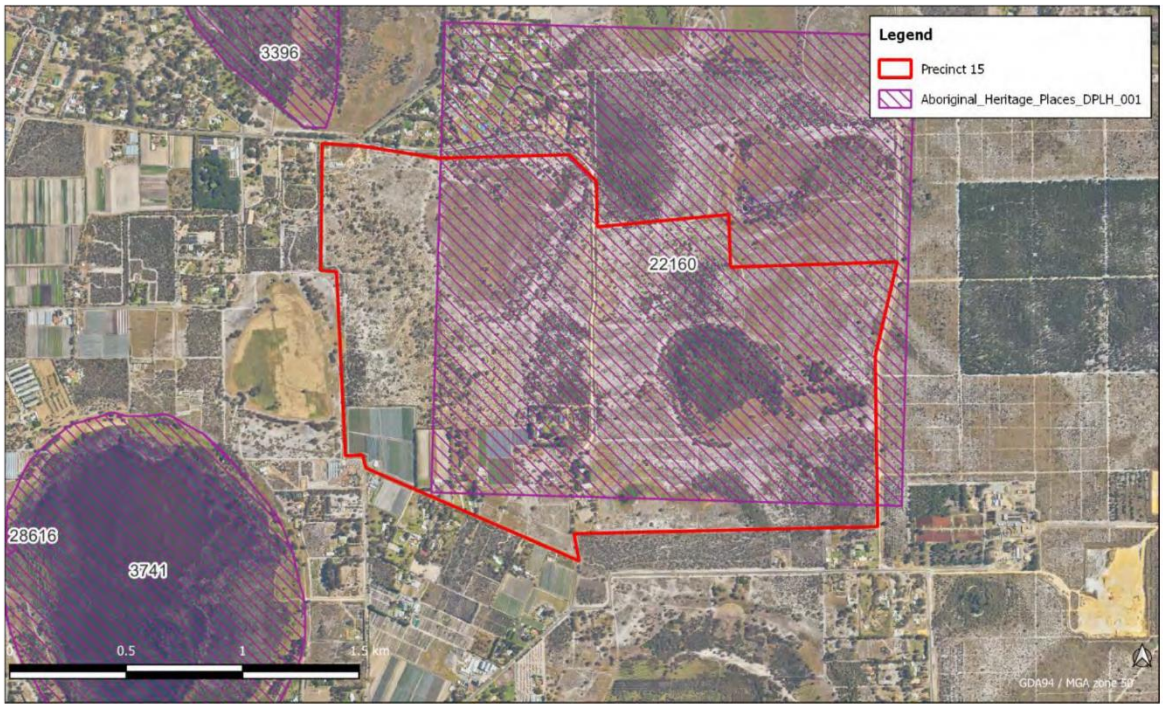

Figure 5: Aboriginal Heritage sites

2.8. Bush Forever sites

A search of the Western Australian Local Government Association Administrative Planning Categories mapping tool (WALGA 2018) did not identify any Bush Forever sites within the site. The nearest Bush Forever sites are site no. 147 (West of the site) and 324 (South of the site), as shown in Figure 6.

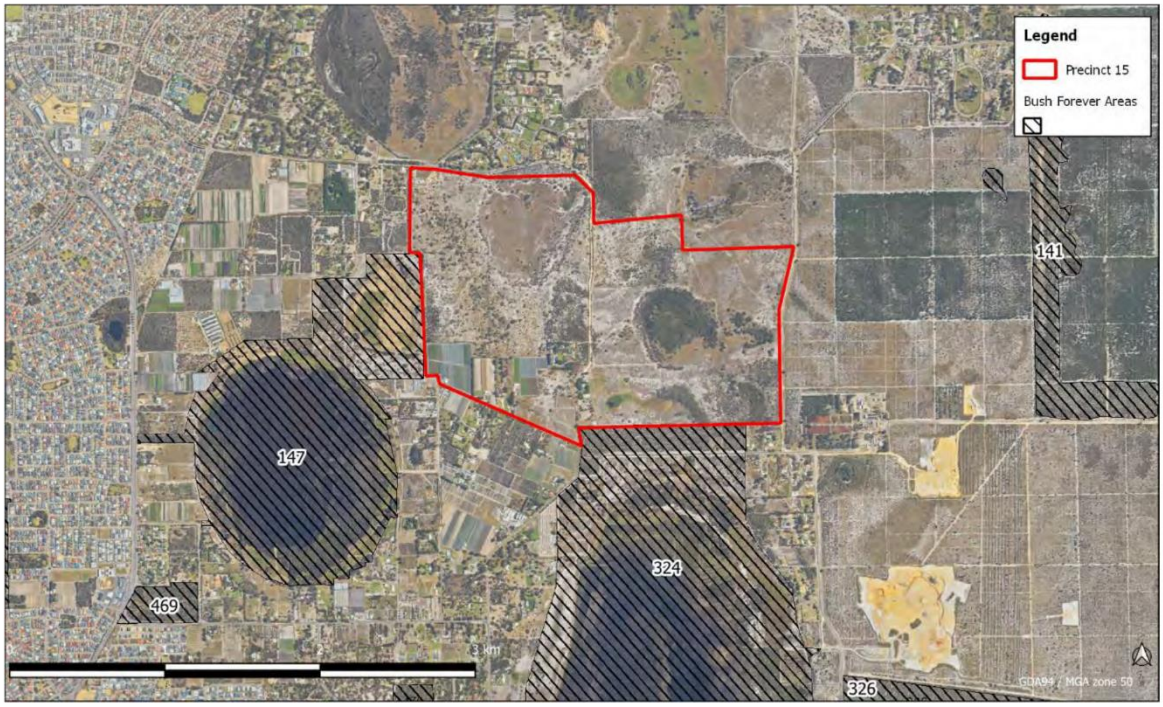

Figure 6: Bush Forever sites

2.9. Wetlands

Several wetlands are mapped within the site boundary (DBCA, 2018). The north-eastern section of the site is mapped as a multiple use (MUW, UFI 15022). Resource enhancement (REW) and MUW are located through the centre of the site and to the east and have the following UFI: 8164, 14244, 14245, 14247, 14248, 14252, 14253, 15442 and 15443. As such, future land uses, development and management should be considered in the context of ecologically sustainable development and best management practice catchment planning through Landcare.

A number of wetlands are also located within close proximity of the site and are shown along with wetlands located on site in Figure 7.

It is noted that a number of wetlands located on site are associated with cultural heritage values, as noted in Section 2.7. It has been recommended that Traditional Owners and Aboriginal people with knowledge of the area are engaged as part of the local structure planning to understand and protect cultural heritage values.

The site constraint adds an additional layer to the development of the site with the project requiring additional expertise as part of the project team.

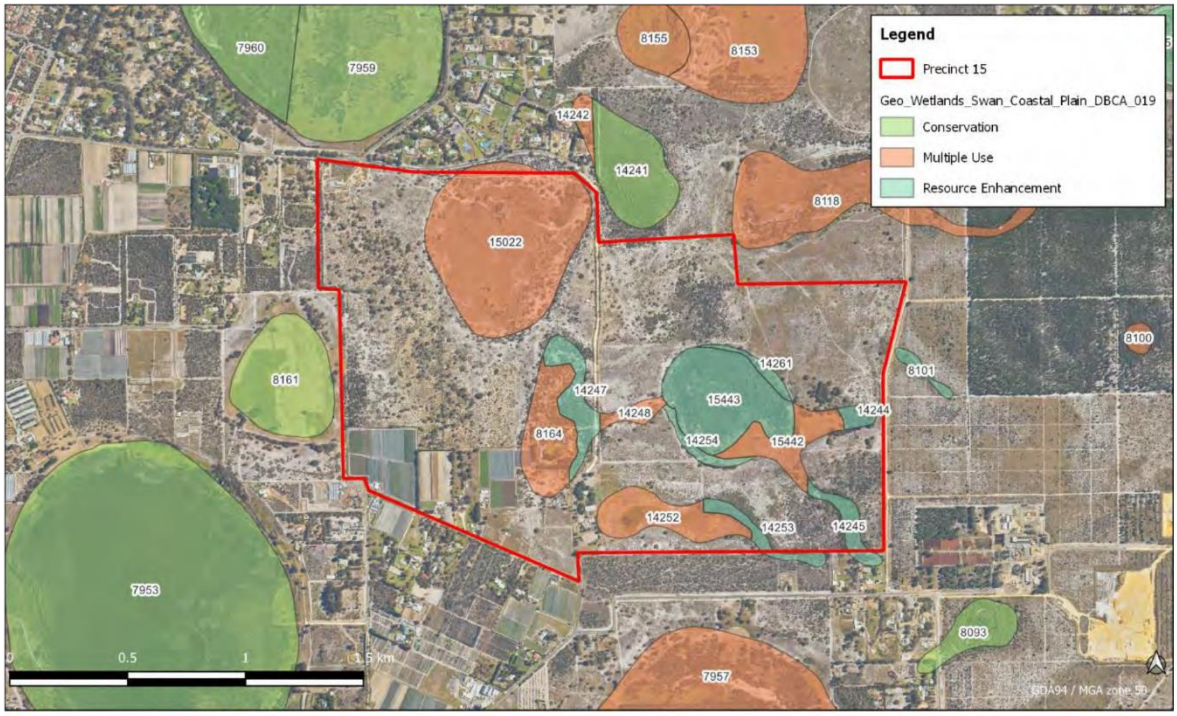

Figure 7: Geomorphic wetlands

2.10. Public drinking water source areas

The Gnangara Underground Water Pollution Control Area is located between about 10 km and 70 km north of Perth. It stretches from the northern suburbs of the Perth Metropolitan Region of Western Australia to the adjacent rural Shires of Gingin and Chittering. The Gnangara UWPCA (also referred to as control area) defines the central area of the Gnangara groundwater system that provides public drinking water supply as part of the Integrated Water Supply Scheme (IWSS).

This Public Drinking Water Source Area (PDWSA) runs through the eastern part of Precinct 15. There is also a Wellhead Protection Zone for bores in the area, with both displayed in Figure 8.

It is anticipated that rezoning of the land within PDWSAs to any urban land use will trigger reclassification of areas of P1 and P2 to P3* areas, as outlined in WQPN 38, and all developments will require connection to deep sewerage.

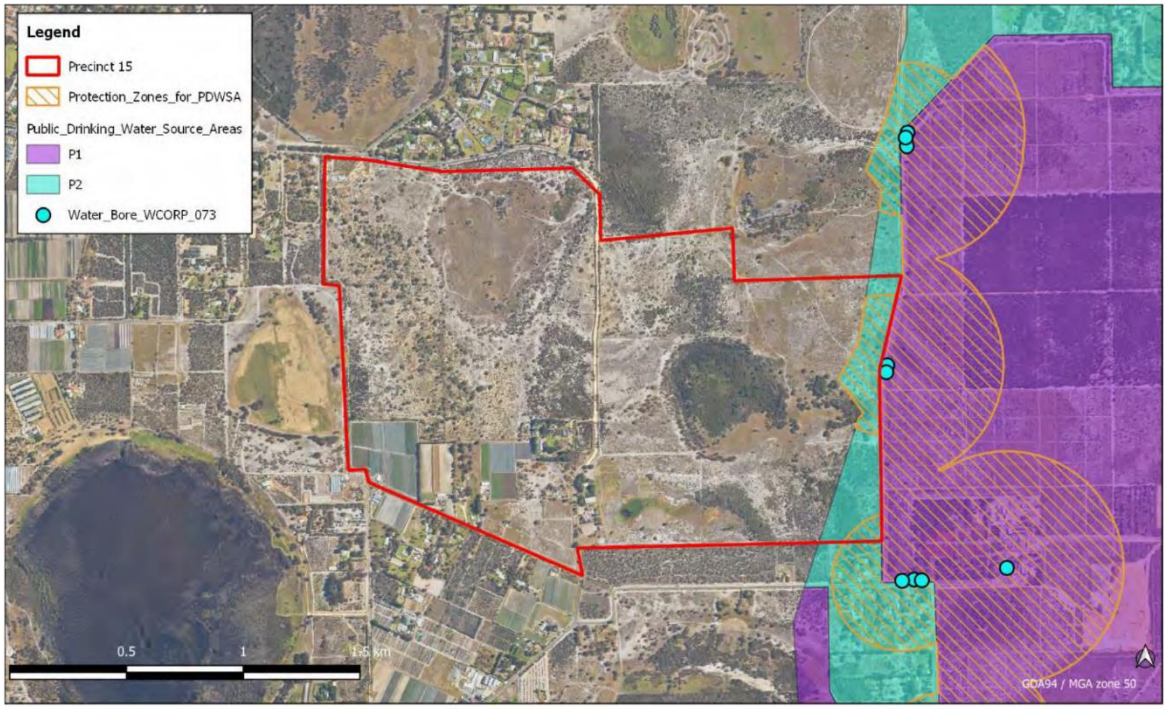

Figure 8: PDWSA and Wellhead Protection Zones

2.11. Groundwater

2.11.1. Aquifers

The site is situated on the Swan Coastal Plain and in the Wanneroo groundwater area. There are three groundwater sub-areas associated with the site: Wanneroo Confined, Mariginiup and Jandabup. This site is part of the Wanneroo groundwater system which comprises of the following hydrogeological units (aquifers), including the:

- Unconfined Superficial aquifer
- Confined Leederville aquifer
- Confined Yarragadee aquifer

Local hydrology is dominated by infiltration and evapotranspiration with almost no runoff due to the highly conductive sandy soils on site (refer Section 2.4.1). Infiltrated rainwater is expected to directly recharge the Wanneroo groundwater system as it does in the bordering Gnangara groundwater system. Surface water is generally confined to wetlands disposed throughout the site which are surface expressions of the Superficial aquifer in low lying land.

Regional groundwater mapping indicates groundwater across the site generally flows from east to west (DWER 2022a).

2.11.2. Regional groundwater levels

The Perth Groundwater Map (DWER 2022a), which provides an indication of regional groundwater levels, shows the historic Maximum Groundwater Level (MGL) at the site to be approximately 48 mAHD in the north-easternmost corner of the site. The lowest historic MGL on site is approximately 43 mAHD and is mapped in the south-westernmost corner of the site.

2.11.3. Groundwater levels

Groundwater bores were installed by Pentium in May and August 2022 for the purpose of pre- and post-development monitoring, with groundwater monitoring being undertaken on site monthly during winter and otherwise quarterly since installation. Peak groundwater levels monitored on site have been detailed in Table 5. Groundwater monitoring by DWER or other is not known to have been historically undertaken on site.

Table 5: Pre-Development groundwater levels

Bore ID	Easting	Northing	Max level (mAHD)
MB01	390962.44	6490187.16	47.57
MB02	389710.88	6490567.29	45.98
MB03	388679.98	6490545.1	43.47
MB04	388812.15	6491385.53	43.37
MB05	389059.4	6490979.67	44.99
MB06	389460.21	6490282.31	45.39
MB07	390497.58	6490157.22	46.26
MB08	390212.74	6489928.47	46.08
MB09	391051.74	6490943.05	49.44
MB10	389828.51	6491076.36	46.61
MP5	389296.54	6490851.38	45.57
MP11	389786.88	6490297.79	45.97
MP12	390437.42	6490306.56	46.34
MP13	390244.68	6489831.05	46.13

Groundwater levels across the site have ranged from a minimum of 42.50 mAHD in April 2023 (MB04) to a maximum of 49.44 mAHD in November at MB09. Relative to existing surface levels, the measured groundwater levels ranged from a minimum of 0.86 metres below ground level (mbgl) at MB8 in September 2022 to a maximum of 8.63 mbgl at MB01 in July 2023.

Groundwater contours across the site based on the MGL are shown in Figure 9 and indicate groundwater flows generally east to west, consistent with regional mapping.

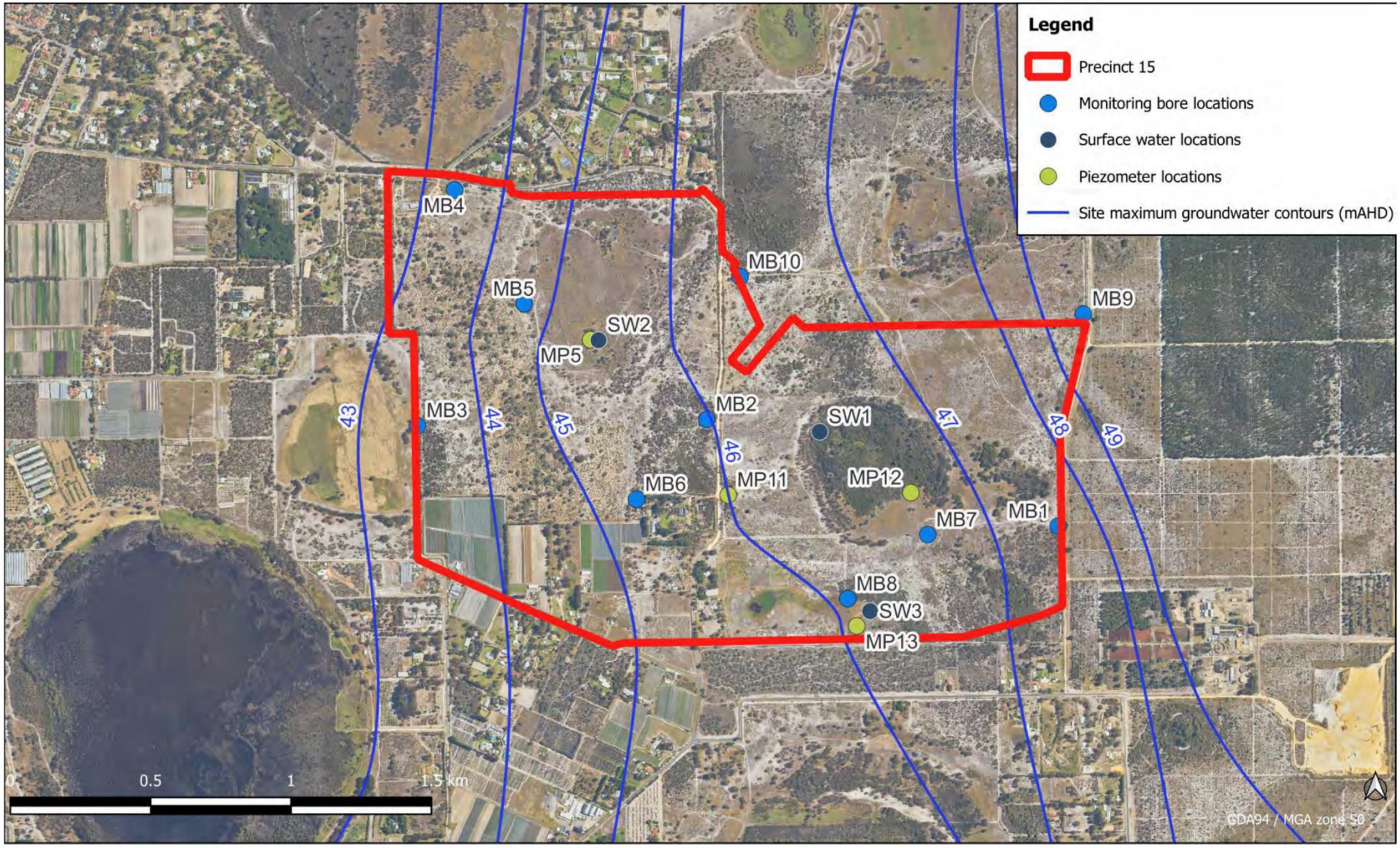

Figure 9: Site maximum groundwater contours

2.11.3.1. AAMGL calculation

The 1986 to 1995 AAMGL was determined for the EWDSP area as follows:

- Shallow bores across the EWDSP area were identified from Water Information Reporting data (DWER 2022b). For this assessment, shallow bores were those in which the top of the screen was less than 15 m below the average 1986 to 1995 water level in the bore. Where there were groups of nested or adjacent bores, the highest screened bore that had a mostly complete set of water level data was selected for the CGL.
- Water level data for these bores was extracted from the Water Information Reporting database (DWER 2022b).
- 90 shallow screened bores were selected for the estimation of the CGL, 85 of which had 8 or more years of maximum (winter) water levels measured between June and November. For these bores the AAMGL was calculated as the average of the annual maximum water levels.
- The remaining 5 bores had 6 or less years of maximum winter water level data. For these bores the AAMGL was calculated by adjusting the measured maximum water level to an AAMGL, using an average adjustment estimated from the 80 bores that had a complete data record.
- The lakes within the EWDSP area are throughflow wetlands, so are expressions of the groundwater table. An AAMGL was estimated for the lakes that had measured surface water levels over the period from 1986 to 1995, including Lake Mariginiup, Lake Jandabup, Lake Gnangara, Lake Adams and Lake Badgerup.
- The calculated AAMGL for Lake Mariginiup and Lake Jandabup were compared to the Gnangara Mound Criteria (Government of Western Australia 2009) and water thresholds presented in both the DWMS (Urbaqua 2021) and a recent review of the thresholds (Kavazos et al. 2020). The calculated AAMGLs for each of these lakes was within the preferred range of lake water levels (i.e., the AAMGL was above the preferred minimum peak water level (spring) and below the absolute maximum peak.
- The CGL surface was generated by contouring (using a kriging analysis) the bore and lake AAMGL values across the EWDSP area.
- The CGL within the vicinity of Precinct 15 is shown in Figure 10.

In the absence of long-term groundwater level data for the site, the 1986 to 1995 AAMGL has been adopted for the site.

Maximum groundwater levels recorded on site in 2022 and 2023 (as discussed in Section 2.11.3) were slightly higher than the AAMGL across the site. It is noted that total rainfall recorded for the month of August in 2022 at the closest BoM weather station (Wanneroo, BoM 9105) was significantly higher (by approximately 100 mm) than both the baseline rainfall (1961 to 1990) and average rainfall (1990 to 2017) as outlined in Section 2.2.1. As the maximum groundwater levels were recorded in the months following this historically high month of rainfall, and without more recent long-term site-specific groundwater data, it is still recommended that the 1986 to 1990 AAMGL is adopted for the site.

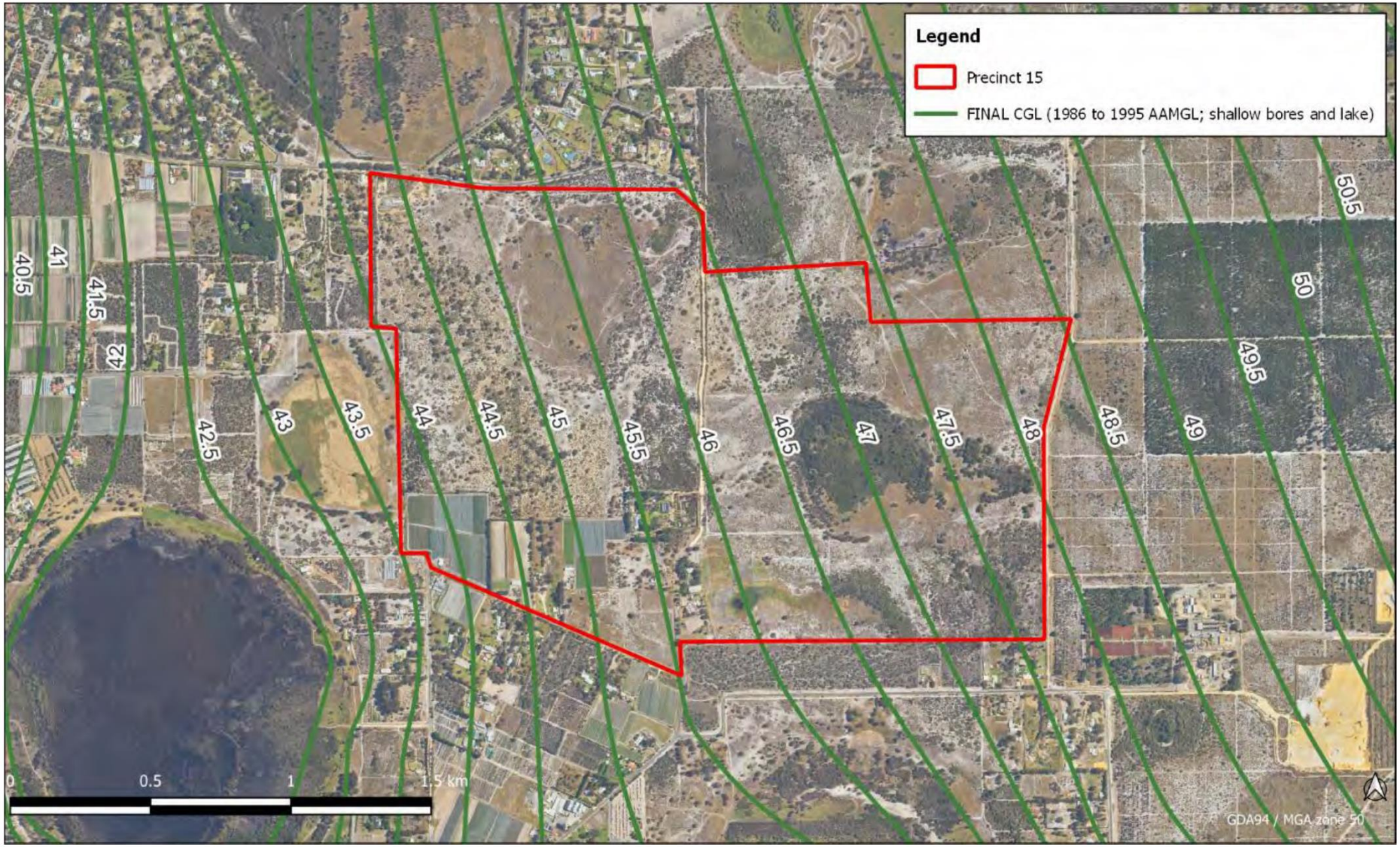

Figure 10: AAMGL/adopted CGL (1986 to 1995)

2.11.3.2. MGL discussion

The proposed controlled groundwater level (CGL) for the EWDSP area is the 1986 to 1995 average annual maximum groundwater level (AAMGL) as discussed in Section 2.11.3.1 and as was endorsed through the DWMS (Urbaqua, 2021).

2.11.4. Groundwater quality

Groundwater was sampled by Pentium Water in July and October 2022 and January, April and July 2023 from bore locations as shown in Figure 9. The field measured physico-chemical parameters and laboratory measured nutrient concentrations from 10 bores that are within the site boundary are provided in Table 6. These have been compared with ANZECC (2000) freshwater guideline values (FWG) for lakes, reservoirs and wetlands.

The monitoring results indicate groundwater beneath the site is acidic (average pH 5.6 and fresh (377 µS/cm). Total Nitrogen (TN) exceeds the ANZECC guideline (average 3.01 mg/L) in all bores. Total Phosphorus (TP) also exceeded the ANZECC guideline in all bores (average 0.01 mg/L).

The elevated nutrient levels are expected to be due to the long-term agricultural activities in the region and soil organic content. Given that two of the three sampling events were taken during or just after the winter months (i.e., rainy season), nutrient flushing into the groundwater system can be expected and a contributing factor to elevated nutrient levels.

Table 6: Groundwater quality results

Parameter	Mean parameter values July and October 2022 and January 2023										
	MB01	MB02	MB03	MB04	MB05	MB06	MB07	MB08	MB09	MB10	ANZECC
pH	6.68	6.32	6.66	6.50	4.79	4.85	4.75	4.82	4.87	5.73	6.5-8.0
EC (µS/cm)	465.8	360.3	663	336.5	136	466.6	153.8	557.3	239.5	388.3	300-1,500
TN (mg/L)	3.1	1.1	7.6	1.7	1.2	2.4	4.5	4.7	2.5	1.4	0.35
TKN (mg/L)	2.5	1.0	7.4	1.6	0.9	2.4	2.6	3.3	1.1	1.4	N/A
NH3 (mg/L)	0.009	0.063	0.055	0.011	0.013	0.282	0.182	0.158	0.078	0.676	0.01
PO4 (mg/L)	0.007 7	0.022	0.022	0.016	<0.005	<0.005	0.062	0.017	<0.005	<0.005	0.005
TP (mg/L)	0.044	0.04	0.07	0.04	0.06	0.10	0.45	0.11	0.06	0.05	0.01

Highlighted cells indicate parameters at or outside ANZECC (2000) guideline values

PO4 – Phosphate NH3 - Ammonia

2.12. Surface hydrology

The pre-development sub-catchment boundary is presented in Figure 11. The majority of the site drains into local depressions that are associated with MUW and REW wetlands located within the site (DBCA, 2018).

Surface water that drains into these depression pond and infiltrate. In the west of the site there is a north to south ridge, and runoff generated on the western side of the ridge drains into Little Mariginiup Lake (CCW 8161) that is located to the west of the site boundary.

Surface water features are shown in Figure 11.

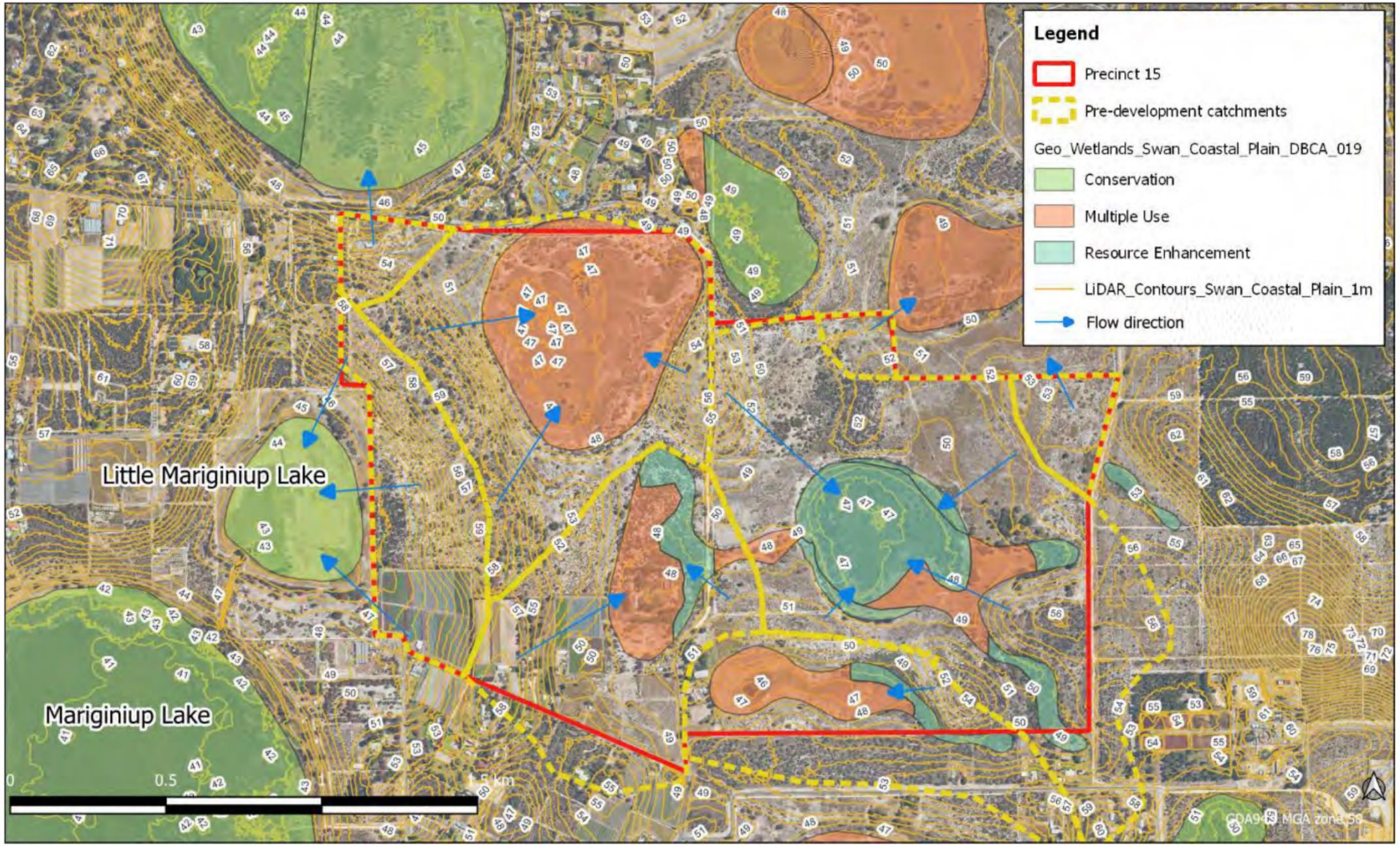

Figure 11: Pre-development surface water drainage

2.12.1. Catchment hydrology

Based on a review of publicly available datasets published by DWER, the site does not contain any mapped natural waterways. Some areas of the site experience minimal separation between land surfaces and groundwater levels, artificial drainage may have been installed in some areas of the site. Surface water is limited to intermittent local flows in shallow agricultural and road drains.

2.12.2. Pre-development flood modelling

A pre-development 1-dimensional surface water model of the entire East Wanneroo DSP area was constructed to provide an estimate on the likely volumes and top water levels in key wetlands during minor and major flood events (Urbaqua, 2021). It was noted that the increase to top water levels from the storage of surface water in key wetlands (including Lake Mariginiup, located nearby) from major and minor events was not considered to be significant (Urbaqua, 2021).

2.12.3. Surface water quantity and flow monitoring

Surface water was not expressed at the surface during any of the monitoring events across 2022 and 2023).

There is no record of historical monitoring of the wetlands on site.

2.12.4. Surface water quality monitoring

Surface water quality monitoring was not undertaken during the monitoring period as each of the locations were dry.



3. WATER SOURCE PLANNING

3.1. Potable water supply

There is a Public Drinking Water Source Area (PDWSA) boundary running across the eastern part of the site and is under the MWSSD (Metropolitan Water Supply Sewerage and Drainage) Act 1909 or the *Country Areas Water Supply Act 1947* enforced by DWER. The Gnangara UWPCA (also referred to as control area) defines the central area of the Gnangara groundwater system that provides public drinking water supply as part of the Integrated Water Supply Scheme (IWSS).

It is acknowledged that the Precinct 15 site is within the P2 area (approximately 14.6 hectares). It is understood that the Western Australian Planning Commission (WAPC) will support development across the DSP and within Precinct 15 and therefore we anticipate that this 14.6 hectares of currently zoned P2 land will be re classified as P3*.

3.2. Non-potable water supply

3.2.1. Requirements

As per the water conservation principle of "No potable water should be used outside of homes and buildings with the use of water to be as efficient as possible" in *Better Urban Water Management* (WAPC 2008)..

3.2.2. Irrigation demand analysis

The reduced irrigation rate of 6,750 kL/ha/yr has been adopted for Precinct 15. Pentium Water has prepared two irrigation scenarios outlined below and in Table 7 and Table 8. It should be noted that these irrigation demand estimates are based on the Precinct 15 Indicative Master Plan (STOMA-1-010) provided by CDP as shown in Appendix C.

- Base case scenario: The total irrigation demand of 126,995 kL/yr with two primary schools including two co-located school ovals, one High school and Public Open Space.
- Conservative scenario: The total irrigation demand of 443,895 kL/yr with two primary schools including two co-located school ovals, one High school, Public Open Space, and regional playing fields (located in the southeast corner of Precinct 15).

The conservative irrigation demand is identical to the base case scenario but includes the 45-hectare Regional Playing Fields outlined in the DSP and their associated considerable irrigation demand.

Table 7: Base Case irrigation Scenario

Area	Total Area (Ha)	Irrigated Area (Ha)	Irrigation Rate (kL/Ha/yr)	Total Water Demand (kL/yr)
Primary School 1	3.5	0.7	6,750	4,725
Primary School 2	3.5	0.7	6,750	4,725
Co-located school Oval 1	1.5	1.05	10,000	10,500
Co-located school Oval 2	1.5	1.05	10,000	10,500
High School	10	2	10,000	20,000
Public Open Space	18.9	11.34	6,750	76,545
Total Irrigation Demand	**28.90**	**16.84**		**126,995**

Table 8: Conservative irrigation Scenario

Area	Total Area (Ha)	Irrigated Area (Ha)	Irrigation Rate (kL/Ha/yr)	Total Water Demand (kL/yr)
Primary School 1	3.5	0.7	6,750	4,725
Primary School 2	3.5	0.7	6,750	4,725
Co-located school Oval 1	1.5	1.05	10,000	10,500
Co-located school Oval 2	1.5	1.05	10,000	10,500
High School	10	2	10,000	20,000
Public Open Space	18.9	11.34	6,750	76,545
Regional Playing Fields	*45.2*	*31.64*	*10,000*	*316,400*
Total Irrigation Demand	**84.10**	**48.48**		**443,895**

3.2.3. Groundwater allocation availability

The DSP site is located within the Wanneroo groundwater area. The following aquifers are present in the area:

- Perth – Superficial Swan (Unconfined, Mariginiup and Jandabup subareas).
- Perth – Leederville (Confined, Wanneroo Confined subarea).
- Perth – Yarragadee North (Confined, Wanneroo confined subarea).

Pentium Water has completed an analysis of the currently available groundwater allocations in the underlying aquifers (within Precinct 15) and adjoining groundwater subareas. Pentium Water requested a groundwater resource allocation report from DWER on 15 June 2022, which is a document that outlines the groundwater allocation status. No groundwater resources are available for allocation in the aquifers beneath Precinct 15 (or the groundwater subareas illustrated in Figure 12). No groundwater allocation will be made available by DWER, and no new groundwater licence will be provided to Stockland for the irrigation of POS or ROS within Precinct 15 as it currently stands.

Despite the facts above, groundwater licences are highly likely to be made available across the precinct as land use change progresses and the current licenced volumes as well as additional recharge to the superficial aquifer will be sufficient to irrigation the POS and ROS demands across Precinct 15. In light on this, no additional requirements to secure non-potable water to meet irrigation demand is required at this point in the planning process and this has been accepted by DWER as a practical position for Precinct 15 (pers. comm. J. Macintosh, DWER).

Figure 12 and Figure 13 below shows Precinct 15 including the groundwater subareas and the groundwater licence areas respectively. Figure 14 illustrates the current groundwater licences within Precinct 15 that could be traded or transferred to Stockland. The details of these existing licences are outlined in Table 9.

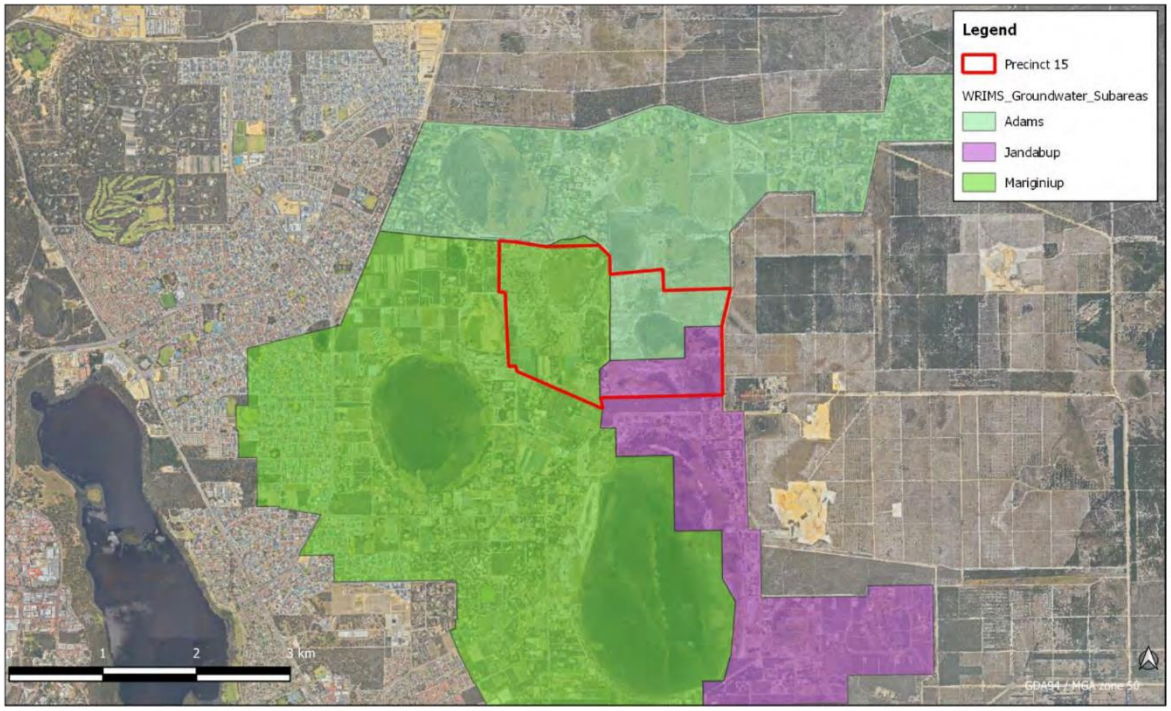

Figure 12: Extent of Precinct 15 and its groundwater subareas

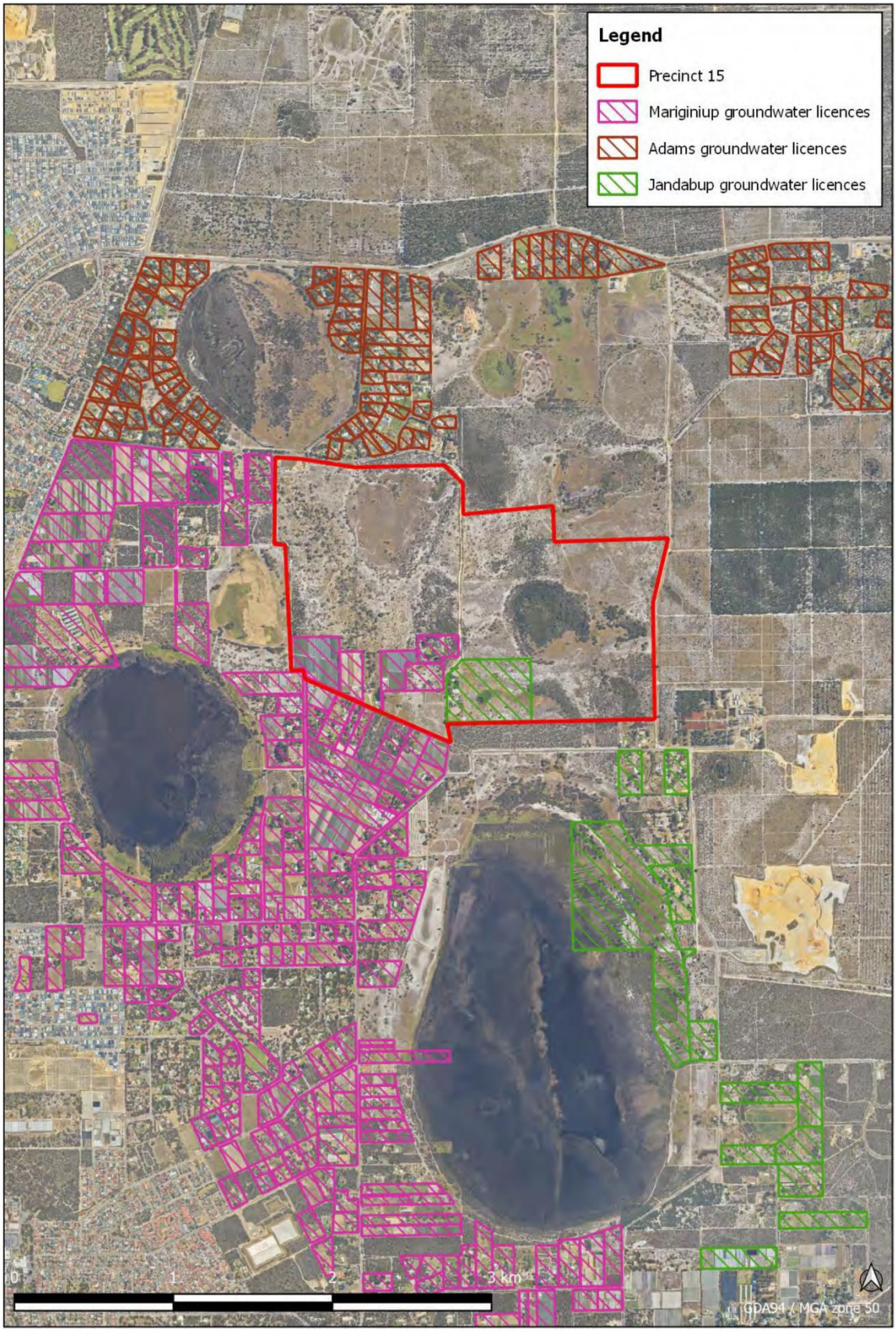

Figure 13: Extent of Precinct 15 including interior and exterior groundwater allocations

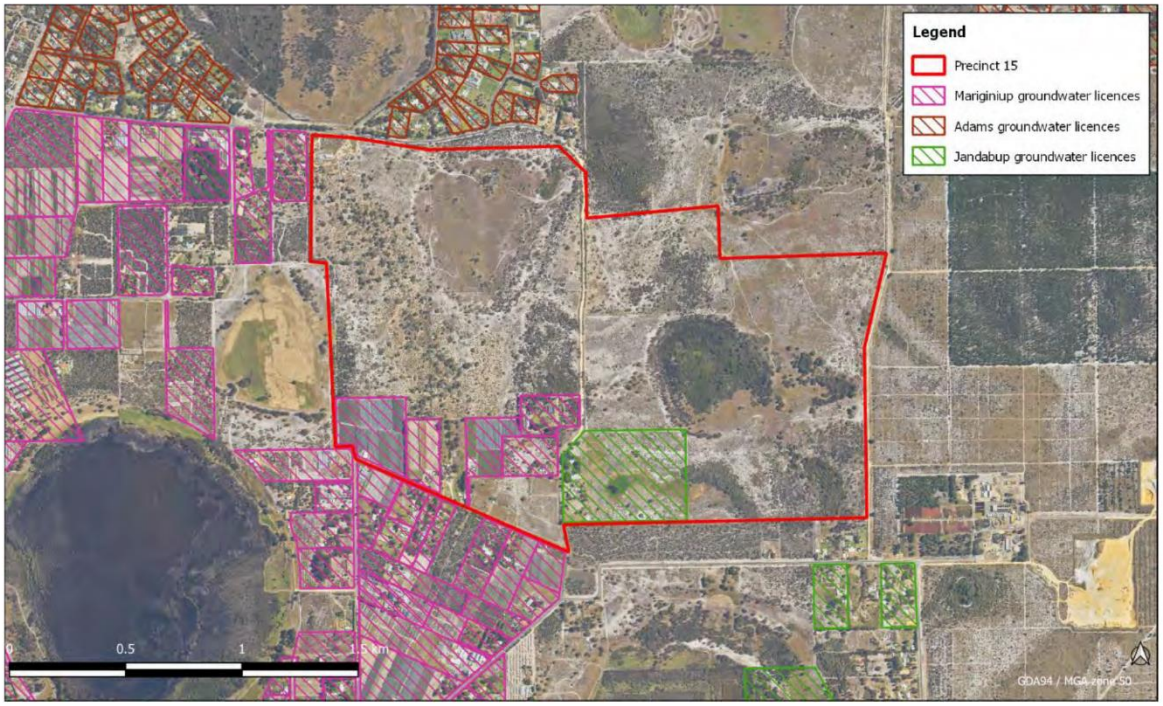

Figure 14: Groundwater licences within Precinct 15 and nearby licences

3.2.4. Groundwater allocation transfers or licence trading

There are mechanisms in place for trading and transfers of groundwater licences under the *Rights in Water and Irrigation Act 1914*. Each application is assessed on an individual, transparent and equitable basis in accordance with the requirement of the Act.

Given the current lack of availability of groundwater from the current resources then Stockland will be required to transfer existing licences during the acquisition of new properties that contain such licences or through trades for existing licences within the three groundwater subareas covering the property: Adams, Mariginiup and Jandabup.

The licences outlined in Table 9 could be transferred to Stockland should Stockland continue to acquire land within Precinct 15. Or Stockland could simply look to trade for these licences with the existing owners outside of a land acquisition deal.

Table 9: Groundwater licences within Precinct 15 and their respective subareas

Lot number	Owner(s) & Licence Address	Groundwater Licence Number(s)	Groundwater Allocation (kL)	Aquifer	Subarea
L804	**Shafto Pty Ltd**; Lot 804 Lakeview St, Mariginiup	178568	120,000	Superficial	Mariginiup
L16	**Tedesco, Andrew Joseph**; 16 Lakeview St, Mariginiup	81436	45,650		
L18	**Vince and John Guida**; Lot 18 Lakeview St, Mariginiup	47232	54,650		
L2361	**Delich, Dujo, Delich, Mara**; Lot2361 Rousset Rd, Mariginiup	86336	4,700		

Lot number	Owner(s) & Licence Address	Groundwater Licence Number(s)	Groundwater Allocation (kL)	Aquifer	Subarea
L2287	**Kevin George Stubbs**; 2287 Rousset Rd, Mariginiup 6078 WA	200368 & 200527	16,800 & 3150 respectively		
L1	**Agostino Nominees Pty Ltd**; Lot 1 Rousset Rd, Mariginiup	87316	23,600		Jandabup
Total Allocation available in the superficial aquifer within Precinct 15			268,550 kL/yr		

*Includes full allocation of GWL200368 which is split over two precincts and may not contribute fully to Precinct 15 water allocation

3.3. Wastewater servicing

The site, as well as all developments within the East Wanneroo DSP area, are to comply with the requirements of the Government Sewerage Policy (DPLH 2019). Facilities across the site (POS, residential lots etc.) are proposed to be connected to deep sewerage.

4. WATER CONSERVATION STRATEGIES

4.1. Proposed strategy

The State Water Plan (2007) is a strategic policy and planning framework to meet the state's water demands to the year 2030. One of the key targets is to reduce potable water consumption to 40 kL–60 kL per person per year. Water conservation measures will be adopted at the site to create a "Waterwise" development and minimise water-servicing requirements. The water conservation strategy will aim to reduce water demand through incorporating a variety of effective initiatives. These are described in more detail below.

4.2. Water conservation measures

The development will adopt the following water conservation measures:

- A Waterwise landscaping strategy which utilises largely native plant species with limited exotic species in select areas only to provide feature planting.
- Front yard Waterwise landscaping packages may be promoted to new home buyers. These may include the use of plant species with low water requirements, minimal turf, mulch, and soil conditioner to increase water retention.
- An outdoor private swimming pool or spa associated with a Class 1 building must be supplied with a cover or blanket.
- All internal hot water outlets (such as taps, showers and washing machine water supply fitting) must be connected to a hot water system or a recirculating hot water system with pipes installed and insulated in accordance with AS/NZS3500.
- Lot owners will be encouraged to install greywater systems for irrigation of individual household landscaping.
- Lot owners will also be encouraged to install rainwater tanks. Rainwater tanks can be connected to water using fixtures such as toilets, washing machines and external taps to reduce potable water demand.

4.3. Water appliances and fittings

As a minimum, builders will be required to fit Waterwise appliances and fittings within all display homes at the site. This will include the use of water efficient taps, showers, and water heating systems as well as Waterwise garden designs and irrigation schemes. Educational material will be made available via the use of education boards and pamphlets within display homes.

4.4. Waterwise landscaping

Landscape plans for POS areas will be provided at subdivision stage which detail the proposed landscape treatments, plantings, community facilities and integration of drainage areas with the POS landscape design. A preliminary landscape masterplan is provided in Appendix D.

The following general principles will be adopted wherever possible in the landscape design:

- Promote the use of native plants with low water and fertiliser requirements.
- Promote landscape treatments sympathetic to climate conditions and prevailing site conditions – e.g. soil types, topography, environment, wetlands etc.
- Utilise "cluster or clump" plantings to provide useable shade areas and better use of reticulated water in preference to single item or symmetrical planting regimes.
- Irrigate grass and garden areas at appropriate time so as to reduce evaporative loss and minimise transpiration losses.
- Ensure that irrigation regime is responsive to prevailing weather conditions.

5. STORMWATER MANAGEMENT

5.1. Drainage principles and criteria

The key aspects and principles of stormwater management to be adopted for the site, consistent with the DWMS (Urbaqua, 2021), are outlined below:

- Small rainfall events are to be managed at source (in lots and streets) wherever possible.
- All small event stormwater management systems are to be accommodated outside of retained wetlands and their buffers.
- Where the depth to groundwater is limited and subsurface drainage systems are required, the design of at source stormwater infiltration systems should be informed by consideration of the interaction between infiltrated stormwater and the controlled groundwater level.
- Where it is not feasible to retain or infiltrate small rainfall events at source without impacting amenity, the use of systems such as rainwater tanks, raingardens and detention tanks should be considered as alternatives to more traditional systems.

5.2. Post development catchments

Post development, the site will consist of 20 catchments as presented in Figure 15. The concept earthworks design and preliminary drainage catchment plan was prepared by Cossill and Webley, and is provided in Appendix E and F respectively.

In small rainfall events runoff generated within catchments Basin 15, Basin 16, Basin 20B and South-east School will infiltrate close-to-source or managed in internal bioretention basins. In large storm events runoff generated in these catchments will discharge into REW (UFI:15443).

Runoff generated in small rainfall events within Catchments Basin 1 and Basin 3 will infiltrate close-to-source or be managed in bioretention basins. In large storm events runoff will discharge from these catchments into Lake Adams and Little Mariginiup Lake.

Runoff generated within the remaining catchments (Basin 9, Basin 21, Basin 12, Basin, 6, Basin 8, Basin 7, Basin 20A, Basin 17, Basin 19 and LLC) will be managed internally in bioretention and flood basins.

Each basin will be under-drained via subsoil pipe network that has been sized to allow for a basin infiltration rate of 1 m/day. Further details of the subsoil drainage network are provided in Section 6.2.1.

The land use breakdown within each catchment is detailed in Table 10 below.



Figure 15: Post-development surface water drainage

Table 10: Land use breakdown (ha)

Basin ID	POS/Drainage/ REW	School	Carpark	Recreation	Community/ Neighbourhood centre	Residential (R30-40) >300m2)	Road reserve	Commercial	Total
Basin 1	4.148	0	0	0	0	9.002	7.371	0.080	20.600
Basin 3	3.216	0	0	0	0	17.110	10.984	0	31.310
Basin 9	1.819	3.500	0	0	0	16.880	6.776	0	29.975
LLC	-	-	-	-	-	-	-	-	8.200
Basin 12	1.174	0	0	0	0	14.512	7.114	0	22.800
Basin 8	0.530	0	0	0	0	4.941	4.659	0	10.130
Basin 7	1.063	0	0	0	0	5.036	4.371	0	10.470
Basin 21	0.9	0	0	0	0	6.578	3.542	0	11.02
Basin 6	2.686	0	0	0	0	4.473	1.291	0	8.450
Basin 19	1.281	4.80	1.784	0	4.761	2.279	3.726	0	18.630
South-east School	0	3.644	0	0	0	0	0	0	3.644
Basin 20A	0.573	0	0	0	0	2.812	1.425	0	4.789
Basin 17	0.454	0	0	0	0	4.659	2.677	0	7.781
Basin 20B	0.827	0	0	0	0	7.174	2.910	0	10.911
Basin 15	2.481	0	0	0	0	4.048	2.932	0	9.460
Basin 16	0.494	0	0	0	0	11.023	6.153	0	17.715
South Recreation	1.8	0	1.5	7.6	0	0	5.261	0	16.161
South-east Recreation	5.311	0	0	0	0	0	0	0	5.311
East Recreation	10	0	0.8	12.96	0	0	0.8	0	24.56
REW	28.789	0	0	0	0	0	0	0	28.789
Total	**67.546**	**11.944**	**4.084**	**20.56**	**4.761**	**110.545**	**71.992**	**0.08**	**291.494**

5.3. Stormwater management strategy

5.3.1. Minor drainage system including the small (15mm) event

5.3.1.1. Lot drainage >300 m²

Residential lots greater than 300 m² in size will be fitted with soakwells within the lot boundary sized to infiltrate the first 15 mm of rainfall.

5.3.1.2. Road reserve

Road runoff will drain to roadside swales or POS, or to either at-source infiltration solutions (i.e. rain gardens, tree pits) or a combination of the above and include draining to basins via a pit and pipe system that will provide bioretention treatment for up to the first 15 mm of rainfall runoff. Managing small rainfall events via close-to-source infiltration will effectively mimic the pre-development

hydrological regime of the site and reduce both the volume and peak flow rate of stormwater discharging into the REW.

5.3.1.3. Other land use types

The first 15 mm of rainfall from schools, recreation, community/ neighbourhood and carparks will be retained within the lot boundaries using soakwells, rainwater tanks or other WSUD methods. Note that all runoff generated within the currently denoted railway reserve through the precinct is assumed to be managed within that rail reserve boundary and does not contribute the drainage basins designs outlined for the POS areas.

5.3.1.4. Bioretention treatment

The effective impervious area was calculated within each catchment as 10% of lots and community/neighbourhood centres; and 80% or Road Reserve area, as summarised in Table 11. Bioretention treatment will be provided for the first 15 mm of rainfall that falls on effective impervious areas within the basins.

The current calculations and assumptions allow for all drainage to be accommodated in bioremediation basins within POS. We understand that this is not proposed to be the outcome, however it provides some conservatism to the calculations of encumbered POS that does not receive a credit through the urban design process.

The required bioretention treatment basin areas for each catchment are detailed in Table 13.

Table 11: Effective impervious area for bioretention treatment

Catchment	Effective impervious area (ha)*
Basin 1	6.797
Basin 3	10.498
Basin 9	7.109
Basin 12	7.142
Basin 8	4.221
Basin 7	4.000
Basin 21	3.491
Basin 6	1.480
Basin 19	3.685
Basin 20A	1.421
Basin 17	2.608
Basin 20B	3.045
Basin 15	2.750
Basin 16	6.025
Total	**64.274**

5.3.2. Major drainage system

The roadside pipe and pit network and swales will be sized to convey the 20% Annual Exceedance Probability (AEP) event. In larger events runoff may be conveyed within the road reserves, with a maximum depth of 0.2 m in the 1% AEP event.

Stormwater modelling was undertaken to size the required bioretention and flood storage in the 1% AEP storm event required in each basin using XPSWMM. The loss rates adopted for each land use type is detailed in Table 12 below.

Basins located adjacent to REW (UFI 15443) including basins 15, 16 and 20B have been sized to retain the 1 Exceedance Year (EY) (1 year) event. In larger storm events they will discharge into the REW which will provide additional flood storage.

Basin 1 and Basin 3 have been sized to retain the 1 EY event and in larger storm events will discharge into Lake Adams and Little Mariginiup Lake.

As REW (UFI 15443), Lake Adams and Little Mariginiup Lake will be less than 0.5 m deep in the 1% AEP event as they are relatively large in size as compared to their contributing catchments.

All other basins within the site have been sized for the full retention and infiltration of up to the 1% AEP event with a maximum depth of 1.2 m.

Table 12: Uniform Loss rates

	Drainage/ POS	School	Carpark	Recreation	Community/ Neighbourhood centre	Road reserve	Residential (R30-40) >300m2
Initial Loss (mm)	20	15	5	15	15	4	15
Proportional loss	0.2	0.2	0.15	0.2	0.2	0.2	0.2

5.4. Modelling results

The bioretention treatment and flood storage areas required in each catchment and is detailed in Table 13 below. The sizing of the basins assumes an infiltration rate of 1 m/day.

Table 13: Stormwater basin designs based on 1 m/day infiltration rate

Basin ID	Bioretention treatment area for first 15 mm rainfall (1 in 3 side slopes)			Area at 0.31 m depth (m2)	20% AEP (1 in 6 side slopes)			1% AEP (1 in 6 side slopes)			Outlets to (in > first 15 mm rainfall event)
	Base area (m2)	Area at 0.3 m (m2)	Volume (m3)		Max depth (m)	Top area (m2)	Max volume (m3)	Depth (m)	Top area (m2)	Max volume (m3)	
Basin 1	1600	0.30	1747	502	NA	NA	NA	NA	NA	NA	Lake Adams
Basin 3	2500	0.3	2683	777	NA	NA	NA	NA	NA	NA	Little Mariginiup Lake
Basin 9	1521	1665	480	15200	0.54	16000	4050	1.2	17900	15224	NA
Basin 12	1521	1665	480	11670	0.55	12300	3427	1.2	14110	12592	NA
Basin 8	1024	1142	325	5041	0.56	5520	1776	1.2	6691	5716	NA
Basin 7	961	1076	307	5329	0.56	5800	1700	1.2	7022	5831	NA
Basin 21	676	773	229	5776	0.54	6260	1603	1.2	7534	5777	NA
Basin 6	289	353	96	4225	0.54	4630	1226	1.2	5746	4432	NA
Basin 19	1089	1211	356	9800	0.54	10410	2786	1.2	12060	10033	NA
Basin 20A	289	353	98	2116	0.60	2460	804	1.2	3226	2635	NA
Basin 17	576	666	186	3844	0.55	4230	1247	1.2	5300	4102	NA
Basin 20B	1225	1354	387	NA	NA	NA	NA	NA	NA	NA	REW (UFI:15443)
Basin 15	1089	1211	345	NA	NA	NA	NA	NA	NA	NA	REW (UFI:15443)
Basin 16	2401	2581	747	NA	NA	NA	NA	NA	NA	NA	REW (UFI:15443)

6. GROUNDWATER MANAGEMENT

6.1. Overview

A district groundwater management scheme will control post-development groundwater level rise through subsoil drainage in areas that are likely to either become submerged or have shallow depth to groundwater if no groundwater control measures are implemented. The groundwater management scheme is to be informed by a detailed groundwater model that is currently under development. In the absence of the groundwater model results and the groundwater management scheme design, planning must follow requirements stipulated in the DWMS (Urbaqua, 2021).

6.2. Groundwater control

The DWMS proposed the controlled groundwater level (CGL) be represented by the 1986 to 1995 AAMGL, but notes:

> *The impacts of using an AAMGL rather than MGL (maximum groundwater level) as the CGL near wetlands and important environmental values will require further consideration when detailed modelling is undertaken for the preparation of the local water management strategy for each precinct.*

The DWMS also states:

> *Where local structure planning is proceeding in advance of the detailed local groundwater modelling being available, the local structure plan must:*
>
> - *Install groundwater management systems (subsoil drains) at invert levels based on the determined controlled groundwater level (CGL) in areas where the predicted future groundwater level is within 2m of the future design surface.*

The CGL, clearance of the drainage basins to CGL, and subsoil drainage extent have been assessed in accordance with the requirements specified in the DWMS.

6.2.1. Controlled Groundwater Level (CGL)

The proposed CGL for the East Wanneroo DSP area is the 1986 to 1995 average annual maximum groundwater level (AAMGL), which is considered appropriate for Precinct 15 without adjustment. Several surface water infiltration basins have been identified across the site, as shown in Figure 15. The DWMS specifies that subsoil drainage is to be at the CGL, and the subsoil drainage pipework will underlie the surface water infiltration basins. A clearance of at least 0.5 m from the basin invert to the CGL will therefore be required to allow for the subsoil drainage pipework to have an invert level at CGL and to allow for infiltration from the surface water basins.

6.3. Groundwater modelling

No specific groundwater modelling has been undertaken to provide groundwater level comparisons between “no-development” and “post-development” model scenarios as it is understood this work is being completed by DPLH. The proponent for Precinct 15 understands that modifications to the drainage design and earthworks design may be required to as a result of the upcoming Groundwater Management Scheme design process.

6.4. Groundwater Management Responses

Subsoil drains will be located beneath road reserves and POS areas to aid infiltration. The detailed design of the subsoil drainage network has not yet been undertaken.

The subsoil drainage design response will also consider the subsoil drainage pipe sizing in response to an appropriate infiltration rate at each POS area. Currently, the flood storage basins have been sized based on an assumed infiltration rate (continuing loss) of 1 m/d.

The DWMS describes a groundwater management scheme that will be controlled by subsoil drainage. Precinct 15 is an undulating area with several post-development surface water catchment draining internal to the precinct and not draining to major lakes or wetlands. The project team understands that these internally draining catchments will be governed by the groundwater harvesting scheme and subsoil drainage abstraction during rainfall events will be critical.

The current earthworks design and subsoil drainage design allows for catchments to drain subsoil drainage to low points in the landscape where it is anticipated a pumping system will abstraction or transfer subsoil drainage to a disposal or final use location. The engineering drawings appended to the report illustrate the preliminary design as it relates to the subsoil drainage networks and its likely abstraction and transfer locations.

The current urban design and engineering drainage design supports flexibility in response to the future groundwater management scheme and is consistent with the known design principles. The urban design responds to the likely infrastructure demands and land take of the groundwater management scheme.

7. MONITORING REQUIREMENTS

7.1. Pre-development monitoring

Pre-development monitoring is on-going across the Precinct 15 development. Details are provided in Section 2.11.3. The monitoring completed captured a winter peak for 2022, with monitoring to continue for a further year to capture a total of two consecutive winter peaks.

7.2. During and post-development monitoring

During post-development, monitoring will be carried out at the site to detect changes to water quality and verify the performance of the proposed management strategies. The proposed period for post-development monitoring is no less than 18 months, as outlined in the DWMS (Urbaqua, 2021). Additional monitoring may be required at the site and should be confirmed with DWER.

Post-development groundwater monitoring will occur on a quarterly basis for levels and quality at 10 groundwater bore locations, with site specific bores MB05 to MB10 being additionally monitored on a monthly basis during winter (June to October). Groundwater loggers installed at each of the bores will continue to collect continuous groundwater level data. The same water quality parameters that were sampled pre-development will be sampled for a period of no less than 18 months after practical completion of the development.

Bores that were monitored pre-development will attempt to be located for post-development monitoring. Where bores have been either destroyed or are no longer available for use, a new bore is to be installed in a location as close to possible as the original bore to ensure consistency in the monitoring regime.

Surface water monitoring will be undertaken at the same frequency (monthly field sampling and bi-annual sampling for laboratory testing), duration and locations as pre-development monitoring. Surface water quality will be measured for the same water quality parameters as the groundwater monitoring. Exact locations will be determined in the respective UWMPs. Capacitance loggers installed at the four surface water locations monitored pre-development will continue to collect continuous surface water level data.

7.3. Trigger values

Baseline water quality will be established after a minimum 18 months (2 winters) of continuous pre-development data collection. Appropriate trigger levels will be determined for contingency action at the conclusion of this period of data collection.

7.4. Reporting

Annual reporting is proposed to review the post-development monitoring program and recommend revisions where necessary to improve understanding of surface water and groundwater systems.

8. FURTHER INVESTIGATIONS

8.1. Further work

The preparation of Urban Water Management Plans (UWMPs) will be required as a condition of subdivision approval and will include the following design measures in more detail:

- Compliance with this LWMS criteria and objectives to the satisfaction of the CoW and DWER
- Detailed stormwater drainage design including final levels and dimensions for bioretention and flood storage areas
- Specific detailed information on structural and non-structural Best Management Practices to be implemented within each subdivision
- Final subdivision layout including final cut and fill levels, minor and major drainage layout and overland flow paths
- Management of subdivision works including details of licence application for dewatering or dust suppression if required
- Updated POS landscaping design drawings which will include design contours, cross-sections, storage areas, plant species, fertiliser regimes and irrigation scheduling
- Detailed monitoring program for both groundwater and surface water monitoring including sampling locations
- Finalised implementation plan including roles and responsibilities of all parties involved.

8.2. Implementation plan

The proposed operation and maintenance program is outlined in Table 14 below.

Table 14: LWMS roles and responsibilities

Principle	Role	Responsibility	Time-scale
Monitoring	Groundwater monitoring	The proponent	Quarterly groundwater levels and water quality monitoring of bores for a period of 18 months following practical completion, with a review after 18 months.
	Surface water monitoring	The proponent	Quarterly surface water levels and water quality monitoring for a period of 18 months following practical completion, with an initial review after 18 months.
Irrigation bore	Bore monitoring and maintenance	The proponent until POS handover. Bore to be serviced prior to pump handover to CoW.	As per the bore licence conditions specified by DWER until handover to the CoW.
Subdivision management	Construction and site works management	The proponent	As required during construction until handover to the CoW.
	Waste and pollution management	The proponent	As required during construction until handover to the CoW.
	Erosion Control	The proponent	As required during construction.

Principle	Role	Responsibility	Time-scale
POS and landscaped community areas	Maintenance of drainage infrastructure	The proponent	As specified within the POS design documentation until handover to CoW.
	Fertiliser application	The proponent	As specified within the POS design documentation until handover to CoW.
	Irrigation systems	The proponent	As specified within the POS design documentation until handover to CoW.

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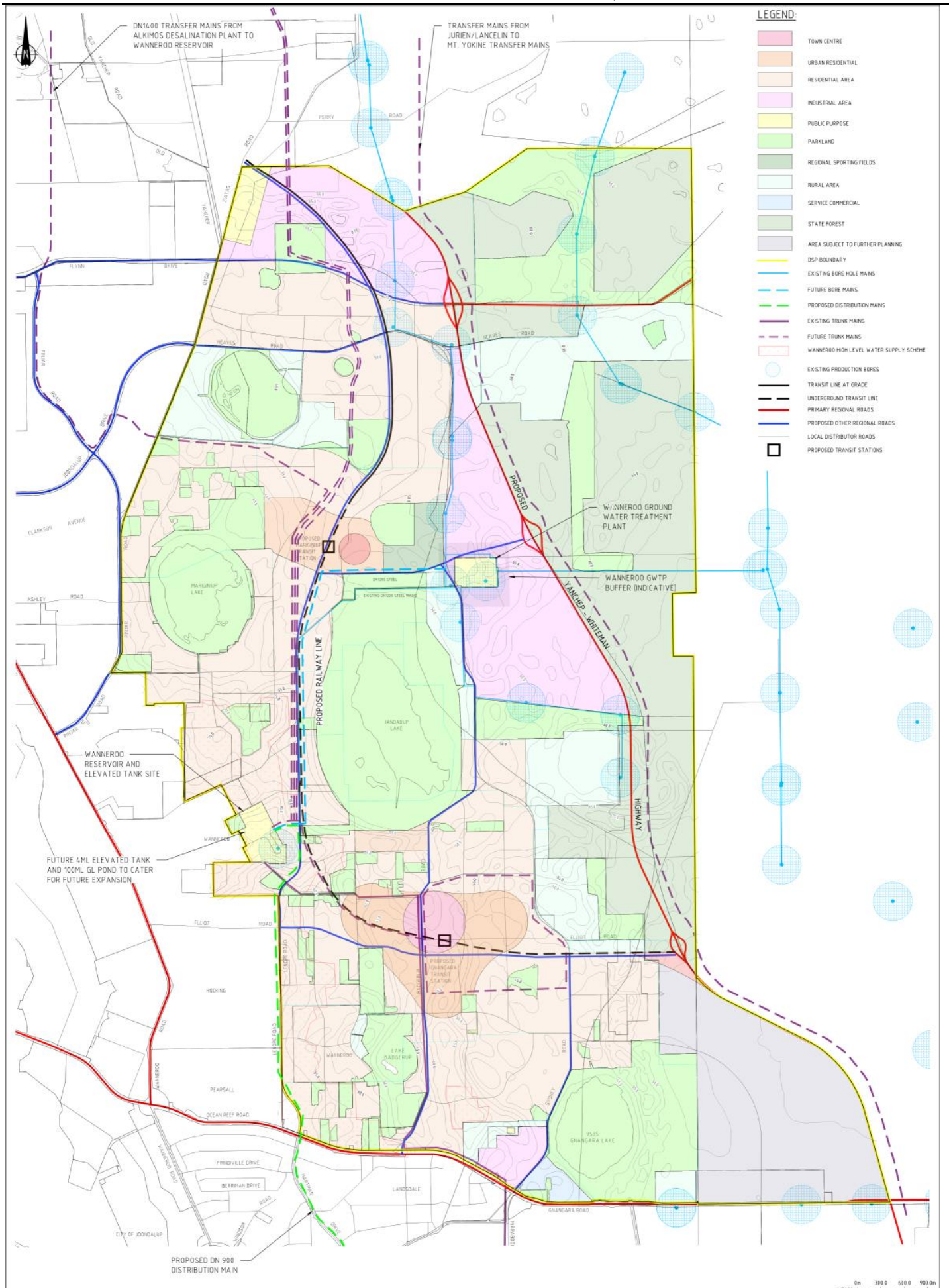
LEGEND:
TOWN CENTRE
URBAN RESIDENTIAL
RESIDENTIAL AREA
INDUSTRIAL AREA
PUBLIC PURPOSE
PARKLAND
REGIONAL SPORTING FIELDS
RURAL AREA
SERVICE COMMERCIAL
STATE FOREST
AREA SUBJECT TO FURTHER PLANNING
DSP BOUNDARY
EXISTING BORE HOLE MAINS
FUTURE BORE MAINS
PROPOSED DISTRIBUTION MAINS
EXISTING TRUNK MAINS
FUTURE TRUNK MAINS
WANNEROO HIGH LEVEL WATER SUPPLY SCHEME
EXISTING PRODUCTION BORES
TRANSIT LINE AT GRADE
UNDERGROUND TRANSIT LINE
PRIMARY REGIONAL ROADS
PROPOSED OTHER REGIONAL ROADS
LOCAL DISTRIBUTOR ROADS
PROPOSED TRANSIT STATIONS
DN1400 TRANSFER MAINS FROM ALKIMOS DESALINATION PLANT TO WANNEROO RESERVOIR
TRANSFER MAINS FROM JURIEN/LANCELIN TO MT. YOKINE TRANSFER MAINS
WANNEROO GROUND WATER TREATMENT PLANT
WANNEROO GWTP BUFFER (INDICATIVE)
PROPOSED RAILWAY LINE
YANCHEP - WHITEMAN HIGHWAY
WANNEROO RESERVOIR AND ELEVATED TANK SITE
FUTURE 4ML ELEVATED TANK AND 100ML GL POND TO CATER FOR FUTURE EXPANSION
PROPOSED DN 900 DISTRIBUTION MAIN
PERRY ROAD
FLYNN DRIVE
HEAVES ROAD
JOONDALUP DRIVE
CLARKSON AVENUE
ASHLEY ROAD
MARIGINIUP LAKE
JANDABUP LAKE
ELLIOT ROAD
HOCKING
PEARSALL
OCEAN REEF ROAD
PRINSVILLE DRIVE
BERRIMAN DRIVE
LANDSDALE
GNANGARA ROAD
LAKE BADGERUP
9535 GNANGARA LAKE
CITY OF JOONDALUP
0m 300.0 600.0 900.0m
1:15000
DEPARTMENT OF PLANNING, LANDS AND HERITAGE
Cossill & Webley
EAST WANNEROO DSP
PROPOSED WATER SUPPLY SCHEME CONCEPT
6371-00-WATER