Forrestfield North Residential Precinct Local Structure Plan (Kala/SPN/2173)

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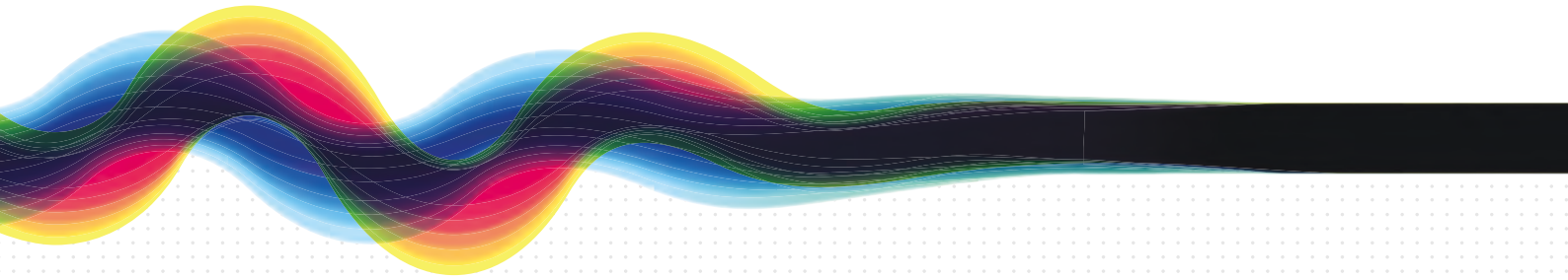

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Endorsement Page

This structure plan is prepared under the provisions of the City of Kalamunda
Local Planning Scheme No. 3.

IT IS CERTIFIED THAT THIS STRUCTURE PLAN WAS APPROVED BY RESOLUTION OF THE WESTERN AUSTRALIAN PLANNING COMMISSION ON: 27 JULY 2020

Signed for and on 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

27 July 2020

_____ Date

27 July 2030

_____Date of Expiry

Table of Amendments

Amendment No.	Summary of the Amendment	Amendment Type	Date approved by WAPC

Table of Cell Based Density Plans

Cell Based Density Plan No.	Area of density plan application	Date approved by WAPC

Executive Summary

This local structure plan has been prepared to facilitate the coordinated development of the Forrestfield North Residential Precinct as identified in the Forrestfield North District Structure Plan.

The structure plan area encompasses the land generally bounded by Poison Gully Creek, Roe Highway, Sultana Road West and Milner Road, just to the east of the new Forrestfield Train Station, and the associated Transit Oriented Development and Activity Centre Precincts.

The local structure plan area covers 90 landholdings and Bush Forever site 45 and is located within the municipality of the City of Kalamunda. The combined site area for the local structure plan is 123.05ha including that portion of Roe Highway immediately abutting the eastern edge of the precinct. Roe Highway, in conjunction with Berkshire Road, Dundas Road and Maida Vale Road, currently service the accessibility requirements of the area.

The Forrestfield North Residential Precinct currently consists primarily of rural residential development including single houses and associated outbuildings on lots generally around one hectare in area. It includes an established sealed road network to service existing properties and a number of generally underutilised bridle trails that reflect the historic character and use of the area.

The area also features substantial tracts of remnant vegetation and significant tree canopy, particularly within the central section and eastern part of the precinct abutting Roe Highway. The former Brand Road Landfill site is located in the eastern part of the precinct close to Roe Highway.

The proposed local structure plan is a considered response to the constraints presented by the Residential Precinct. Considerations have included the following:

- The retention of the significant environmental values of the area to the greatest extent practical.
- The protection and enhancement of the ecological value of Poison Gully Creek .
- A district open space (sporting precinct) is proposed to utilise the land at the old landfill site on Brand Road to meet existing and emerging community need.
- A primary school is proposed to be co-located with the sporting precinct to create a combined education and sporting precinct within the area.
- A proposed town park will provide both passive and active recreational opportunities in a central location in close proximity to the proposed activity centre and Forrestfield Train Station.
- Where possible, existing roads have been re-purposed as part of the new development. The broader intention of the project is to frame roads with vegetation and provide longer vistas to conservation and public opens space areas to retain and build on the bush character of the locality.
- The provision of an integrated cycle and pedestrian network throughout the precinct connecting to the Forrestfield Train Station via the town park and activity centre at the core of the Forrestfield North project area.
- Repurposing of existing bridle trails either as part of environmental areas or the proposed public open space network. Additionally, the Structure Plan seeks to utilise the existing road network with a new TOD Connector road to ultimately connect Forrestfield North and Maida Vale South.

- An integrated approach to bushfire management with perimeter roads proposed at the interface with both external and internal bushfire prone vegetation where possible.
- The delivery of an appropriate interface to the Forrestfield / High Wycombe Light Industrial Area on the western side of Sultana Road West.
- Co-location of drainage areas with public open space and in some instances the use of underground storage due to size limitations and the need to manage potential impacts on the future urban form.
- Responding appropriately to noise and vibration from road traffic, Perth Airport, Forrestfield Train Station and nearby freight rail with treatments and notification requirements identified for implementation.
- The delivery of an approporiate interface to the Forrestfield Station Transit Oriented Development Precinct to the west of the residential precinct.

The proposed local structure plan comprises the following key elements:

- Seven separate development cells to assist with land assembly and project delivery, defined by key road infrastructure and a public open space network.
- Nine public open space areas, including the proposed town park and sporting precinct.
- Thirteen environmental conservation areas.
- Seven designated drainage areas forming part of the public open space network.
- A new TOD Connector road to provide access to the new TOD Precinct to the north.
- A proposed flyover across Roe Highway.
- Proposed town park centrally located within the precinct.
- A primary school site collocated with district open space as part of a combined education and sporting precinct.
- Residential development ranging in density from Residential R40 to Residential R100 with densities increasing as you move west through the precinct towards the Forrestfield Train Station.

It is intended that the local structure plan will promote a future housing environment that encompasses high quality medium to high residential development, with consistency of quality ensured through the application of comprehensive private realm design guidelines. Future development forms are expected to encompass single houses, grouped dwellings and apartments. A key focus of the future residential development will be the delivery of the 'missing middle', a significant gap in Perth's housing market, generally comprising more efficient high amenity medium density housing in terraces or other innovative forms.

The local structure plan provides for over 30 hectares of open space in the form of local open space, environmental conservation areas and pre-existing Bush Forever. A landscaping concept plan has been prepared by Place Laboratory to broadly depict the open space intent and support the approach to water management. The landscaping concept plan is based on the ambition to create a 'Forest Neighbourhood', a medium to high density area with a bush character.

The approach to future land assembly has been a key focus of the preparation of the local structure plan. Using the proposed road and public open space network, seven separate development cells have been defined to facilitate future development. The development of the cells independently of each other will be facilitated by the provision of key infrastructure under the development contributions for the precinct, reducing reliance on typical estate land developers and providing a wider range of future development options for existing landowners with the precinct.

The development of the structure plan area is likely to be implemented in multiple stages due to the fragmented land ownership and the significant size of the future development area. Final development staging and composition will also be dependent upon a number of factors, including market demand, servicing and infrastructure considerations.

Table 1 – Structure Plan Summary

Item	Data	Structure Plan Ref (section no.)
Total area covered by the structure plan	123.0591 hectares (incl Roe Highway)	1.2.1
Area of each land use proposed • Residential • Community Purpose	Hectares Lot Yield 47.5228 2,612 3.9773 1	2.7.2
Total estimated lot yield	2,612	2.7.1.3
Estimated number of dwellings	3,576	2.7.1.3
Estimated residential site density	75.24 dwellings per hectare	2.7.1.3
Estimated population	8,582	2.7.1.2
Number of high schools	0	2.7.5.1
Number of primary schools	1	2.7.2 and 2.7.5.1
Estimated commercial floor space	Up to 150m^2 net lettable area (notional allocation within Sporting Precinct)	2.7.2
Estimated area and percentage of public open space given over to: • Regional Open Space • District Open Space • Neighbourhood Parks • Local Parks	 1.0412 hectares (0.8%) 10.5164 hectares (8.5%) 8.9784 hectares (7.3%) 4 parks 2.7440 hectares (2.2%) 3 parks	2.7.3
Estimated percentage of natural area (Environmental Conservation)	10.0685 hectares (8.1%)	2.7.3

* It is noted that the lot yield, dwelling and population estimates provide an indication of future development potential only and may vary. Estimates will be confirmed when cell density plans are prepared for the separately identified development cells within the LSP area in accordance with the requirements set out under Part One - Implementation of the LSP.

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Abbreviations

ACM - Asbestos Containing Material

AH Act - Aboriginal Heritage Act 1972

AHD – Australian Height Datum

ANEF – Australian Noise Exposure Forecast

APZ - Asset Protection Zone

ARI – Average Return Interval

ASS – Acid Sulfate Soils

BAL – Bushfire Attack Level

BAM Act - Biosecurity and Agriculture Management Act 2007

BHL – Bushfire Hazard Level

BMP – Bushfire Management Plan

BMPS – Best Management Practice

BoM – Bureau of Meteorology

CC – Carnaby's Cockatoos

CIS – Community Infrastructure Strategy

City – City of Kalamunda

CS Act – Contaminated Sites Act 2003

DA – Development Application

DBCA - Department of Biodiversity, Conservation and Attractions

DC 1.6 – Development Control Policy 1.6 – Planning to Support Transit Use and Transit Oriented Development

DC 4.1 – Development Control Policy 4.1 – Industrial Subdivision

DCA – Development Contribution Area

DCP – Development Contribution Plan

DEE – Department of the Environment and Energy

Development Plan (Plan 2) – Forrestfield North Residential Precinct Development Plan

DFES – Department of Fire and Emergency Services

DoW – Department of Water (now DWER)

DRF – Declared Rare Flora

DSAs – Drainage Storage Areas

Residential Precinct - Forrestfield North District Structure Plan

DWER – Department of Water and Environmental Regulation

DWMS – District Water Management Strategy

EAMS – Environmental Assessment and Management Strategy

EC – Environmental Conservation Reserves

EELS – Economic and Employment Lands Strategy

EPA – Environmental Protection Authority

EPBC Act – Environment Protection and Biodiversity Conservation Act 1999

ESAs – Environmentally Sensitive Areas

FFN – Forrestfield North

FLC - Freight and Logistics Council

Residential Precinct or precinct – Forrestfield North Residential Precinct

FRTBC – Forest Red-tailed Black Cockatoos

Green Growth Plan – Perth and Peel Green Growth Plan for 3.5 million

Guidelines – Guidelines for Planning in Bushfire Prone Areas

ISR – Infrastructure Servicing Report

KHIM – Kewdale Hazelmere Integrated Masterplan

LGA – Local Government Authority

LILO – Left-in/Left-out

LN – Liveable Neighbourhoods

LPS3 - City of Kalamunda Local Planning Scheme No. 3

LSP – Local Structure Plan

LSP area – Local Structure Plan area

LSP Map (Plan 1) – Forrestfield North Residential Precinct Local Structure Plan Map

LWMS – Local Water Management Strategy

MAR – Managed Aquifer Recharge

MNES - Matters of National Environmental Significance

MRIF – Metropolitan Region Improvement Fund

MRS – Metropolitan Region Scheme

MRWA - Main Roads WA

MUW – Multiple Use Wetland

OEPA - Office of the Environmental Protection Authority

PD Act – Planning and Development Act 2005

PD Regulations - Planning and Development (Local Planning Schemes) Regulations 2005

POS – Public Open Space

PP3.5 – Perth and Peel@3.5 million

PTA - Public Transport Authority

R-Codes – State Planning Policy 3.1 – Residential Design Codes

REW – Resource Enhancement Wetland

SPP 2 – State Planning Policy 2 – Environment and Natural Resources Policy

SPP 2.8 – State Planning Policy 2.8 – Bushland for the Perth Metropolitan Region

SPP 2.9 – State Planning Policy 2.9 – Water Resources

SPP 3 – State Planning Policy 3 – Urban Growth and Settlement

SPP 3.6 – State Planning Policy 3.6 – Development Contributions for Infrastructure

SPP 3.7 – State Planning Policy 3.7 – Planning in Bushfire Prone Areas

SPP 4.1 – State Planning Policy 4.1 – Activity Centres for Perth and Peel

SPP 5.1 – State Planning Policy 5.1 – Land Use Planning in the Vicinity of Perth Airport

SPP 5.4 – State Planning Policy 5.4 – Road and Rail Transport Noise and Freight Considerations in Land Use Planning

TAG – Technical Advisory Group

TEC – Threatened Ecological Community

The Framework – North-East Sub-regional Planning Framework (March 2018)

TIA – Transport Impact Assessment

TOD - Transit Oriented Development

TP – Total phosphorus

UWMP – Urban Water Management Plan

WAPC – Western Australian Planning Commission

WC - Water Corporation

WC Act – Wildlife Conservation Act 1950

WSUD – Water Sensitive Urban Design

Part One – Implementation

1. Structure Plan Area

This Local Structure Plan (LSP) applies to the Forrestfield North Residential Precinct (Residential Precinct or precinct) generally bound by Poison Gully Creek to the north, Roe Highway to the east, Sultana Road West to the south and Milner Road to the west, being the land contained within the inner edge of the line denoting the LSP boundary as shown on the Forrestfield North Residential Precinct Local Structure Plan Map.

Refer to Forrestfield North Residential Precinct LSP - Local Structure Plan Map (Plan 1)

The LSP Map outlines intended land uses and residential densities within the structure plan area and aligns generally with the City of Kalamunda (the City) Local Planning Scheme No. 3 (LPS3) and Forrestfield North District Structure Plan (DSP).

2. Operation

The date the LSP comes into effect is the date the structure plan is approved by the Western Australian Planning Commission (WAPC).

3. Staging

The development of the LSP area will be implemented in multiple stages due to the fragmented land ownership and significant size of the future development area. Final development staging and composition will also be dependent upon a number of factors, including market demand, servicing and infrastructure considerations.

Indicative development staging is shown under Figure 44 in Part Two based on short term services availability, pre-existing road access and prevailing market conditions at the time of the preparation of the LSP.

4. Subdivision and Development Requirements

4.1 Land Use Permissibility

The LSP Map (Plan 1) outlines the land use and residential density intent within the LSP area. Land use permissibility within the LSP area shall be in accordance with the corresponding zone or reserve purpose under the City's LPS3.

4.2 Cell Based Density Plans and Supporting Information Requirements

Seven (7) separate development cells (Development Cells 01 – 07) have been defined to facilitate future development as depicted on the Forrestfield North Residential Precinct Development Plan.

Refer to Forrestfield North Residential Precinct LSP – Development Plan (Plan 2)

The development of the cells independently of each other will be facilitated by the provision of key infrastructure under the Development Contribution Plan (DCP) for the precinct, reducing reliance on typical estate land developers and providing a wider range of future development options for existing landowners with the precinct. Development consistency across the precinct will be delivered through the implementation of public realm and private realm design guidelines.

Prior to subdivision or development, a cell density plan is to be submitted for each cell, incorporating the additional information as set out in Table 2.

In respect to these requirements, Clause 20(b)(ii) of the *Planning and Development Regulations 2009* provides the ability for the WAPC to request any other information the Commission requires to determine an application for subdivision.

Table 2 – Additional Information to be Submitted with Cell Density Plan

Item Number	Item	Additional Information To Be Submitted
1.	Public Realm Infrastructure – Roads, Drainage and additional POS (where proposed)	A simple compliance statement and details of public realm infrastructure consistent with the Forrestfield North Residential Precinct Public Realm Design Guidelines.
2.	Earthworks Plan	Earthworks plan showing proposed levels.
3.	Tree Retention	Landscape Feature and Tree Retention Plan, which details location, species, size and structural health of significant trees (>50cm DBH) on site, and associated retention proposal.

4.3 Conditions of Subdivision and Development Approval

Table 3 prescribes the regulatory provisions of the LSP pertaining to requirements and pre-requisites for subdivision and development within the LSP area, pursuant to the *Planning and Development (Local Planning Schemes) Regulations 2015*.

At the time of subdivision, the City may recommend conditions to the WAPC, as applicable, requiring the preparation and/or implementation of conditions outlined in Table 3.

These conditions are listed to guide decision making only and do not fetter the WAPC with respect to decision making or imposing model conditions set by the WAPC.

Table 3 – Conditions of Subdivision and Development

Item Number	Item	Additional Information To Be Submitted
1.	Bushfire Management	1.1 Bushfire Management Plans (BMPs) are required to be prepared for subsequent subdivision and Development Applications (DA) and are to meet the relevant commitments outlined in the BMP at Technical Appendix B, address the relevant requirements of State Planning Policy 3.7 - Planning in Bushfire Prone Areas (SPP 3.7) (i.e. Policy Measures 6.4 and 6.5 respectively) and demonstrate in detail how the proposed development will incorporate the relevant acceptable solutions to meet the performance requirements of the Guidelines for Planning in Bushfire Prone Areas. Future BMPs are to include the following detailed information: • proposed lot layout and detailed Public Open Space (POS), reserve and drainage basin design • post development classified vegetation extent, effective slope and separation distances • post development Bushfire Attack Level (BAL) application requirements • BAL contour map demonstrating that proposed development areas will achieve a rating of BAL– 29 or lower • width and alignment of compliant Asset Protection Zones (APZs) • confirmation of how bushfire management will be addressed during development staging • confirmation of how bushfire management will be addressed with regards to temporary bushfire hazards on adjacent future development stages, including staging buffers or temporary quarantining of lots where required • proposed approach to fuel management or AS 3959 application in response to on-site POS or easements (if and where required) • vehicular access provisions, including demonstration that a minimum of two access routes will be achieved for each stage of development in accordance with acceptable solution A3.1 • water supply provisions with regards to reticulated water • future requirements for any identified vulnerable land uses, such as provision of a Bushfire Emergency Evacuation Plan at the DA or building permit stage for the proposed primary school site • provisions for notification on Title for any future lots with a rating of BAL-12.5 or greater as a condition of subdivision • compliance requirements with the current City annual firebreak notice • acceptable solutions assessment against the bushfire protection criteria • proposed audit program outlining all measures requiring implementation and the appropriate timing and responsibilities for implementation. *Refer to Forrestfield North Residential Precinct Bushfire Management Plan at Technical Appendix B for additional information.*
2.	Aircraft Noise	2.1 Notification on titles for any residential development where the external noise level is expected to be greater than 70 dB LAmax. Any glazing is to incorporate minimum 6mm thick glass in awning style window frame and sliding door with seals as a minimum. 2.2 Notification on titles for any development (other than industrial) where the external noise level is expected to be greater than 75 dB LAmax. Any construction is to incorporate 6mm thick glazing in awning style frames as a minimum. *Refer to Transportation Noise Assessment at Technical Appendix C for additional information.*
3	Road Noise	3.1 Where residences are located in close proximity (first row) to a road carrying reasonable volumes but less than 20,000 vpd in 2050 (Milner Road and TOD Connector), a notification on title is required. 3.2 Where residences are within 300 metres of the northbound carriageway to Roe Highway, notifications on title are required and developers must undertake a site specific noise assessment. 3.3 Where residences are greater than 300 metres but less than 500 metres from the northbound carriageway to Roe Highway, Package A (refer Appendix A of Technical Appendix C) architectural treatment packages are to be incorporated and notifications on lot titles. 3.4 In respect to residences proposed alongside Roe Highway, where the predicted noise levels are above 65 dB LAeq(Day), a suitably designed noise wall is to be provided. *Refer to Transportation Noise Assessment at Technical Appendix C for additional information.*

Item Number	Item	Additional Information To Be Submitted
4	Rail Noise	4.1 An acoustic assessment is to be undertaken and implemented to the satisfaction of the local government at subdivision and/or development stage to investigate and respond to noise impacts from Forrestfield Station.
5.	Other Noise Sources	5.1 In addition to the above, the first row of residential development is required to incorporate notifications on title, warning of the potential for higher than normal noise levels, opposite the following locations: • Light Industry west of Sultana Road West • Primary School and District Open Space (Sporting Precinct). *Refer to Transportation Noise Assessment at Technical Appendix C for additional information.*
6.	Geotechnical	6.1 A geotechnical assessment is required to determine infiltration rates of key drainage areas. *Refer to Forrestfield North Residential Precinct Environmental Assessment and Management Strategy at Technical Appendix A for additional information.*
7.	Acid Sulfate Soils (ASS)	7.1 Confirmation if dewatering below the water table or the excavation of more than 100m^2 is required as part of associated earthworks. 7.2 Complete an ASS desktop investigation and completion of a self-assessment form to whether ASS investigations are required. 7.3 Prepare an ASS Management Plan (if ASS is present, and site works will intersect ASS areas) that includes; • potential environmental impacts—groundwater drawdown, disruption to existing bore users, vegetation stress, reduction in water quality, noise and air impacts: • earthwork strategy—soil extraction methods, stockpile management, soil treatment/ neutralisation, calculated liming rate and disposal techniques • dewatering strategy—procedure and control measures, treatment and disposal options, contingency measures if acidification of groundwater occurs • monitoring program—soil, groundwater, vegetation, noise and air. *Refer to Forrestfield North Residential Precinct Environmental Assessment and Management Strategy at Technical Appendix A for additional information.*
8.	Asbestos Containing Material (ACM)	8.1 Undertake an ACM audit of existing structures (buildings sheds) particularly those erected prior the mid-1980s. *Refer to Forrestfield North Residential Precinct Environmental Assessment and Management Strategy at Technical Appendix A for additional information.*
9.	Brand Road Landfill Site	9.1 Intrusive site investigations as required for development adjacent to landfill area. *Refer to Forrestfield North Residential Precinct Environmental Assessment and Management Strategy at Technical Appendix A for additional information.*
10	Retention of Resource Enhancement Wetland and Environmental Conservation Areas along Poison Gully Creek (excluding existing Bush Forever sites)	10.1 Have regard to the Strategic Conservation Management Plan for all Environmental Conservation Areas, which considers the conservation objectives in DEC (2009) Waxy-leaved Smokebush Recovery Plan with respect to (but not limited to): • areas to be rehabilitated (including revegetation low fuel plant species [FESA, 2011), KPIs planting densities, weed control) • controlled access and fencing requirements particularly along the interface of passive recreation and conservation areas • contingency measures • monitoring program • implementation and responsibilities. *Refer to Forrestfield North Residential Precinct Environmental Assessment and Management Strategy at Technical Appendix A for additional information.*

Item Number	Item	Additional Information To Be Submitted
11.	Works proposed within the Poison Gully foreshore area	11.1 Development of a Construction Management Plan (pre-and during construction), including: • consultations with the Nyungar community • environmental outcomes and performance • indicators • risk assessment and management measures • monitoring • contingency response and corrective action • report and review. *Refer to Forrestfield North Residential Precinct Environmental Assessment and Management Strategy at Technical Appendix A for additional information.*
12.	Protection of Environmental Conservation Areas and Local Open Space	12.1 Development of a construction environmental management plan to incorporate environmental elements during pre- construction and during construction, including: • identification of potential threats/impacts and risks associated with construction activities within and adjacent to Environmental Conservation Areas (i.e. dieback, fauna and habitat management) • environmental outcomes and performance indicators • management measures and monitoring • contingency response and corrective actions • reporting and review. 12.2 Assess the viability of the retention of the black cockatoo roosting site development area. If possible incorporate into future development design. 12.3 A construction environmental management plan is required for development within 100m of Environmental Conservation areas, or Local open Space, or where a development lot contains an occurance of Banksia woodland TEC to be cleared. Refer to Forrestfield North Residential Precinct Environmental Assessment and Management Strategy at Technical Appendix A for additional information.
13.	Ecological linkage of POS area between Bush Forever site No. 123) and Poison Gully Creek	13.1 Complete a Landscape Feature and Tree Retention Plan, which location, species, size and structural health of significant trees (>50cm DBH) on site. 13.2 Assess the feasibility of bushland retention in response to bushfire and recreational requirements. 13.3 Where possible retention of Black cockatoo habitat trees - with priority to trees containing hollows. *Refer to Forrestfield North Residential Precinct Environmental Assessment and Management Strategy at Technical Appendix A for additional information.*
14.	Preservation of heritage values	14.1 Nyungars are invited to engage in any works associated with Poison Gully Creek, including the rehabilitation of the creek and revegetation with native vegetation. *Refer to Forrestfield North Residential Precinct Environmental Assessment and Management Strategy at Technical Appendix A for additional information.*
15.	Any required construction works within Poison Gully Creek and/or foreshore	15.1 Determine whether a s.18 permit is likely to be required under the *Aboriginal Heritage Act 1972* (AH Act) or approval under Regulation 10 from the Registrar of Aboriginal Sites: • consultation with Department of Planning, Lands and Heritage (DPLH) and relevant Aboriginal groups to confirm the significance of existing Aboriginal Heritage sites, and to confirm whether an Aboriginal Heritage survey and/or s 18 permit is likely to be required • an Aboriginal Heritage survey of the project to provide further detail on the significance and location of Aboriginal Heritage sites, and prepare an s18 notice form under the AH Act, if required. *Refer to Forrestfield North Residential Precinct Environmental Assessment and Management Strategy at Technical Appendix A for additional information.*
16.	Heritage education and opportunities	16.1 In conjunction with Nyungar women, examine ways in which the natural bush and creek between Dundas Road and Milner Road can be enhanced as a Nyungar women's place. 16.2 The potential incorporation of public art and interpretative/education signs within POS to reflect the heritage importance of the area. *Refer to Forrestfield North Residential Precinct Environmental Assessment and Management Strategy at Technical Appendix A for additional information.*

Item Number	Item	Additional Information To Be Submitted
17	Further archaeological survey	17.1 Archaeological survey to be undertaken as required. *Refer to Forrestfield North Residential Precinct Environmental Assessment and Management Strategy at Technical Appendix A for additional information.*
18	Stormwater Management	18.1 Prior to the commencement of subdivision or development works, an Urban Water Management Plan (UWMP) is to be prepared and approved, in consultation with the Department of Water and Environmental Regulation (DWER). The UWMP is required to address the following: • results of geotechnical investigations, including measurement of hydraulic conductivity at locations where underground storages and roadside raingardens are proposed as part of the subdivision infrastructure; • present design of treatment structures, including tree pits, biofilters, median vegetated swales and vegetated swales at public car parks, streets and public open spaces; • present design stormwater management systems that provide serviceability, amenity and road safety during minor rainfall events; • consideration of art within stormwater management structures; • refinement of the final configuration (storage side slopes, type and invert level of underground storages etc) and exact location of the flood detention storage areas dependent on final earthworks, drainage and road design levels for the RP area; • construction details inverts and diameters of stormwater pipes; • confirmation of groundwater design levels; • confirmation of subsoil location and levels (if any); • confirmation of finished levels and demonstration of adequate clearance to the 1% AEP flood levels to residential, commercial and industrial building habitable floor levels; • landscaping design and POS water use; • Foreshore Management Plan where the development includes open space adjacent to Poison Gully. *Refer to Forrestfield North Residential Precinct Local Water Management Strategy at Technical Appendix D for additional information.*
19.	Movement Networks	19.1 The movement network within the LSP area shall be provided generally in accordance with this LSP and as identified on the LSP Map (Plan 1) and Development Plan (Plan 2). *Refer to Forrestfield North Residential Precinct Transport Impact Assessment at Technical Appendix F for additional information.*
20	Infrastructure	20.1 The subdivider is to extend reticulated services to service the proposed subdivision and/or development in accordance with advice received from the relevant servicing authority. *Refer to Forrestfield North Residential Precinct Infrastructure Servicing Report at Technical Appendix G for additional information.*
21.	Light Industrial Interface Management	21.1 At the subdivision stage, the residential interface with the Forrestfield / High Wycombe Light Industrial Area on the western side of Sultana Road West is to be treated by one or a combination of the following treatments to ensure adequate separation between the uses and to ensure an acceptable level of amenity is maintained: • an acoustic wall; • a landscape buffer strip; and/or • a local road running parallel to Sultana Road West to provide adequate separation. 21.2 A notification is to be placed on the titles of the first row of residential lots which interface with the light industrial area on the western side of Sultana Road West warning of the potential for higher than normal noise levels.

4.4 Management of Environmental Conservation Areas and Local Open Space

The proposed 'Environmental Conservation Areas' identified on the Structure Plan Map are to be protected initially under a Planning Control Area with the intention to ultimately reserve these areas as 'Parks and Recreation' under the Metropolitan Region Scheme.

Areas identified as 'Local Open Space' on the Structure Plan Map will ultimately be ceded to the City of Kalamunda with its reservation to be recognised under Local Planning Scheme No. 3 which has due regard to the land use classifications under the Forrestfield North Residential Precinct Local Structure Plan. These areas will ultimately be reserved 'Local Open Space' under LPS3 upon normalization of the Structure Plan into LPS3.

'Environmental Conservation Areas' and 'Local Open Space' are to be managed and protected as described by the approved Strategic Conservation Management Plan and Management Agreement.

5. Local Development Plans

There is not anticipated to be any need for the preparation of Local Development Plans (LDPs) to support future subdivision and/or development.

Relevant built form matters will be addressed in the cell density plans and the Forrestfield North Residential Precinct Built Form Design Guidelines.

6. Other Requirements

6.1 Development Contribution Arrangements

Developer contribution arrangements under the City's LPS3 are contemplated for the LSP area and will be set out for a defined Development Contribution Area (DCA) in the form of a Development Contribution Plan (DCP).

Refer to section 2.7.14 in Part Two for additional information in respect of development contributions.

6.2 Public Open Space

A minimum of 10% public open space of the gross subdivisable area is to be provided subject to the requirements of Liveable Neighbourhoods being met to the satisfaction of the local government and the WAPC. Public open space is generally to be provided in accordance with the Structure Plan Map and the Public Open Space Schedule included in Part 2, with an updated Public Open Space Schedule to be provided at the time of subdivision for determination by the WAPC, upon the advice of the local government.

6.3 Structure Plan Area Normalisation

The LSP will be normalised into LPS3 as set out in Table 4.

Table 4 – Local Structure Plan Normalisation into Local Planning Scheme No. 3

Land Use and Residential Density	Local Planning Scheme No. 3 Modification
Local Open Space	Following acquisition of these areas by the City shall be reserved as 'Local Open Space'.
Public Purposes – Primary School	Following acquisition of the area required for the primary school site by the Department of Education it shall be reserved as 'Public Purposes - Primary School'.
Residential	Following completion of the applicable cell based density plan these areas shall be zoned 'Residential' with the applicable density coding superimposed on the LPS3 Map.

It is noted that the proposed 'Environmental Conservation Areas' will ultimately be reserved as 'Parks and Recreation' under the Metropolitan Region Scheme with this reservation purpose being shown on LPS3 maps.

Plan 1

Forrestfield North Residential Precinct - Plan 1: Structure Plan

LEGEND

Structure Plan Boundary

Region Scheme Reserves

Parks and Recreation

Primary Regional Road

Notice of Delegation

Bush Forever

Land Use and Residential Density

Environmental Conservation

Local Open Space

PS — Public Purposes - Primary School

Residential Medium Density (R40 - R60)

Residential Medium / High Density (R60 - R80)

Residential High Density (R80 - R100)

Other Categories

District Integrator A (Existing / Proposed)

District Integrator A (Potential Future)

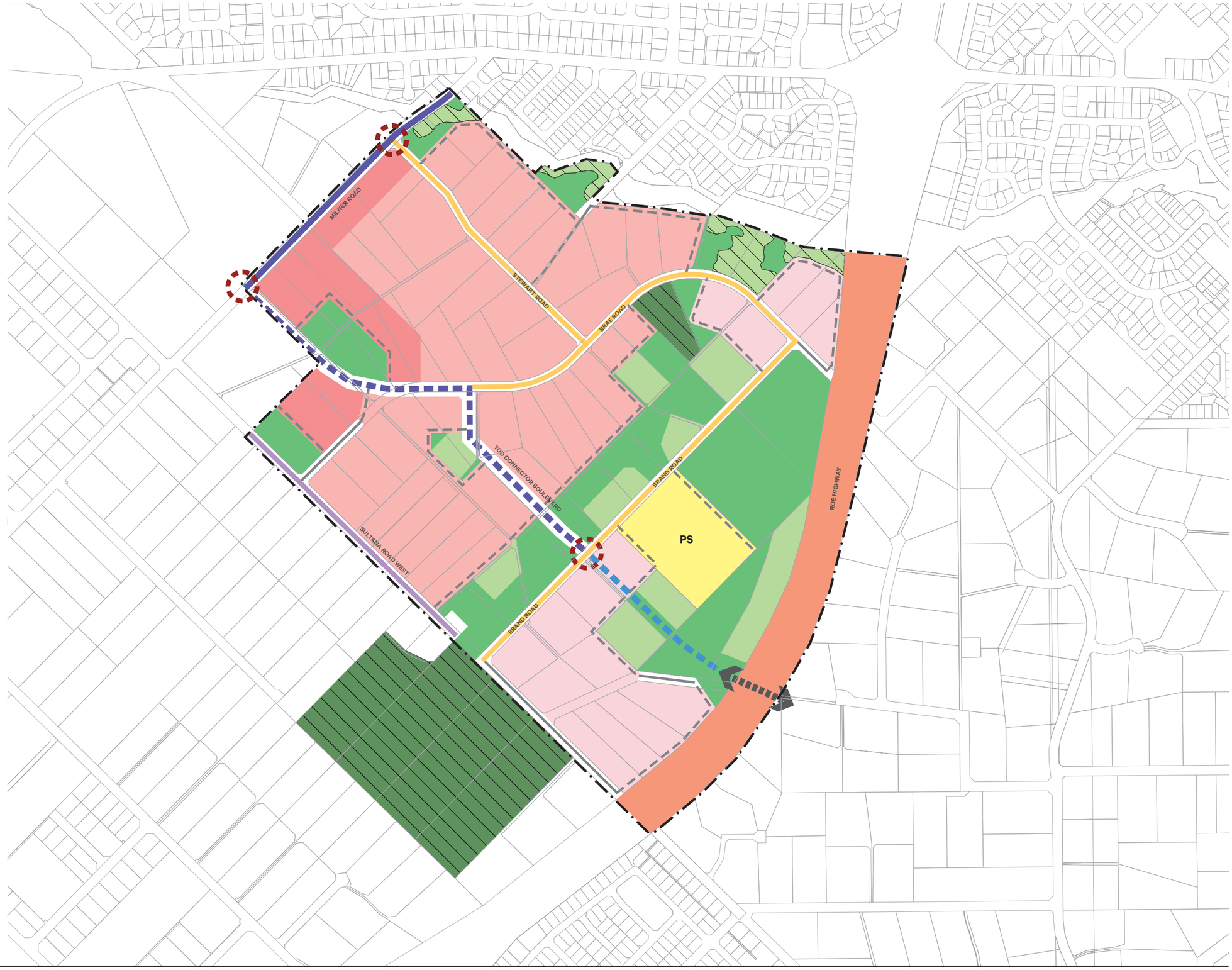
District Integrator B (Existing / Proposed)

Neighbourhood Connector (Existing / Proposed)

Local Street (Existing / Proposed)

Proposed Roundabout

Potential Future Fly-Over Roe Highway



Plan 1: Structure Plan

Forrestfield North Residential Precinct

0 80 160m

Date: 26 Feb 2020 Scale: 1:8000@ A3 1:4000 @ A1 File: **17-527 ST-1 A** Staff: MC GW Checked: MC

element.

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Plan 2

Forrestfield North Residential Precinct – Development Plan

Legend

- Structure Plan Boundary
- Existing Cadastre
- New Main Connecting Road
- New Main Connecting Road (Potential Future)
- Development Area
- Primary School
- New Public Open Space
- Existing Parks and Recreation Reserve (MRS)
- New Environmental Conservation Reserve
- Drainage Storage Area **
- Closed Road Reserve
- 1 in 100 Year Flood Plain

** All drainage areas are subject to further detailed investigations with locations and configurations to be confirmed in Urban Water Management Plans (UWMPs)

Cell Number	Area (ha)*
01	2.3413
02	1.8785
03	11.1945
04	6.9663
05	10.8625
06	16.4782
07	13.0585
Total	**62.7799**

* Area is a gross figure which includes proposed local roads.

Plan 2: Development Plan

Forrestfield North Residential Precinct

Date: 11 Aug 2020 Scale: 1:8000@ A3 1:4000 @ A1 File: **17-527 ST-2 A** Staff: MC GW Checked: MC

0 80 160m

element.

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Part Two – Explanatory Report

1. Planning Background

1.1 Introduction and Purpose

This LSP report has been prepared in accordance with the WAPC Structure Plan Framework (August 2015). This LSP represents the eastern Residential Precinct as identified by the Forrestfield North District Structure Plan (DSP) as approved by the WAPC on the 29 September 2016.

The LSP has been prepared in collaboration with a team of specialist consultants, who have provided technical input in relation to the various opportunities and constraints within the Residential Precinct. The consultant team details are set out in Table 5 below.

Table 5 – Forrestfield North Residential Precinct Project Team

Company	Project Role
element (formerly TPG+Place Match)	Planning and Urban Design
Strategen JBS&G	Environmental Management, Water Management, Bushfire Hazard Assessment and Management
KCTT	Transport Analysis, Civil Engineering and Servicing
CCS Strategic	Community Infrastructure Assessment
Lloyd George Acoustics	Transportation Noise Assessment
AEC and Location IQ	Economic, Employment and Retail Strategy
Woodsome Management and HillPDA	Land Assembly and Preliminary Development Contribution Considerations
Norman Disney & Young	Sustainability and Innovation
Place Laboratory	Landscaping Concept and Public Realm Assessment
Deicke Richards	Urban Design and Private Realm Assessment

It should also be noted that this LSP has been prepared in consultation with a Technical Advisory Group (TAG) comprising key State Government Agencies with an interest in the progression of the project. The TAG membership includes the following:

- City of Kalamunda
- Department of Planning, Lands and Heritage (DPLH)
- Department of Biodiversity, Conservation and Attractions (DBCA)
- Department of Water and Environmental Regulation (DWER)
- Office of the Environmental Protection Authority (OEPA)
- Department of Fire and Emergency Services (DFES)
- Metronet / LandCorp
- Public Transport Authority (PTA)
- Main Roads WA (MRWA)
- Water Corporation (WC)
- Freight and Logistics Council (FLC)
- Perth Airport

1.2 Land Description

1.2.1 Location

The LSP area covers 90 landholdings and Bush Forever site 45 and is located within the municipality of the City. The combined site area for the LSP is 123.05ha including that portion of Roe Highway immediately abutting the eastern edge of the precinct. Roe Highway, in conjunction with Berkshire Road, Dundas Road and Maida Vale Road, currently service the accessibility requirements of the area.

The Residential Precinct is also strategically located within:

- Four kilometres of the Kewdale Industrial Area
- Three kilometres of the Perth International Airport
- Five kilometres of Kalamunda Central.

Refer to Figure 1 – Location Plan

Refer to Figure 2 – Site Plan

1.2.2 Area and Land Use

The Forrestfield North Residential Precinct consists primarily of rural residential development including single houses and associated outbuildings on lots generally around one hectare in area. It includes an established sealed road network to service existing properties and a number of generally under utilised bridle trails that reflect the historic character and use of the area.

The area also features substantial tracts of remnant vegetation and significant tree canopy, particularly within the central section and eastern part of the precinct abutting Roe Highway. The former Brae Road Landfill site is located in the eastern part of the precinct close to Roe Highway.

Located immediately north of the Residential Precinct area are Poison Gully Creek (Bush Forever Site 45) and the High Wycombe residential area. Existing light industrial uses and the initial Stage 1 of the Forrestfield/High Wycombe Industrial Area are located to the south, which provide a buffer to nearby general industrial land uses.

The Residential Precinct is also located within close proximity of the Forrestfield North Transit Oriented Development (TOD) and Activity Precincts to the immediate west, the Forrestfield Freight Yard, Access Park bulk grain depot and Mainline Freight Rail. The Forrestfield Train Station is currently under construction to the west of the precinct.

Refer to Figure 3 – Aerial Plan

Refer to Figure 4 – Local Context Plan

Refer to Figure 5 – Regional Context Plan

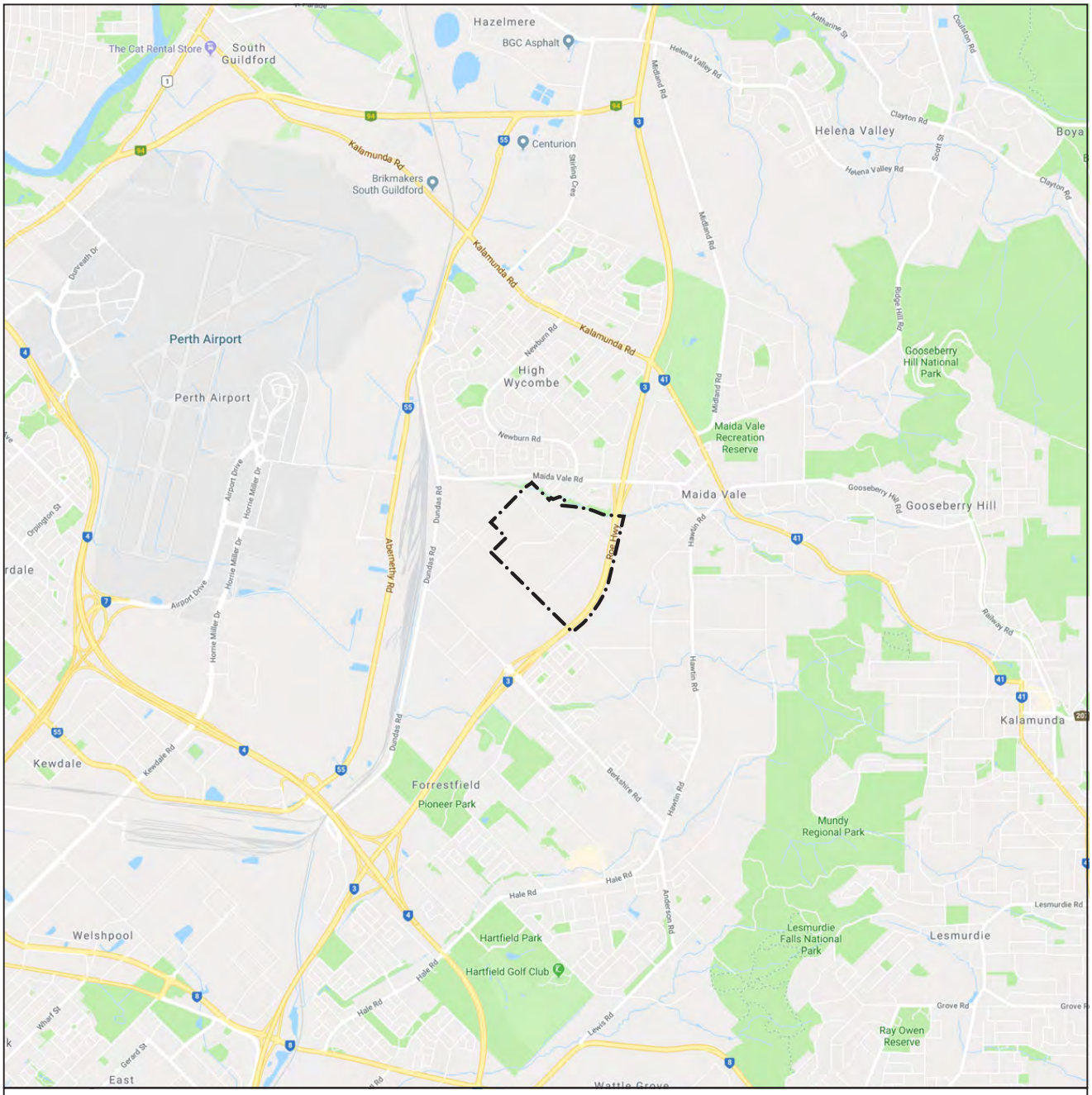


Figure 1. Location Plan

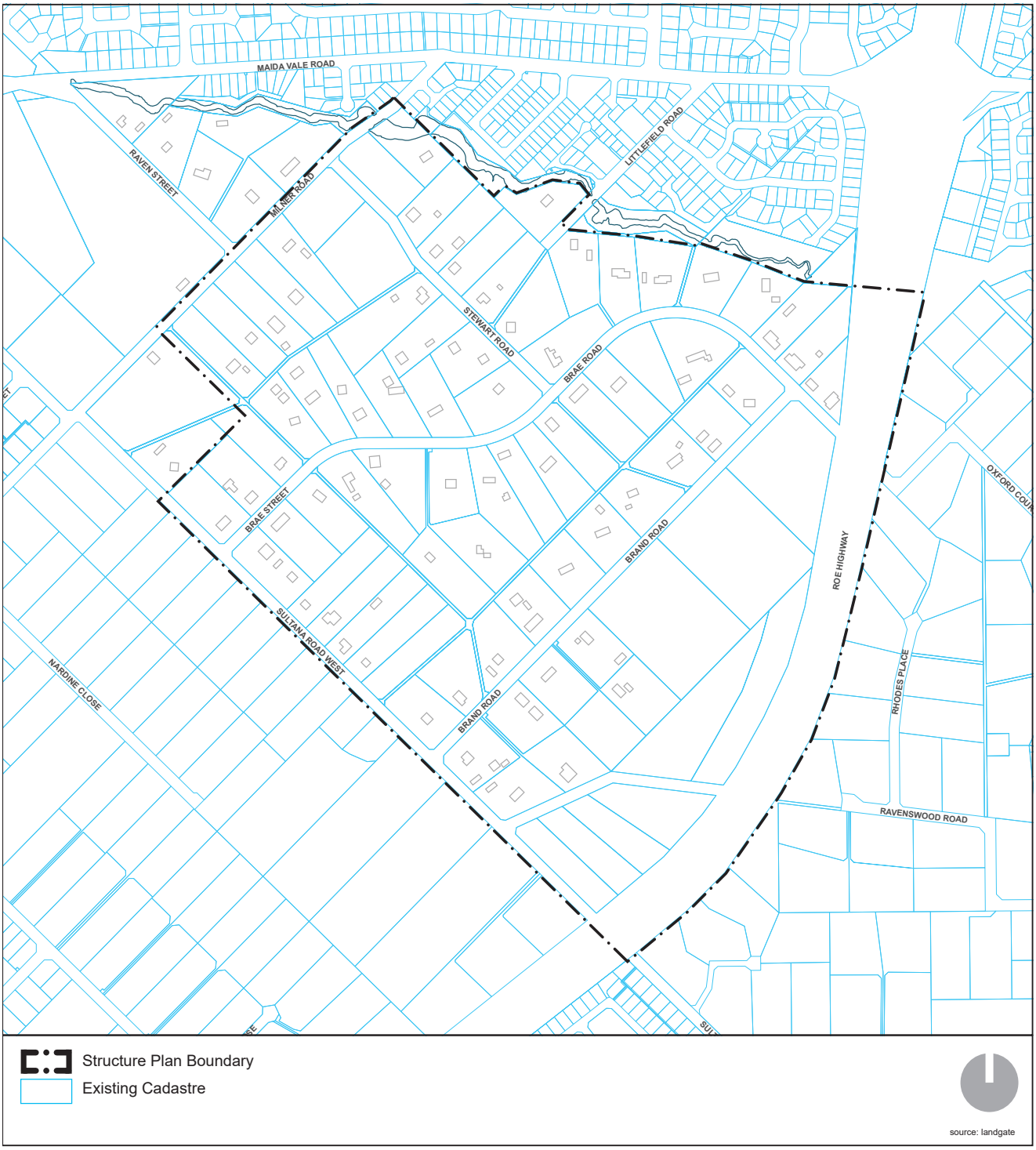


Figure 2. Site Plan

Figure 3. Aerial Plan

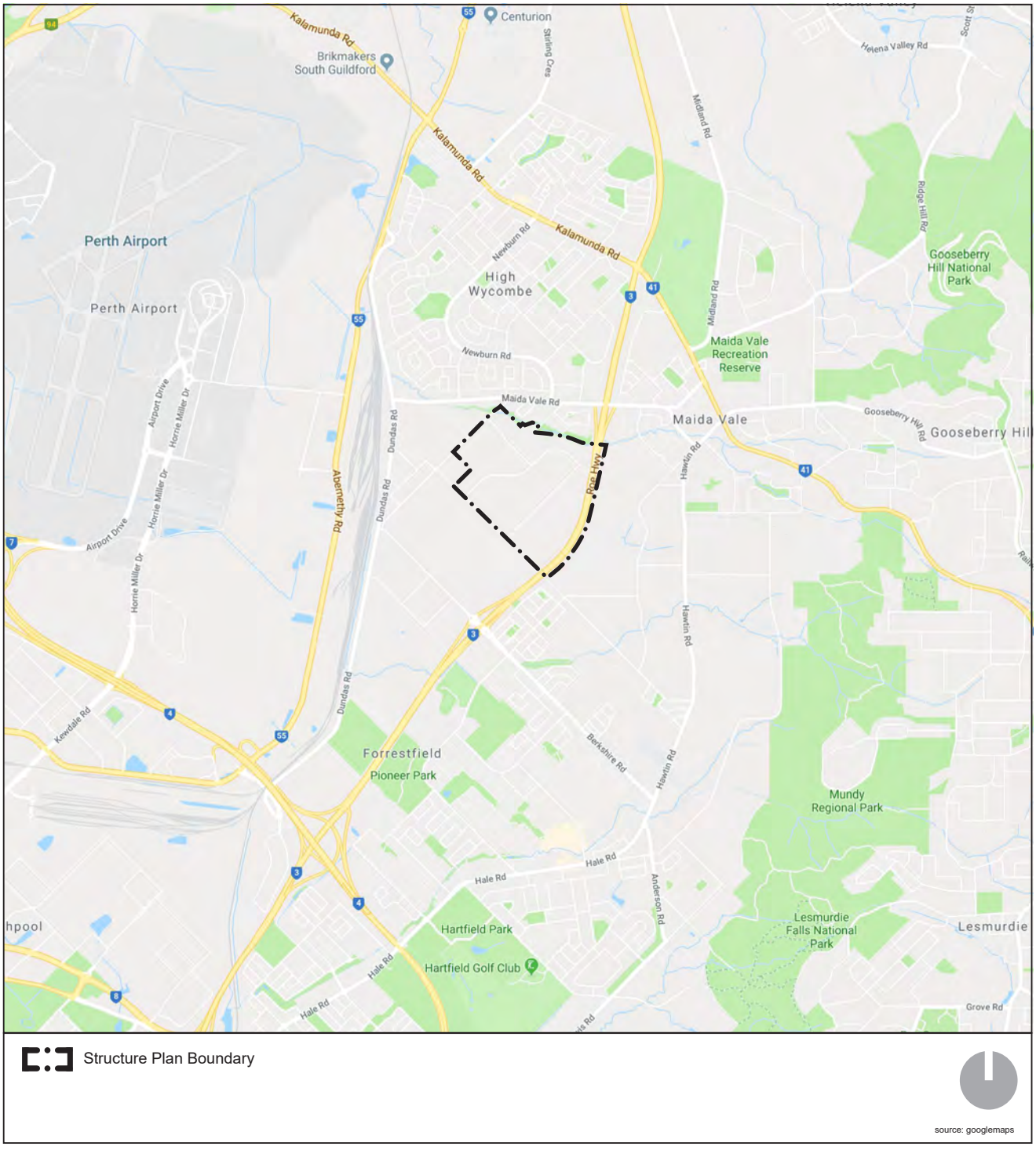


Figure 4. Local Context Plan

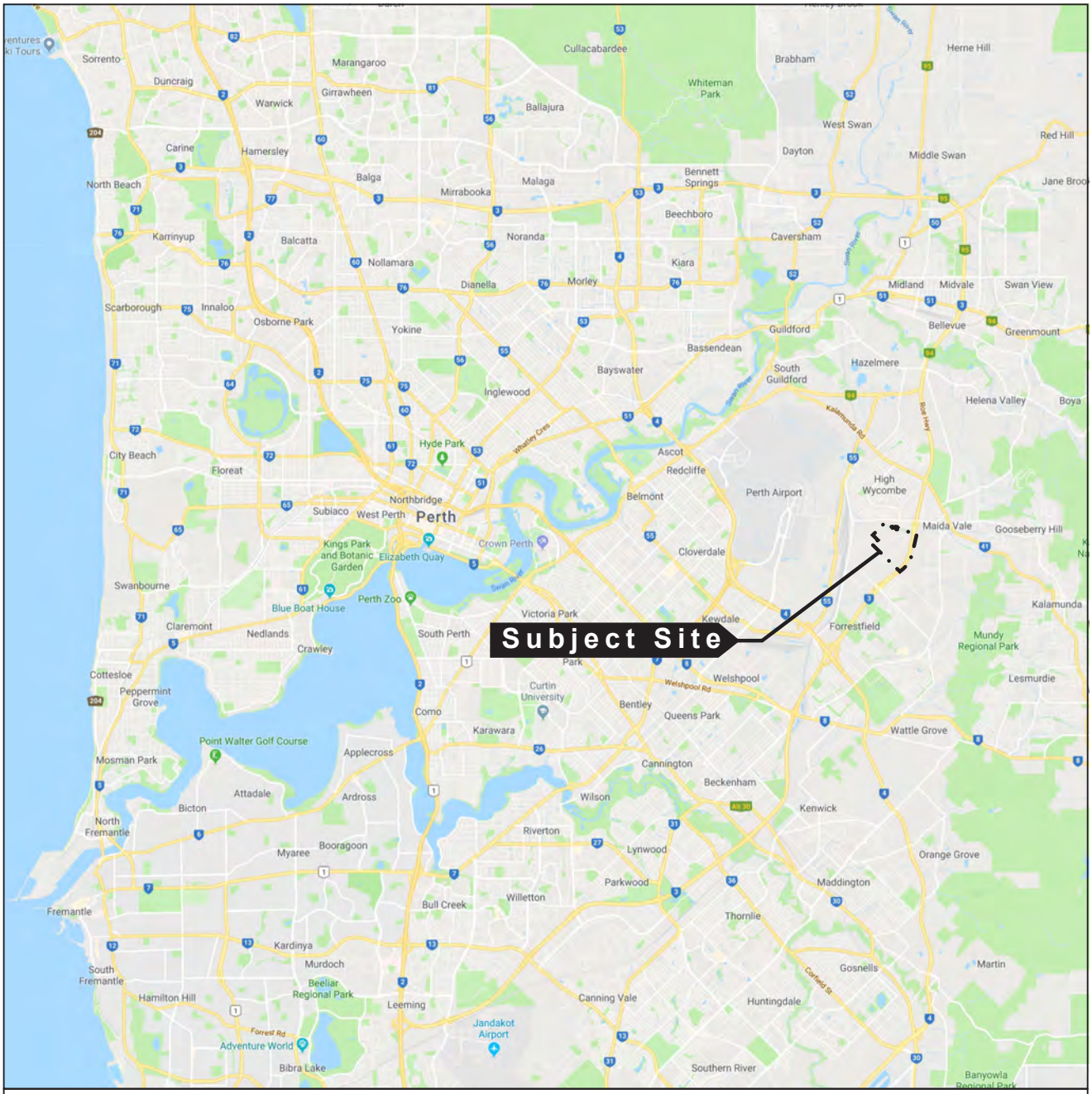


Figure 5. Regional Context Plan

1.2.3 Legal Description and Ownership

The land within the Residential Precinct is described in Table 6 below and includes 91 individual properties.

Table 6 – Property Details

Lot Number	Road
2, 46, 47, 48, 49, 50, 92, 1563	Milner Road
35, 36, 37, 38, 39	Sultana Road West
5, 13, 40, 41, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 81, 82, 83, 84, 85, 86, 200, 201, 1209, 10274	Brae Road
51, 52, 54, 55, 56, 57, 87, 88, 89, 90, 91, 1028, 1028, 10205	Stewart Road
3, 4, 7, 8, 9, 10, 14, 15, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34	Brand Road
5, 6, 18, 50, 100, 101, 102, 103	Smokebush Place
13	Littlefield Road

Land ownership is highly fragmented within the Residential Precinct.

1.3 Planning Framework

1.3.1 Zoning and Reservations

1.3.1.1 Metropolitan Region Scheme

The LSP area is predominantly zoned 'Urban' under the Metropolitan Region Scheme (MRS), with the northern most portion of the area being zoned 'Rural' and containing Bush Forever Site No. 45 and Roe Highway to the east being reserved as a 'Primary Regional Road'.

Refer to Figure 6 – Metropolitan Region Scheme

1.3.1.2 City of Kalamunda Local Planning Scheme No. 3

The City's LPS3 is a statutory document that forms the basis for assessing and determining proposals for the use and development of land within the municipality.

Under the provisions of LPS3, the LSP area is predominantly zoned 'Urban Development'. A number of land parcels are reserved for 'Local Open Space' at the northern edge of the precinct and there are two land parcels that are subject to additional use rights, being Additional Use No. 19 and 20, allowing for a Rotary Hoeing Business and an Educational Establishment.

Refer to Figure 7 – City of Kalamunda Local Planning Scheme No. 3

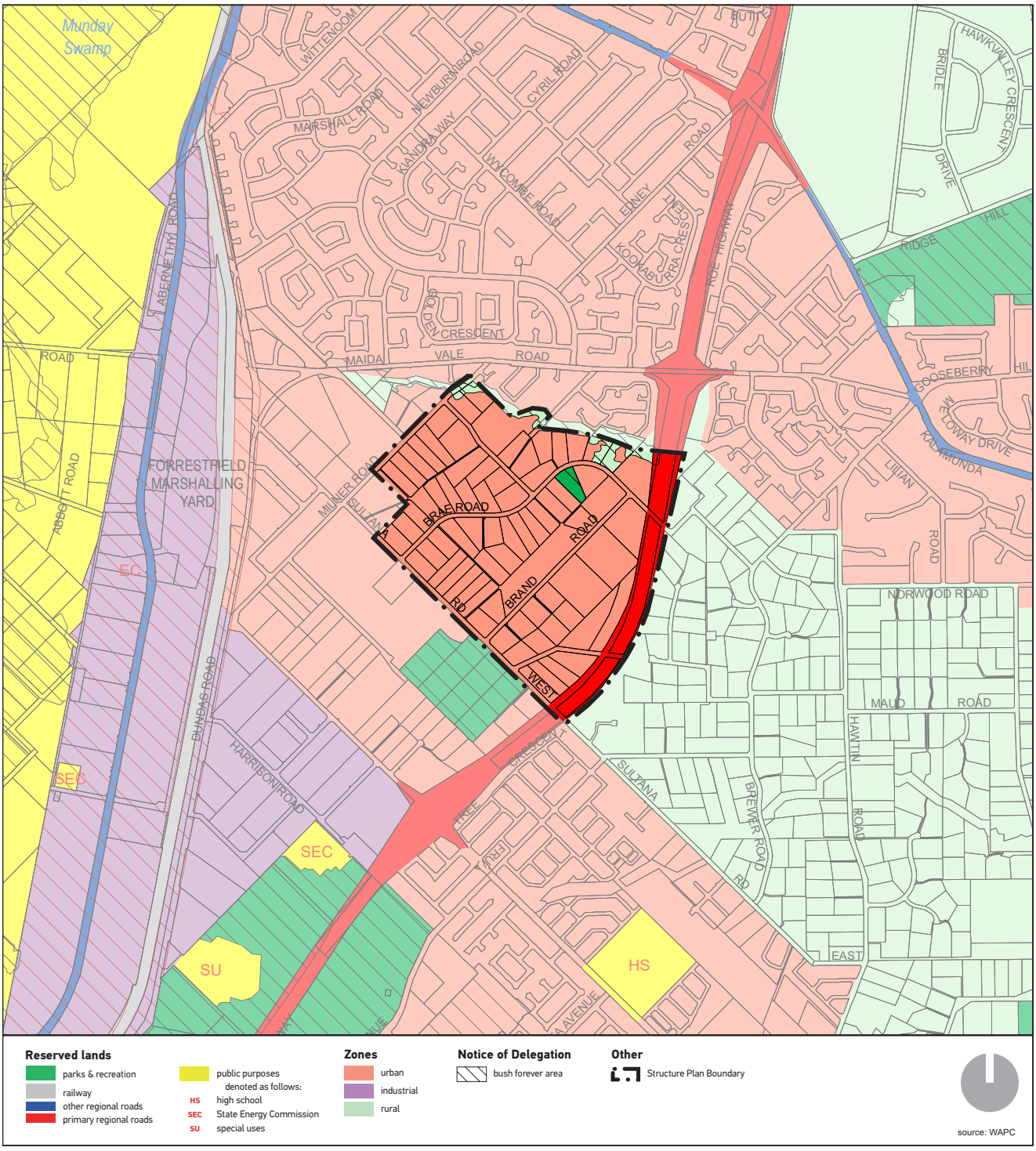


Figure 6. Metropolitan Region Scheme

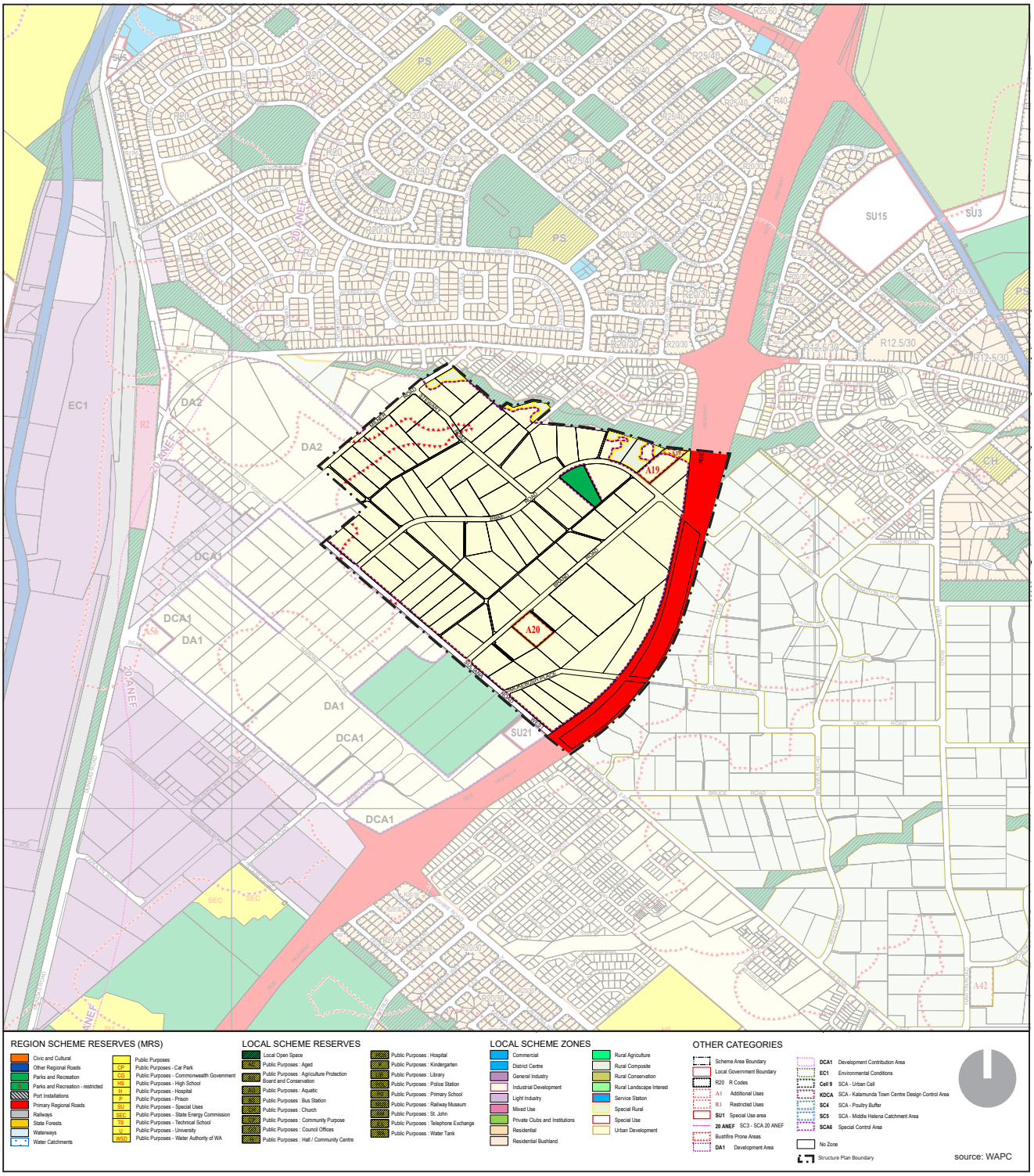


Figure 7. City of Kalamunda Local Planning Scheme No. 3

1.3.2 Planning Strategies

1.3.2.1 Directions 2031

Directions 2031 was released by the WAPC in August 2010 as a land use strategy for the Perth Metropolitan and Peel Regions. The plan built upon the previous metropolitan strategy Network City (2004) and encourages a polycentric city model with development concentrated in a number of activity centres across the metropolitan region. The Strategy states its vision as: "By 2031, Perth and Peel people will have created a world class liveable city; green, vibrant, more compact and accessible with a unique sense of place".

Directions 2031 identifies the connected city model as the preferred medium-density future growth scenario for the Perth Metropolitan and Peel region. Key characteristics of a connected city pattern of urban growth are:

- Promoting a better balance between green field and infill development;
- Protecting and enhancing the natural environment, agricultural land, open spaces and heritage and community wellbeing;
- Reducing energy dependency and greenhouse gas emissions;
- Developing and revitalising activity centres as attractive places in which to invest, live and work;
- Ensuring that economic development and accessibility to employment inform urban expansion;
- Planning for an adequate supply of housing and land in response to population growth and changing community needs;
- Facilitating increased housing diversity, adaptability, affordability and choice;
- Planning and developing key public transport corridors, urban corridors and transit oriented developments to accommodate increased housing needs and encourage reduced vehicle use;
- Creating and enhancing transport and freight movement networks between activity centres and industrial centres; and
- Maximising essential service infrastructure efficiency and equity and identifying and prioritising the coordination of projects to support future growth.

Whilst not specifically recognized in Directions 2031, the Forrestfield North area represents a significant opportunity to reinforce connected city objectives with housing diversity and employment opportunities proposed to be provided within an established urban context supported by excellent accessibility to public transport and the broader transport network.

Importantly, the Residential Precinct LSP supports the aspirations of Directions 2031 in that it will closely align the existing and emerging transport system with a land use pattern that will optimize accessibility and amenity.

1.3.2.2 Perth and Peel@3.5 million

Released by the WAPC in March 2018, the latest strategic document for the Perth Metropolitan Region is Perth and Peel@3.5 million (PP3.5) which includes a range of land use planning and infrastructure frameworks that will prepare Perth to accommodate a population of 3.5 million by 2050. The plan builds upon the concept of a 'connected city' identified in Directions 2031, identifying an integrated land use and movement network to achieve the objectives. The plan divides the metropolitan area into four sub-regions with the LSP area being categorised into the North-East Sub-region. In each sub-region the plan manages urban growth and provides certainty about the amount of available land, whilst guiding infill and improving the urban environment.

Refer to Figure 8 – Perth and Peel@3.5 million Spatial Plan Extract

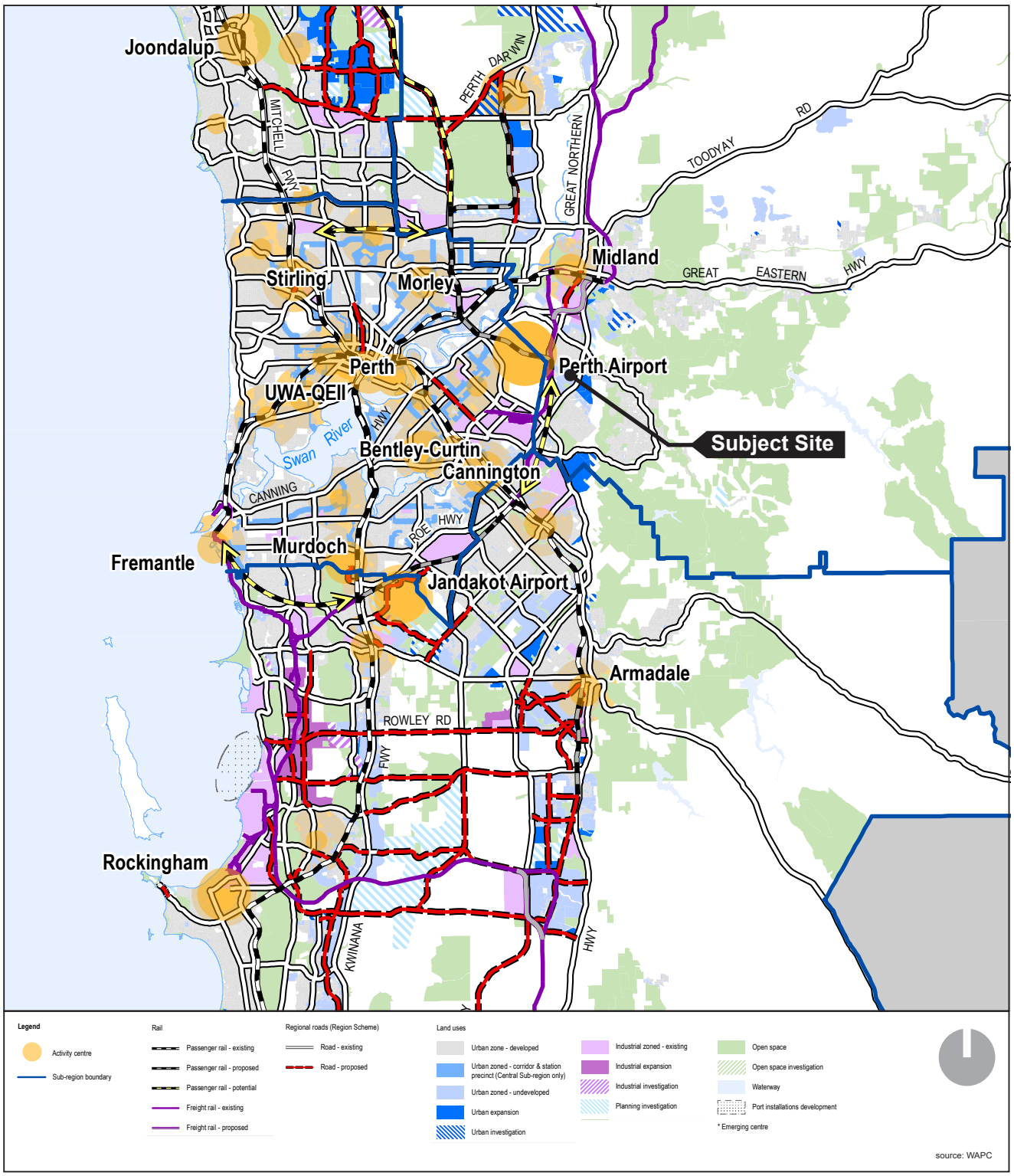


Figure 8. Perth and Peel@3.5 million Spatial Plan Extract

The plan sets out seven overarching objectives which will be key to achieving a truly connected city. These objectives are detailed as follows:

- Consolidating urban areas to use land more efficiently and improve access to infrastructure;
- Providing more and improving current community and social infrastructure to improve the wellbeing of the community;
- Improving the service infrastructure in urban areas by focusing on the timely, efficient and cost-effective delivery of utilities;
- Promoting employment in the region by creating areas of economic activity and subsequent employment within the sub-regions;
- Connecting the sub-regions to the Perth CBD and the rest of the state through an effective and efficient transport and freight network;
- Focusing on the retention and protection of the environment within the sub-regions; and
- Managing natural resources to achieve the objectives of the land use whilst considering the future land uses in the sub-region.

The integrated land use and movement network model produced by PP3.5 identifies the need to plan land use around the movement network and prioritise infill development in these areas. The Residential Precinct is a prime example of a location which can be successfully planned and developed around a new train station to provide urban infill and fulfil the objectives of PP3.5.

1.3.2.3 Perth and Peel Green Growth Plan for 3.5 million (draft)

The Perth and Peel regions are projected to grow to 3.5 million people by 2050 – an increase of almost 70 per cent on our current population. Supporting this growth and delivering an efficient and liveable city while protecting our unique natural environment is a significant challenge.

The State Government has prepared the draft Perth and Peel Green Growth Plan for 3.5 million (Green Growth Plan) to meet this challenge.

The Green Growth Plan (or also known as SAPPR) indicates that there are specific commitments identified within the Residential Precinct. The Green Growth Plan does not however specify which specific commitments are depicted by the Specific Commitments layer, which may include:

- threatened flora and threatened ecological communities.
- conservation category wetlands and wetlands of international importance.
- vegetation complexes with less than 10 per cent remaining.
- Bush Forever areas.
- Short Tongued Bee (*Leioproctus douglasiellus*) distribution (not applicable) (Department of the Premier and Cabinet, 2015).

As of the 6 April 2018, the State Government suspended work and will be re-evaluating the SAPPR through an independent review. The Government has advised that "SAPPR sought to secure up front environmental approval for future development and raw materials extraction for an identified development footprint for a 30-year period. It represents the largest and most complex land use reconciliation work, attempting to balance certainty for development and long term environmental protection" (Department of the Premier and Cabinet, 2018).

While the SAPPR has been suspended, the Specific Commitments mapping was reviewed and given due regard in formulating the design of the LSP.

Refer to the EAMS provided at Technical Appendix A for additional information in relation to the Green Growth Plan and the SAPPR.

1.3.2.4 North-East Sub-regional Planning Framework (March 2018)

The North-East Sub-regional Planning Framework (the Framework) is one of three frameworks prepared for the outer sub-regions of Perth and Peel that, combined with the draft Central Sub-regional Planning Framework, establish a long-term and integrated planning framework for land and infrastructure. The frameworks build upon the principles of PP3.5 and are key instruments for achieving a more consolidated urban form that will reduce dependence on new urban greenfield developments to accommodate the anticipated population growth by increasing residential density and urban infill development targets.

The frameworks are sub-regional structure plans that will provide guidance for:

- The preparation of amendments to the MRS and Peel Region Scheme, local planning strategies/schemes and district, local and activity centre structure plans; and
- The staging and sequencing of urban development to inform public investment in regional community, social and service infrastructure.

The framework identifies Forrestfield North, inclusive of the Residential Precinct as a proposed urban expansion area and indicates that the location immediately east of a proposed rail station represents an opportunity to achieve more intensive TOD.

Refer to Figure 9 – North East Sub-regional Planning Framework

The framework targets Kalamunda to gain an additional 11,450 infill dwellings and 25,190 new residents from those infill dwellings by 2050. A large amount of the infill will be occurring in and around station precincts and the urban corridors that come with the transport network. Under the framework, the classification of the centre surrounding Forrestfield Station is yet to be determined but it has been identified as having significant potential and is in close proximity to the Forrestfield District Centre.

1.3.2.5 Forrestfield North District Structure Plan

The Forrestfield North DSP sets out the dominant land uses to be included in the area within and surrounding the Forrestfield Train Station TOD. The DSP is intended to be used by both State and local government as the basis for the preparation of precinct based local structure plans and to inform planning and development decisions across the Forrestfield North area.

Refer to Figure 10 – Forrestfield North District Structure Plan

The principal objectives of the DSP are to:

- Place Forrestfield North in its emerging regional context and identify any factors that might influence the future planning and development of the area;
- Confirm the role and function of Forrestfield North in the context of the State Government's metropolitan planning strategy, Directions 2031 and the North-East Sub-regional Planning Framework;
- Develop a spatial plan that defines planning and development precincts based on projected land use, and informs the preparation of local structure plans, planning scheme amendments, and statutory planning and development proposals;
- Identify existing environmental assets and district level water management considerations applicable to the area and to confirm what additional studies and investigations are necessary to support planning and development decisions;
- Consider the impacts of future development in Forrestfield North on the established transport network and identify what modifications may need to be made as part of a future staged development process to meet future development requirements; and
- Identify any key services and infrastructure constraints, and options for the coordinated delivery of additional capacity to the area.

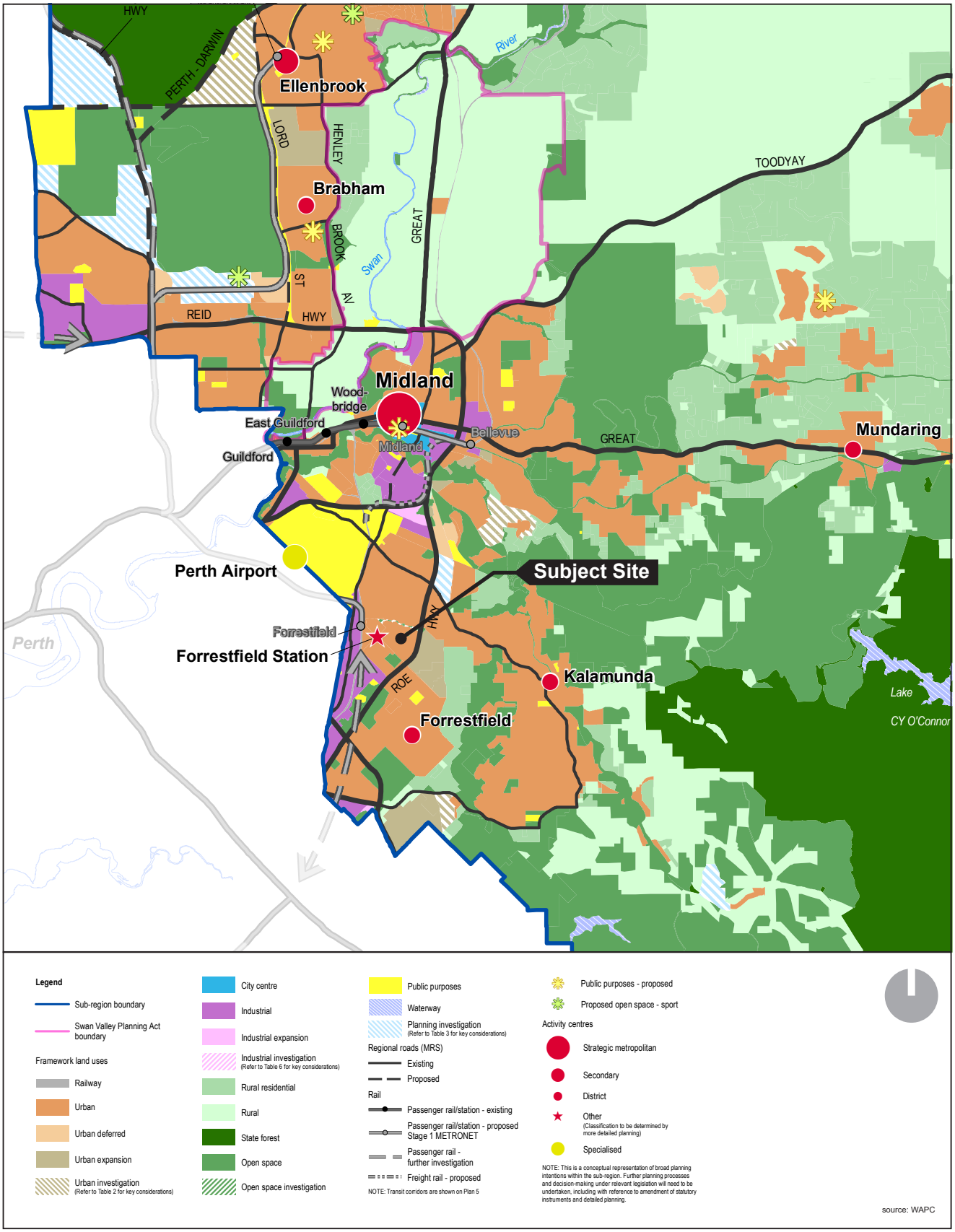


Figure 9. North East Sub-regional Planning Framework

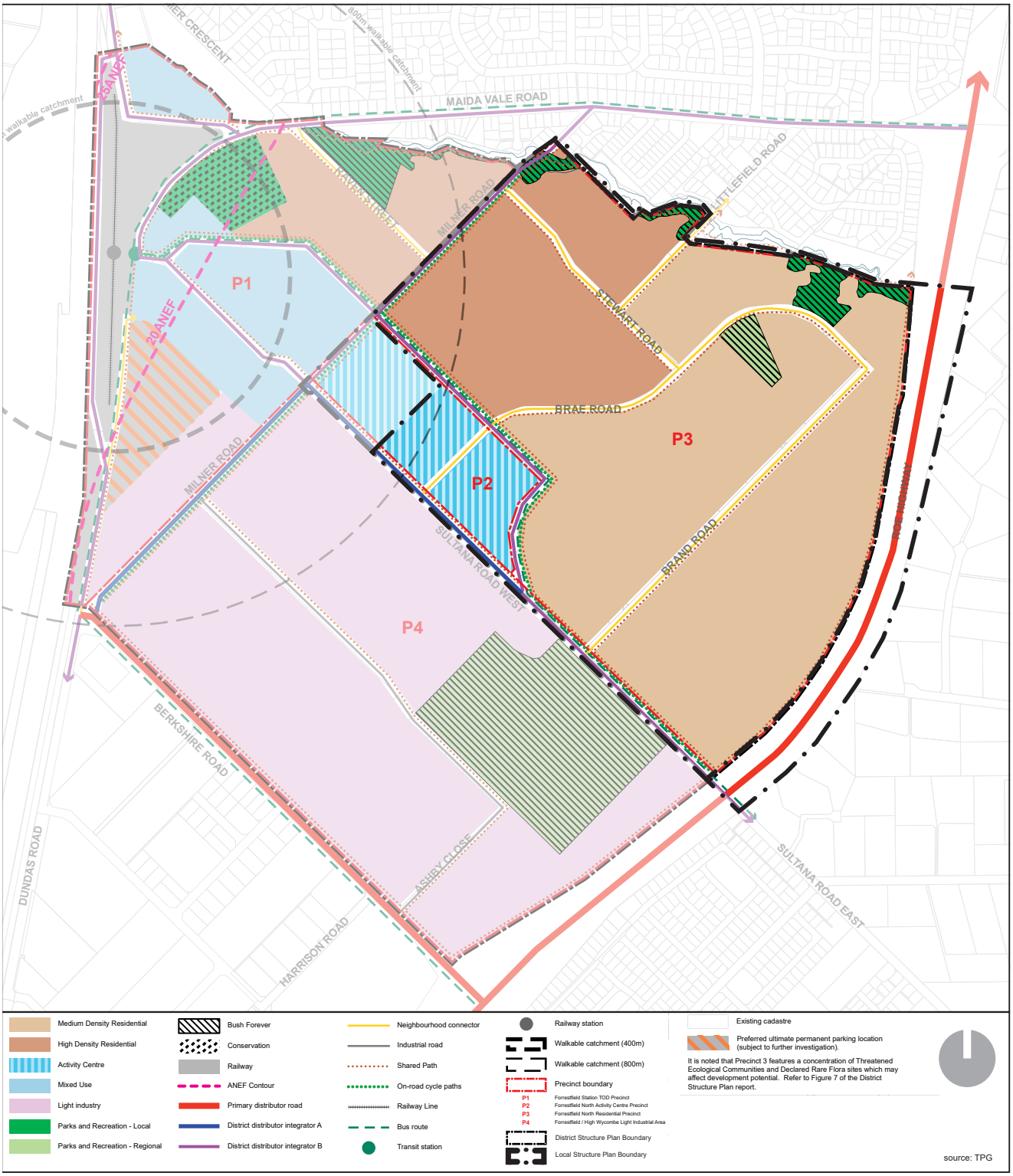


Figure 10. Forrestfield North District Structure Plan

The DSP reflects the State Governments announcement in 2014 regarding the development of the Forrestfield Airport Rail Link, including the Forrestfield Train Station at the western edge of the Forrestfield North area. This resulted in the Forrestfield North area being focused on the delivery of higher density forms of residential development not currently well represented in the City, a new activity centre to meet the needs of an expanding local population, and a commercially focused TOD precinct based around the new Forrestfield Train Station.

The LSP is a direct response to and intends to build upon the land use planning initiatives incorporated into the DSP, which will ensure that ongoing planning processes for the area are consistent with the intent and requirements of the DSP.

1.3.2.6 Draft Outer Metropolitan Perth and Peel Sub Regional Strategy (August 2010)

The WAPC's Draft Outer Metropolitan Perth and Peel Sub- Regional Strategy formed an integral part of the Directions 2031 vision and was intended to provide guidance to assist with the application of Directions 2031 at the local level. It addresses issues that extend beyond local government boundaries and that require a regional response, as well as commonly shared issues such as the provision of housing choice, affordability and employment.

It identifies a strategic plan of actions, agency responsibilities and delivery time frames and links State and local government strategic planning to guide the preparation and review of local planning strategies. The draft strategy informed the preparation of the City's Local Planning Strategy and will ultimately assist in the formulation of a new local planning scheme as outlined in the key planning actions required for the north-east sub region.

The development of Forrestfield North as envisaged under the LSP will support achieving the housing targets as identified in Directions 2031 and associated planning and delivery of land for employment growth and economic development.

1.3.3 Relevant Planning Policies

1.3.3.1 Western Australian Planning Commission State Planning Policy 2 – Environment and Natural Resources Policy

The WAPC's *State Planning Policy 2 – Environment and Natural Resources Policy* (SPP 2) acts as a broad overarching sectoral policy for environmental and natural resource planning in Western Australia and includes measures that identify those areas of high biodiversity and conservation value, such as Bush Forever sites. The protection of environmental assets in the LSP area have been identified in accordance with SPP 2 requirements and have been a key consideration in the evolution of the design and management framework proposed in the LSP.

Refer to the EAMS provided at Technical Appendix A for additional information.

1.3.3.2 Western Australian Planning Commission State Planning Policy 2.8 – Bushland Policy for the Perth Metropolitan Region

The WAPC's *State Planning Policy 2.8 – Bushland Policy for the Perth Metropolitan Region* (SPP 2.8) provides an implementation framework for the protection and management of regionally significant bushland within the Perth Metropolitan Region, identified as Bush Forever sites. These areas are intended to secure the long-term protection of biodiversity and associated environmental values within the Perth Metropolitan Region.

The LSP identifies the Bush Forever sites within the area and seeks to integrate these within future development through the creation of dedicated environmental conservation areas and local open space. The preservation of Bush Forever sites and other environmentally significant sites has been a key consideration of the LSP.

Refer to the EAMS provided at Technical Appendix A and section 2.1 for additional information.

1.3.3.3 Western Australian Planning Commission State Planning Policy 3 – Urban Growth and Settlement

The WAPC's *State Planning Policy 3 – Urban Growth and Settlement* (SPP 3) applies throughout Western Australia and seeks to promote a sustainable and well planned pattern of settlement across the State, with sufficient and suitable land to provide for a wide variety of housing, employment, recreation facilities and open space.

The LSP strategically locates areas of high and medium density housing in close proximity to the Forrestfield Train Station and represents an appropriate response to SPP 3 objectives. This includes:

- Locating higher density residential in locations accessible to transport and services.
- Concentrating commercial uses in and around activity centres and corridors with good access to public transport.
- Protecting biodiversity.
- Clustering retail, employment and other activities that attract large numbers of people at major transport nodes.
- Directing urban expansion that are or will be well serviced by employment and public transport.
- Proposing an urban structure of walkable neighbourhoods clustered to reduce car dependence for access to employment, retail and community facilities.

1.3.3.4 Western Australian Planning Commission State Planning Policy 3.1 – Residential Design Codes

The WAPC's *State Planning Policy 3.1 – Residential Design Codes* (R-Codes) provide a comprehensive basis for the control of residential development throughout Western Australia. The R-Codes aims to address emerging design trends, promote sustainability, improve clarity and highlight assessment pathways to facilitate better residential design outcomes.

Local governments are responsible for the day-to-day administration and application of the R-Codes through the implementation of their respective planning schemes.

The LSP has responded to the opportunities and constraints that are associated with the area. Higher density residential development forms are proposed to locate within close proximity of and be well connected to the Forrestfield Train Station. There is also proposed to be a transition to higher densities as you move west towards the TOD and Activity Centre Precincts as identified under the DSP, with additional built form guidance being provided under the Forrestfield North Residential Precinct Private Realm Design Guidelines to ensure positive outcomes.

1.3.3.5 Western Australian Planning Commission State Planning Policy 3.6 – Development Contributions for Infrastructure

In WA, as in other Australian states, local governments face increasing pressures on the services they provide. These pressures arise from population and economic growth and increasing expectations of the community for new and upgraded infrastructure.

The WAPC's *State Planning Policy 3.6 – Development Contributions for Infrastructure* (SPP 3.6) sets out the requirements and considerations for establishing development contributions for infrastructure that are required to support the orderly development of an area. It also aims to provide a consistent, accountable and transparent system for local governments to plan and charge for development contributions over and above the standard provisions through DCP'S.

Requirements for and implementation of development contributions for the LSP area have been specifically considered as part of the structure planning process for the Residential Precinct. This information will be formulated into a detailed DCP with associated costings and apportionment arrangements set out for a designated DCA established under LPS3. The DCP will also need to consider resolving the complexities of how to deal with shared infrastructure being provided to support development over the three precincts identified under the DSP.

1.3.3.6 Western Australian Planning Commission State Planning Policy 3.7 – Planning in Bushfire Prone Areas

SPP 3.7 intends to assist in reducing the risk of bushfire to people, property and infrastructure by taking a risk minimisation approach to development proposed in bushfire-prone areas.

A BMP has been prepared to support the LSP design, and has ensured an appropriate response to the associated risk of bushfire in the precinct through the careful design and layout of land uses within the area.

Refer to the BMP provided at Technical Appendix B and section 2.5 for additional information.

1.3.3.7 Western Australian Planning Commission State Planning Policy 4.1 – State Industrial Buffer Policy

The purpose of the WAPC's *State Planning Policy 4.1 – State Industrial Buffer Policy* (SPP 4.1) is to provide a consistent Statewide approach for the protection and long-term security of industrial zones, transport terminals (including ports) other utilities and special uses. The policy is to provide for the safety and amenity of surrounding land uses while having regard to the rights of landowners who may be affected by residual emissions and risk.

The residential interface with the Forrestfield / High Wycombe Light Industrial Area on the western side of Sultana Road West is intended to be treated by one or a combination of the following treatments to ensure adequate separation between the uses and to ensure an acceptable level of amenity is maintained:

- an acoustic wall;
- a landscape buffer strip; and/or
- a local road running parallel to Sultana Road West to provide adequate separation.

It is further recommended that the first row of residential development incorporate notifications on the title, warning of the potential for higher than normal noise levels, opposite the light industry located on the western side of Sultana Road West.

1.3.3.8 Western Australian Planning Commission State Planning Policy 4.2 – Activity Centres for Perth and Peel

The WAPC's *State Planning Policy 4.2 – Activity Centres for Perth and Peel* (SPP 4.2) specifies the broad planning requirements for the planning and development of new activity centres and the redevelopment of existing centres in the Perth and Peel region. It mainly concerns the distribution, function, broad land use, urban design criteria and coordination of land use and infrastructure.

Although there are no activity centres proposed to be located within the precinct, the LSP reflects the aims of SPP 4.2 through locating high and medium density residential development immediately adjoining the proposed TOD and Activity Centre Precincts to the west. The TOD and Activity Centre precincts will actively encourage connection to the Forrestfield Train Station and will form a new component of the City's activity centres hierarchy to meet current and future population needs in terms of access to services, facilities and employment.

1.3.3.9 Western Australian Planning Commission State Planning Policy 5.1 – Land Use Planning in the Vicinity of Perth Airport

The general intent the WAPC's *State Planning Policy 5.1 – Land Use Planning in the Vicinity of Perth Airport* (SPP 5.1) is to consider the planning of areas in close proximity of Perth Airport having regard to the impacts of aircraft noise with reference to the Australian Noise Exposure Forecast (ANEF).

The LSP area is located three kilometres to the west of Perth Airport outside of the ANEF 20 contour. On this basis, there is no restriction on zoning or development. However, given that residents within the area are likely to be unaccustomed to aircraft noise, it is recommended that the 70 db(A) contour be used as an area of notification and increased glazing requirements.

Refer to Transportation Noise Assessment provided at Technical Appendix C and section 2.7.10 for additional information.

1.3.3.10 Western Australian Planning Commission State Planning Policy 5.4 – Road and Rail Transport Noise and Freight Considerations in Land Use Planning

The criteria relevant to road and rail noise is *State Planning Policy 5.4 Road and Rail Transport Noise and Freight Considerations in Land Use Planning* (SPP 5.4) produced by the WAPC. The objectives in SPP 5.4 are to:

- Protect people from unreasonable levels of transport noise by establishing a standardised set of criteria to be used in the assessment of proposals;
- Protect major transport corridors and freight operations from incompatible urban encroachment;
- Encourage best practice design and construction standards for new development proposals and new or redevelopment transport infrastructure proposals;
- Facilitate the development and operation of an efficient freight network; and
- Facilitate the strategic co-location of freight handling facilities.

SPP 5.4 sets out criteria for the objective and permitted levels of outdoor noise in the vicinity of outdoor living areas. These criteria are detailed to achieve:

- acceptable indoor noise levels in noise - sensitive areas (e.g. bedrooms and living rooms of houses); and
- a 'reasonable' degree of acoustic amenity in at least one outdoor living area on each residential lot.

If a noise sensitive development takes place in an area where outdoor noise levels will meet the *target*, no further measures are required under SPP 5.4.

In areas where the *target* is exceeded, customised noise mitigation measures should be implemented with a view to achieving the *target* in at least one outdoor living area on each residential lot, or if this is not practicable, within the *margin* detailed in SPP 5.4. Where indoor spaces are planned to be facing outdoor areas that are above the *target*, mitigation measures should be implemented to achieve acceptable indoor noise levels in those spaces.

For residential buildings, "acceptable indoor noise levels" are taken to be 40 dB LAeq(Day) in living areas and 35 dB LAeq(Night) in bedrooms.

The Transportation Noise Assessment prepared to support the structure planning process has identified that the LSP area will not be affected by vibration or noise from the nearby freight railway. In regards to road traffic it is recommended that:

- Notifications on title be required in close proximity to Milner Road and the TOD Connector Road.
- Where residences are within 300 metres of the northbound carriageway of Roe Highway, notifications on title are required and developers must undertake a site specific noise assessment.

- Where residences are greater than 300 metres but less than 500 metres from the northbound carriageway to Roe Highway, Package A (refer Appendix A of the Transportation Noise Assessment) architectural treatment packages are to be incorporated and notifications on lot titles.
- A Transport Noise Assessment will also need to be completed and implemented at subdivision and/or development stage with respect to noise impacts from Forrestfield Station.

Refer to Transportation Noise Assessment provided at Technical Appendix C and section 2.7.10 for additional information.

1.3.3.11 Western Australian Planning Commission Development Control Policy 1.6 – Planning to Support Transit Use and Transit Oriented Development

The WAPC's *Development Control Policy DC1.6 – Planning to Support Transit Use and Transit Oriented Development* (DC 1.6) seeks to maximise the benefits to the community of an effective and well used public transit system by promoting planning and development outcomes that will support and sustain public transport use.

This policy applies to all areas of the State, within transit precincts as defined under the policy, and is intended to inform government agencies, local government, landowners and prospective developers of the policy approach which will be applied by the WAPC.

The LSP is intended to support future development at higher residential densities which is vital to the success of the overall TOD development. The different density cells have been strategically positioned to capitalise on the future public transport network which is set to service the area. This density, combined with the road structure and community use areas, supports the objectives of DC 1.6, creating an active TOD outcome.

1.3.3.12 Operational Policy – Liveable Neighbourhoods

Liveable Neighbourhoods (LN) is the WAPC's operational policy guiding the design and approval of structure plans for green field sites. The objective of LN is the delivery of new developments that provide high quality living, working and recreational environments, thereby contributing to the successful implementation of State Planning and State Sustainability Targets. The LSP is a direct response to the aspirational requirements of LN, and meets all of it's principal aims.

1.3.3.13 Guidelines – Better Urban Water Management

The WAPC's planning guidelines for Better Urban Water Management have been prepared to facilitate the better management of our urban water resources by ensuring an appropriate level of consideration is given to the total water cycle at each stage of the planning system.

A detailed Local Water Management Strategy (LWMS) has been prepared for the Residential Precinct and to support the preparation of the LSP.

Refer to LWMS provided at Technical Appendix D and section 2.7.8 for additional information.

1.3.3.14 Guidelines – Acid Sulfate Soils Planning Guidelines

The WAPC's planning guidelines for ASS outline a range of matters to be addressed at various stages of the planning process to ensure that the development of land containing ASS is planned and managed to avoid potential adverse effects on the natural and built environment.

There is the potential that ASS may occur within the Residential Precinct, with the entire site being classified as having a 'moderate to low' risk of ASS. The impacts associated with ASS can be associated with the increase in acidity and/ or the release of heavy metals into the environment, resulting in a number of detrimental impacts. The impacts of ASS can be avoided through a number of methods that deal with the issue, which, if identified as being necessary, would be addressed in an ASS Management Plan at the time of development.

1.3.3.15 Guidelines – Planning For Bushfire Protection

Prepared pursuant to SPP 3.4, the Planning for Bushfire Protection Guidelines set out a range of matters that need to be addressed at various stages of the planning process, to provide an appropriate level of protection to life and property from bush fires, and avoid inappropriately located or designed land use, subdivision and development on land where a bush fire risk is identified.

Bushfire considerations form an integral part of the LSP design, particularly the use of roads and other design feature to mitigate bushfire risk.

Refer to the BMP provided at Technical Appendix B and section 2.5 for additional information.

1.3.3.16 Environmental Protection (Noise) Regulations 1997

Existing industry and new premises, as part of the overall Forrestfield North development (e.g. Activity Centres), will be required to control their noise emissions to comply with the prescribed standards of the *Environmental Protection (Noise) Regulations 1997*. These Regulations have not been explained in detail in this report, due to the early stage of this development. However, as each of these developments submits DA's, these are to be accompanied by an acoustic assessment, undertaken by a suitably qualified acoustical consultant, being a member firm of the Association of Australasian Acoustic Consultants.

1.3.4 Local Planning Context

1.3.4.1 City of Kalamunda Local Planning Strategy

The City has developed a comprehensive local planning strategy to guide the future evolution of the district. The Local Planning Strategy was endorsed by the WAPC in February 2013.

In response to WAPC strategic planning direction at the time including the Kewdale Hazelmere Integrated Masterplan (KHIM) and Economic and Employment Lands Strategy (EELS), a key element of the Local Planning Strategy was the identification of additional industrial lands for further investigation in Forrestfield North as part of the Forrestfield/ High Wycombe Light Industrial Area.

This thinking pre-dated announcement of the Forrestfield Airport Rail Link, which necessitated the re-thinking of the optimal planning outcomes for this area, resulting in the preparation of the DSP and ultimately the LSP for the Residential Precinct.

1.3.4.2 City of Kalamunda Local Biodiversity Strategy

The City Local Biodiversity Strategy has been developed in anticipation of future development encroaching into natural assets. The strategy aims to strategically plan natural area protection so that biodiversity conservation is incorporated into the City's planning and decision-making processes.

The Local Biodiversity Strategy identifies ecological linkages within or adjacent to the Forrestfield North area running east-west along Poison Gully Creek and north south through the eastern portion of the project area, generally picking up high quality remnant vegetation including the corridor adjacent to Roe Highway. It also states that there are opportunities to protect natural areas in public open space contributions within Forrestfield North.

The environmental outcomes depicted in the LSP are an appropriate response to the objectives of the City's Local Biodiversity Strategy.

1.3.4.3 Local Planning Policies and Procedures

A number of the City's policies and/or procedures were also relevant to the preparation of this LSP, or will be used to inform future detailed design and implementation of staged development of the Residential Precinct.

The City's operational policies and procedures can be accessed via the following link: kalamunda.wa.gov.au/council/governance/local-policy

2. Site Conditions and Constraints

A detailed Opportunities and Constraints Plan has been prepared to illustrate the main issues discussed in this section of the LSP.

Refer to Figure 11 – Forrestfield North Residential Precinct Opportunities and Constraints

2.1 Biodiversity And Natural Area Assets

A detailed Environmental Assessment and Management Strategy (EAMS) has been prepared for the Forrestfield North LSP by Strategen JBS&G Environmental. The objectives of the EAMS are to:

- describe the environmental and heritage values within the precinct and surroundings based on existing information.
- identify potential opportunities to secure, protect and manage the significant environmental values on site and present management requirements.

To ensure that an integrated approach is developed for the precinct area the EAMS has been prepared in parallel with the Local LWMS and BMP.

Refer to EAMS provided at Technical Appendix A.

Refer to BMP provided at Technical Appendix B.

Refer to LWMS provided at Technical Appendix D.

2.1.1 Flora and vegetation

Vegetation occurring within the region was initially mapped at a broad scale (1:1 000 000) by Beard during the 1970s. This dataset has formed the basis of several regional mapping systems, including physiographic regions defined by Beard (1981) which led to the delineation of botanical districts as described in Beard (1990); the biogeographical region dataset (Interim Biogeographic Regionalisation for Australia, IBRA) for Western Australia (DEE 2017a) and System 6 Vegetation Complex mapping undertaken by Heddle et al. (1980). The site is located within the Swan Coastal Plan 2 (SWA2) bioregion.

Beard (1980) vegetation association mapping indicates that the precinct resides within the 1001- Medium very sparse woodland; jarrah, with low woodland; banksia and casuarina. Remnant areas of the association are identified in Figure 12. WALGA (2017) estimates that there is approximately 10-30% of this vegetation complex within the IBRA subregion.

Heddle et al (1980) broadly mapped vegetation complexes across the Swan Coastal Plain. The precinct comprises the Southern River Complex and the Forrestfield Complex.

The Southern River Complex occurs in the western portion of the precinct area and is described as 'open woodland of *Eucalyptus calophylla* (now *Corymbia calophylla*) – *E. marginata – Banksia spp.* with fringing woodland of *E. rudis – M. rhaphiophylla* along creek beds' (Heddle et al 1980).

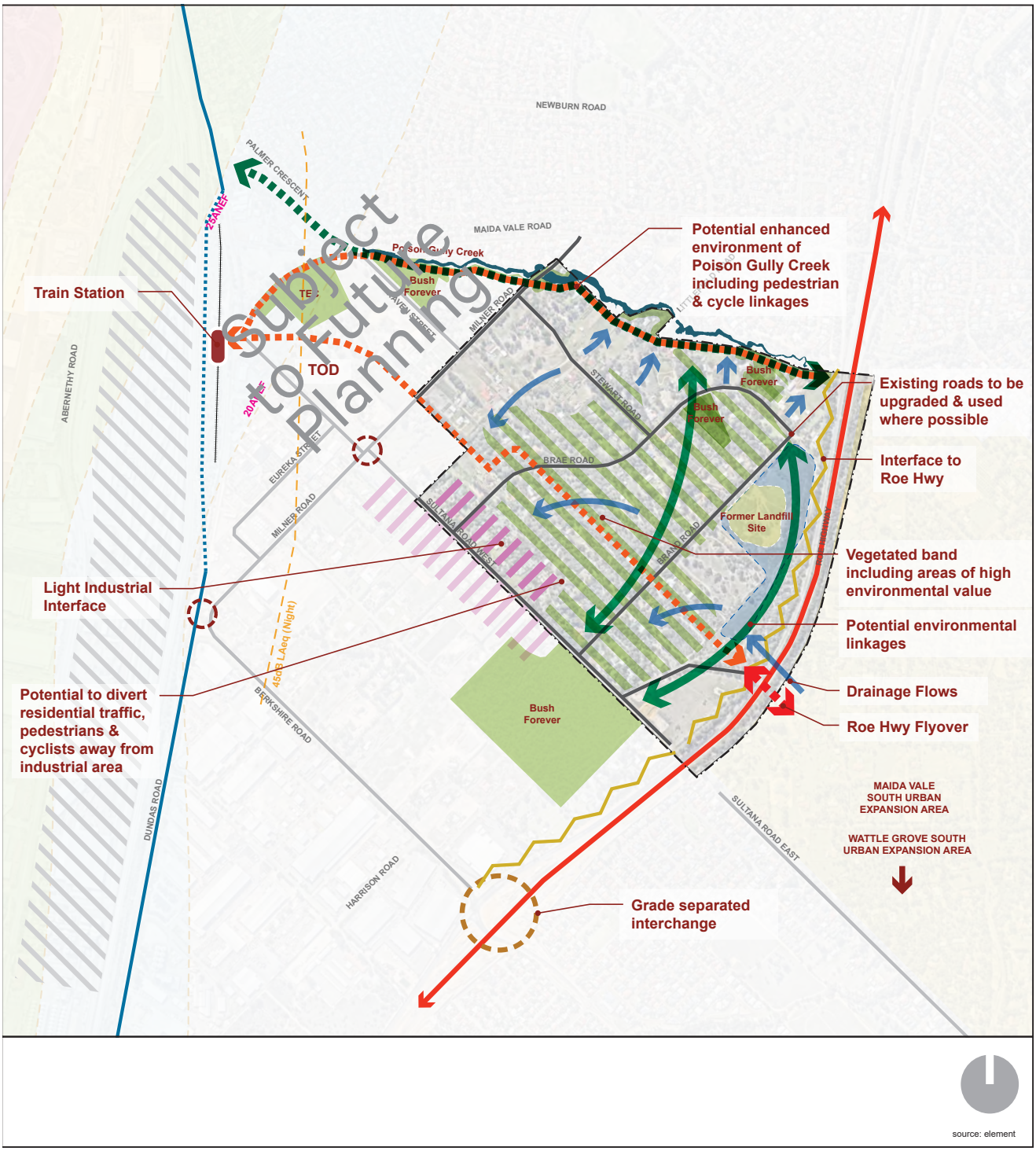


Figure 11. Forrestfield North Residential Precinct Opportunities and Constraints

The Forrestfield Complex occurs in the eastern portion of the precinct and is described as 'vegetation ranges from open forest of *Eucalyptus calophylla* (now *Corymbia calophylla*) – *E. wandoo* – *E. marginata* to open forest of *E. marginata* – *C. calophylla* – *C. Fraseriana* – Banksia spp. Fringing woodland of *E. rudis* in the gullies that dissect this landform' (Heddle et al 1980).

The Environmental Protection Authority (EPA) (2015) has estimated that approximately 1,967 (10.3%) of the Forrestfield Complex and approximately 6,936 ha (16.8%) of the Southern River Complex remains in the Perth Peel Regional compared to the pre-European extent. Within the Swan Coastal Plain (SPC) area vegetation complexes that are less than 10% of the original extent are considered to be significant with focus on the retention of the remaining vegetation complex within the SCP, the remaining areas for both complexes are above the 10% threshold.

Remnant vegetation on site has been fragmented through semi-rural land development and clearing for building footprints, the remaining areas supporting mapped vegetation complexes within the precinct are represented in Figure 12.

Refer to Figure 12 – Regional Vegetation Association and Complex

2.1.1.1 Vegetation Communities, Condition and Flora

Five vegetation communities (EmAcMt, EmToDo, AfHhMp, ErApEh and trees) totalling approximately 23.8ha were mapped within the precinct which ranged from 'Degraded' to 'Excellent' condition (Keighery. 1994) (AECOM 2017). Refer to Figures 13 and 14 respectively.

Refer to Figure 13 – Vegetation Unit

Refer to Figure 14 – Vegetation Condition

The Threatened Wavy-leaved Smokebush (*Conospermum undulatum*) which is listed as Vulnerable under the *EPBC Act* and *WC Act* was extensively recorded within the precinct. One Priority 3 species, *Isopogon drummondii,* was also recorded in the precinct. A total of 525, individual Wavy-leaved Smokebush plants were recorded within the DSP. Within the State (swan costal plan) context there are 11,453 individuals recorded, based on this recorded 4.5% of individual plants reside within the precinct (AECOM, 2017).

There are 520 individual Wavy-leaved Smokebush plants within the Residential Precinct (99% of the population within the DSP area). Refer to Figure 15.

Refer to Figure 15 – Threatened and Priority Flora and Banksia Woodland TEC

Refer to Tables in the EAMS provided at Technical Appendix A.

2.1.1.2 Threatened Ecological Communities

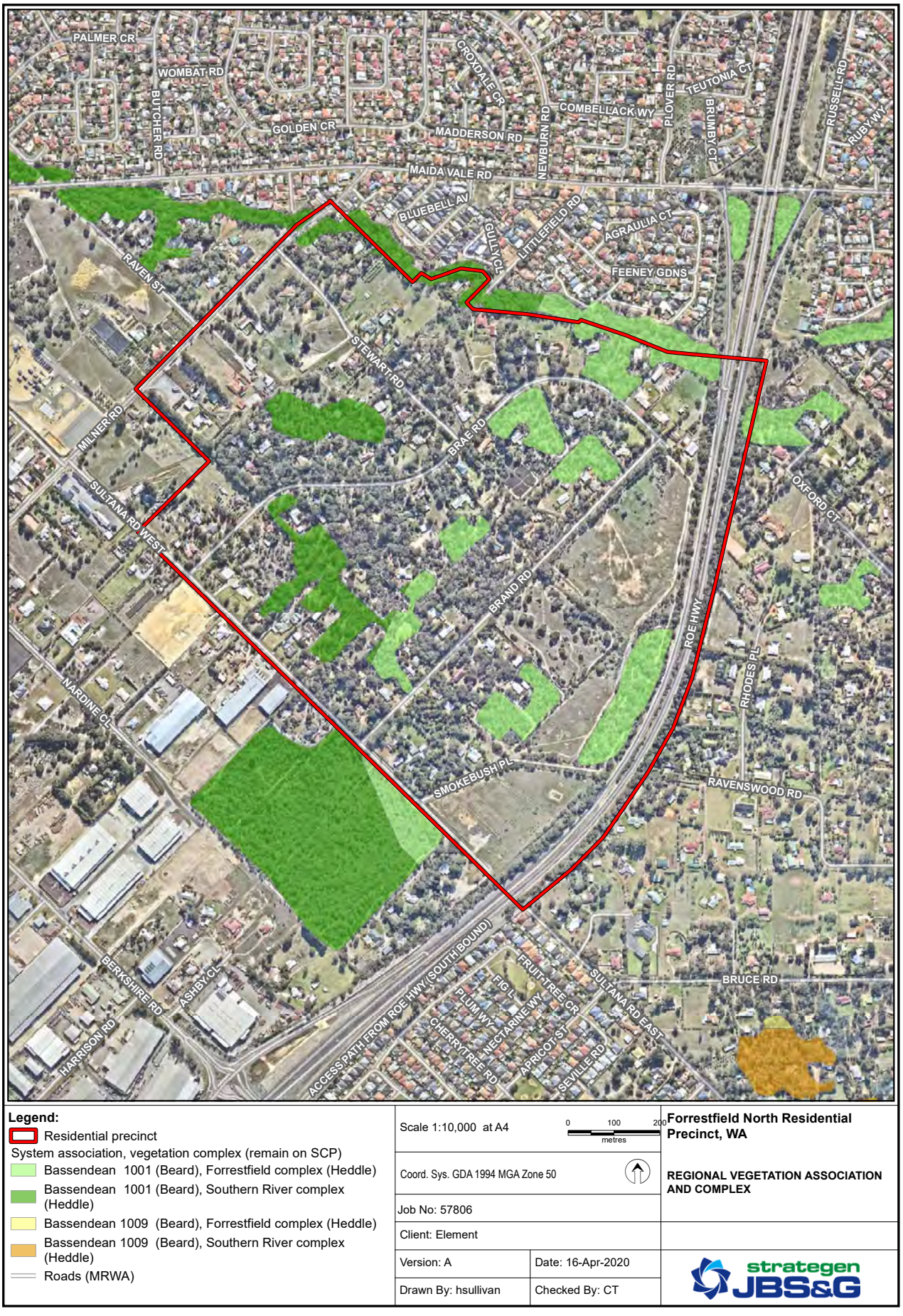
Four communities listed as Threatened Ecological Communities (TECs) were considered to potentially occur within the vicinity of the Forrestfield North Area (Strategen JBS&G 2016 and AECOM 2017a).

The total area of native vegetation representing the Banksia Woodland TEC within the DSP area is 15.30ha of which 100% is located within the Residential Precinct.

Refer to EAMS provided at Technical Appendix A for additional information.

2.1.1.3 Weed (Introduced) Taxa

During the Strategen JBS&G (2016) survey a total of 29 introduced (exotic) taxa were recorded within specific lots within the DSP area, while AECOM (2017) recorded 11 species within the DSP area. Two species (*Zantedeschia aethiopica* [Arum Lily] and *Asparagus asparagoides* [Bridal Creeper]) recorded within the precinct are Declared Plant species in Western Australia pursuant to section 22 of the *Biosecurity and Agriculture Management Act 2007* (BAM Act) according to the Western Australian Department of Agriculture and Food (DAFWA 2015) (Strategen JBS&G 2016).



Legend:

- Residential precinct

System association, vegetation complex (remain on SCP)

- Bassendean 1001 (Beard), Forrestfield complex (Heddle)
- Bassendean 1001 (Beard), Southern River complex (Heddle)
- Bassendean 1009 (Beard), Forrestfield complex (Heddle)
- Bassendean 1009 (Beard), Southern River complex (Heddle)
- Roads (MRWA)

Scale 1:10,000 at A4 (0 100 200 metres)		**Forrestfield North Residential Precinct, WA**
Coord. Sys. GDA 1994 MGA Zone 50		**REGIONAL VEGETATION ASSOCIATION AND COMPLEX**
Job No: 57806		
Client: Element		
Version: A	Date: 16-Apr-2020	strategen JBS&G
Drawn By: hsullivan	Checked By: CT	

Figure 12. Regional Vegetation Association and Complex (Source: Strategen JBS&G)

Legend:
- Residential precinct
- Vegetation community
- AfHhMp
- EmAcMt
- EmToDo
- ErApEh
- Trees
- Roads (MRWA)

Scale 1:10,000 at A4 (0 100 200 metres)		**Forrestfield North Residential Precinct, WA**
Coord. Sys. GDA 1994 MGA Zone 50		**VEGETATION UNIT**
Job No: 57806		
Client: Element		
Version: A	Date: 16-Apr-2020	strategen JBS&G
Drawn By: hsullivan	Checked By: CT	

Figure 13. Vegetation Unit (Source: Strategen JBS&G)

Legend:

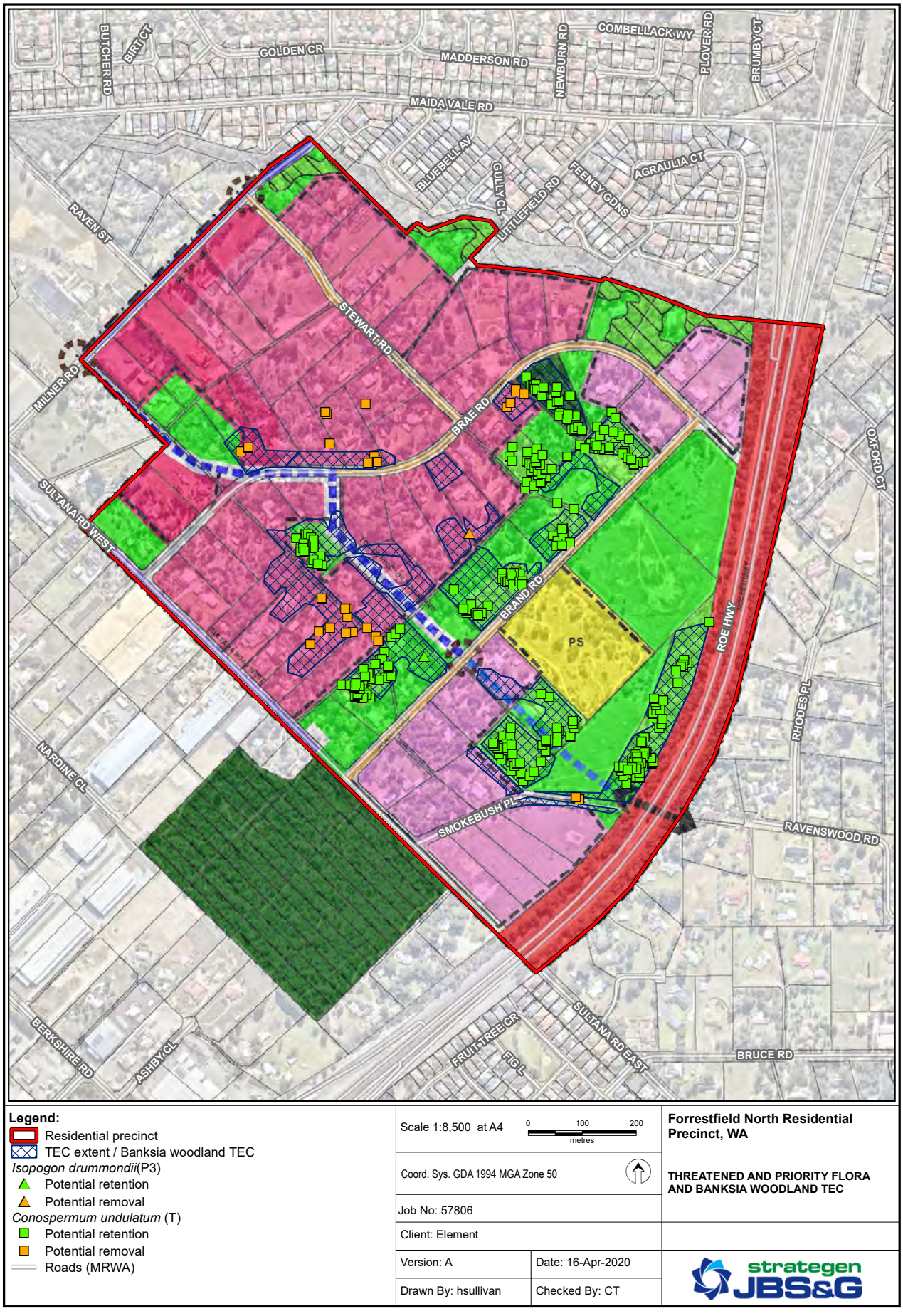
- Residential precinct

Vegetation condition

- Excellent
- Very good
- Good
- Degraded
- Completely degraded
- Roads (MRWA)

Scale 1:10,000 at A4 (0, 100, 200 metres)		**Forrestfield North Residential Precinct, WA**
Coord. Sys. GDA 1994 MGA Zone 50		**VEGETATION CONDITION**
Job No: 57806		
Client: Element		
Version: A	Date: 16-Apr-2020	strategen JBS&G
Drawn By: hsullivan	Checked By: CT	

Figure 14. Vegetation Condition (Source: Strategen JBS&G)



Legend:

- Residential precinct
- TEC extent / Banksia woodland TEC

Isopogon drummondii(P3)

- Potential retention
- Potential removal

Conospermum undulatum (T)

- Potential retention
- Potential removal
- Roads (MRWA)

Scale 1:8,500 at A4 (0 100 200 metres)		**Forrestfield North Residential Precinct, WA**
Coord. Sys. GDA 1994 MGA Zone 50		**THREATENED AND PRIORITY FLORA AND BANKSIA WOODLAND TEC**
Job No: 57806		
Client: Element		
Version: A	Date: 16-Apr-2020	strategen JBS&G
Drawn By: hsullivan	Checked By: CT	

Figure 15. Threatened and Priority Flora and Banksia Woodland TEC (Source: Strategen JBS&G)

2.1.1.4 Dieback

A Dieback (*Phytophthora cinnamomic*) survey has not been completed for the precinct. It was noted during the AECOM (2017) survey that no visual evidence of dieback existed within the DSP area (based on the health of Xanthorrhoea, Banksia and Eucalyptus species).

2.1.2 Fauna

A Level 1 Fauna Assessment conducted in accordance with EPA Guidance Statement No. 56 (EPA 2004b) was completed by AECOM (2017) for the DSP area. Twelve fauna species were recorded during the AECOM (2017) field survey. This included nine birds, one mammal and two reptiles.

It was reported that four species of conservation significance including three birds and one mammal and three types of habitats were recorded within the precinct. These include:

- Carnaby's Cockatoo listed as Endangered under the *EPBC Act* and the *WC Act*
- Forest Red-tailed Black Cockatoo listed as Vulnerable under the *EPBC Act* and the *WC Act*
- Rainbow Bee-eater listed as Marine under the *EPBC Act*
- Quenda listed as Priority 4 by DBCA.

The Rainbow Bee-eater was seen and heard at one location in the DSP area. This species is listed as Marine and as such, is not considered protected unless it is in Commonwealth land (AECOM 2017).

2.1.2.1 Black Cockatoo

Carnaby's Cockatoos (CC), feed on the seeds, nuts and flowers, of a variety of native and introduced plant species and insect larvae (DEE 2017b). Food plants generally occur within proteaceous genera such as Banksia, Dryandra, Hakea and Grevillea, though are known to forage on eucalypt species in woodland areas. CC have also adapted to feeding on exotic species such as pines and cape lilac and weeds such as wild radish and wild geranium (DEE 2017b). CC usually breed between July and December in the hollows of live or dead eucalypts; primarily in Salmon Gum and Wandoo, but also within Jarrah, Marri and other eucalypt species (Johnstone 2010). Hollows are usually at least 2 metres above ground, sometimes over 10 metres and the depth of the hollow varies from 0.25 metres to 6 metres (DEE 2017b). The Western Australian Department of Parks and Wildlife (now DBCA), renewed the Carnaby's Cockatoo Recovery Plan in 2013, clearly mapping the distribution of likely breeding and non-breeding areas in southwest WA for CC (Parks and Wildlife 2013). Based on this map, the Residential Precinct is situated within the CC breeding range.

Forest Red-tailed Black-Cockatoos, listed as Vulnerable under the EPBC Act, depend primarily on Marri and Jarrah trees for both foraging and nesting. The seeds of both eucalypts are the favoured food source of the birds and hollows within live or dead individual trees are utilised for nesting purposes (Johnstone & Kirkby 1999). Breeding varies between years and occurs at times of Jarrah and Marri fruiting. These black cockatoos breed in woodland, forest or artificial nest boxes, but may also breed in former woodland or forest that has been reduced to isolated trees (DEE 2017b).

2.1.2.2 Quenda

The Quenda (*Isoodon obesulus*) is considered to likely occur in the DSP area. During the survey, evidence that Quenda are present within the precinct was observed. Preferred habitat usually consists of a combination of sandy soils and dense heathy vegetation (AECOM 2017).

2.1.3 Habitat Assessment

Four fauna habitats have been defined and mapped for the DSP area, three of these occur within the precinct. Refer to Table 9 of EAMS provided at Technical Appendix A.

2.1.3.1 Foraging Assessment

The Residential Precinct was divided into three different vegetation types, all of which are considered to be utilised by two species of black cockatoos (CC and FRTBC) for foraging (AECOM (2017).

Foraging habitat quality is displayed in Figure 16. Foraging habitat was based on the following assessment by AECOM (2017) for CC and FRTBC:

- high quality: based on suitable foraging species, Jarrah woodlands, presence of water availability within 2 kilometres, and support of trees with potential to be used for breeding
- valued quality: low quality vegetation comprised of native trees over planted vegetation or cleared paddocks, lack of suitable foraging plants present (mostly due to lack of complexity in vegetation structure).

AECOM (2017) identified 'Quality' habitat for FRTBC. This classification related to low quality vegetation for FRTBC but had a higher value due to the vegetation being near a known roosting site, water and other areas of quality foraging habitat. The boundaries for 'Quality' habitat for FRTBC are the same as 'Valued' quality for CC.

No foraging evidence was recorded for CC; however, all native vegetation, including trees with planted vegetation, was considered by AECOM (2017) to be suitable foraging habitat for CC. Vegetation communities AfHhMp, EmAcMt and EmToDo had 10-57% foliage cover of suitable foraging species (Table 9 of EAMS). The variety of cover is directly related to the condition of the vegetation. Degraded vegetation lacks the Proteaceous species in the understorey and has reduced Banksia cover. Suitable CC's foraging species included 24 Proteaceous species and Jarrah trees (AECOM 2017).

All native vegetation within the DSP area is considered by AECOM (2017) to be suitable FRTBC foraging habitat. AECOM (2017) also identified ten observations of foraging evidence by FRTBC. Communities AfHhMp, EmAcMt, EmToDo and VdCd all support suitable foraging species. These are limited to three overstorey species including Jarrah, Sheoak and Snottygobble. The foliage cover of these species varies from 1.5–57%. The DSP area supports Eucalypt woodlands dominated by Jarrah, contains trees with potential to become breeding trees, supports a known large roost site (more than 10 birds), and is less than 2 kilometres from a watering location (AECOM 2017). The trees with planted vegetation or in paddocks were classified as 'Quality' habitat and were located near known roosting site, water and other areas of quality foraging habitat (AECOM 2017).

Based on the results of the foraging assessment, the Residential Precinct contains a total of 23.64ha of foraging habitat for CC and FRTBC black cockatoos of which:

- 19.28 ha comprises of high quality foraging habitat
- 4.35 ha comprises of valued quality foraging habitat.

2.1.3.2 Roosting

Black Cockatoo roosting habitat is generally found in or near riparian vegetation, close to fresh water and typically is comprised of the tallest trees in these areas (AECOM 2017). There is a known roosting site located within the precinct on Lot 47 Brae Road, as provided in DBCA Black Cockatoo observational data (AECOM 2017).

2.1.3.3 Habitat Trees

'Breeding habitat' for black cockatoos is defined in DSEWPaC (2012) as trees of species known to support breeding within the range of the species which either have a suitable nest hollow or are of a suitable DBH to develop a nest hollow (> 300 mm for salmon gum and wandoo, and >500 mm for other species). These trees are known as significant trees. Trees of this size may also be large enough to provide roosting habitat (i.e. trees which provide a roost or rest area for the birds).

A total of 458 potentially significant trees (with DBH >500 mm) were recorded in the DSP area, of which 411 are located within the Residential Precinct (refer to Figure 16) (Table 10). 26 of these trees, contained a total of 42 suitable hollow(s), within the DSP area. A total of 26 trees with suitable hollow(s) were within the Residential Precinct. (AECOM 2017). No evidence of black cockatoo occupancy was identified within these hollows, there were signs of use by bees and/or galahs on some hollows (AECOM 2017).

Refer to Figure 16 – Potential Black Cockatoo Habitat Trees and Foraging Habitat

2.1.4 Bush Forever and Local Natural Areas

Bush forever site No. 45 Poison Gully Bushland runs along the northern cadastral boundary of the precinct and extends into Lots 80 and 81. Lot 78 has recently been included within Bush forever site No. 45. Bush forever Site No. 123 Sultana Road West Bushland is located outside of the precinct, and is located on the southern cadastral boundary of the precinct.

Local Natural Areas (LNA) have been identified for priority of retention, protection and management. These areas are usually the responsibility of the Local Government Area (Del Marco et al. 2004). The LNA mapped by WALGA (2017) within the precinct are shown in Figure 12 of the EAMS at Technical Appendix A.

2.1.5 Ecological linkages

According to Del Marco et al. (2004) the importance of ecological linkage is to connect natural areas, preferably with continuous corridors of native vegetation, which assists in fauna movement between the areas and to access resources and habitats. The protection, management and buffering of existing natural areas within an ecological linkage is a higher priority than revegetation of cleared portions of the link. The precinct has been identified within the Perth Regional Ecological Linkage network.

2.1.6 Environmentally sensitive areas

Environmentally Sensitive Areas (ESAs) are areas that have been identified for protection due to their environmental significance as outlined in the Western Australian Environmental Protection (Environmentally Sensitive Areas) Notice 2005, which was gazetted on 8 April 2005.

Exceptions offered for clearing under Regulation 5 of the Environmental Protection (Clearing of Native Vegetation) Regulations 2004 do not apply within ESAs. ESAs are protected under the EP Act, and include the following:

- World Heritage areas
- areas included on the National Estate Register
- defined wetlands and associated buffers
- vegetation within 50 m of a listed Threatened species
- TECs.

ESA mapping includes the entire precinct (WALGA, 2017). These are likely to be associated with the known presence of the Declared Rare Flora Wavy-leaved Smokebush (*Conospermum undulatum*), Bush Forever Sites and State listed TEC within and adjacent to the precinct.

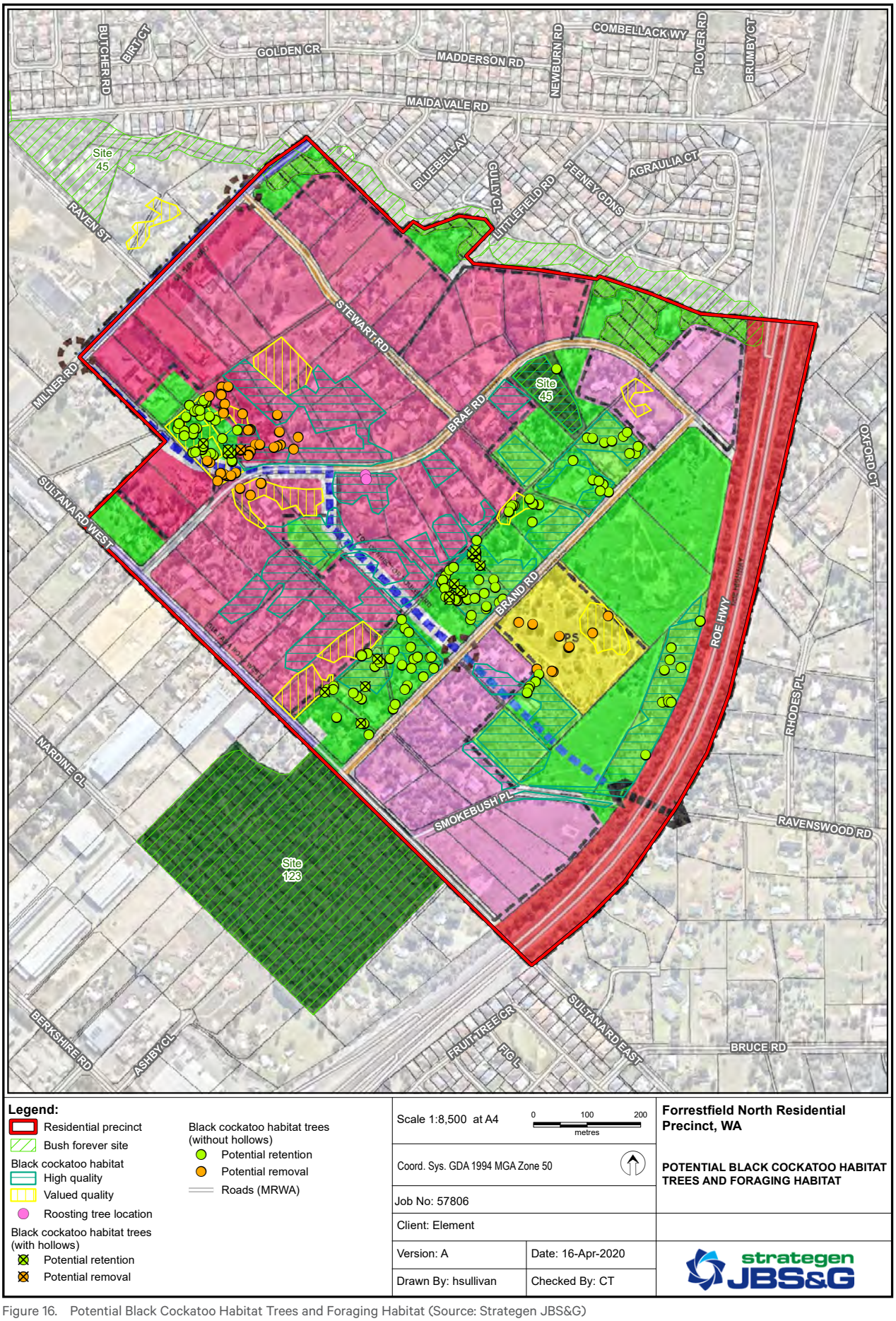


Figure 16. Potential Black Cockatoo Habitat Trees and Foraging Habitat (Source: Strategen JBS&G)

2.1.7 Wetlands

A search of the Geomorphic Wetlands of the Swan Coastal Plain Database shows that the western section of the precinct is mapped as a Multiple Use Wetland (MUW), and a portion of Poison Gully Creek is classified as a Palusplain Resource Enhancement Wetland (REW) (UFI 13997) (DBCA 2017).

REW's are considered as priority wetlands where they have been partially modified but still support substantial ecological attributes and function. The ultimate objective is to manage, restore and protect towards improving their conservation value. No unauthorised development is permitted within a REW. A generic wetland buffer to protect the wetlands ecosystem is usually associated with REW, site buffer assessment can be undertaken to determine the buffer widths (EPA 2008). The existing buffer (generic 30metres) associated with REW (UFI 15880) (Poison Gully) is semi developed (i.e. residential properties, cleared footprints and sheds).

Refer to Figure 17 – Hydrology

MUW's are the lowest management category assigned to wetlands by the DWER, and are generally considered appropriate for development, provided the hydrological regime is not disturbed (EPA 2008).

2.1.8 Legislation, Policies and Guidelines

2.1.8.1 Federal

The *EPBC Act* is administered by the Department of the Environment and Energy (DEE). The *EPBC Act* aims to protect and manage nine Matters of National Environmental Significance (MNES) throughout Australia including:

- World Heritage Properties
- National Heritage Places
- wetlands of international importance (listed under the Ramsar Convention)
- listed threatened species and ecological communities
- migratory species protected under international agreements
- Commonwealth Marine Areas
- the Great Barrier Reef Marine Park
- nuclear actions (including uranium mines).

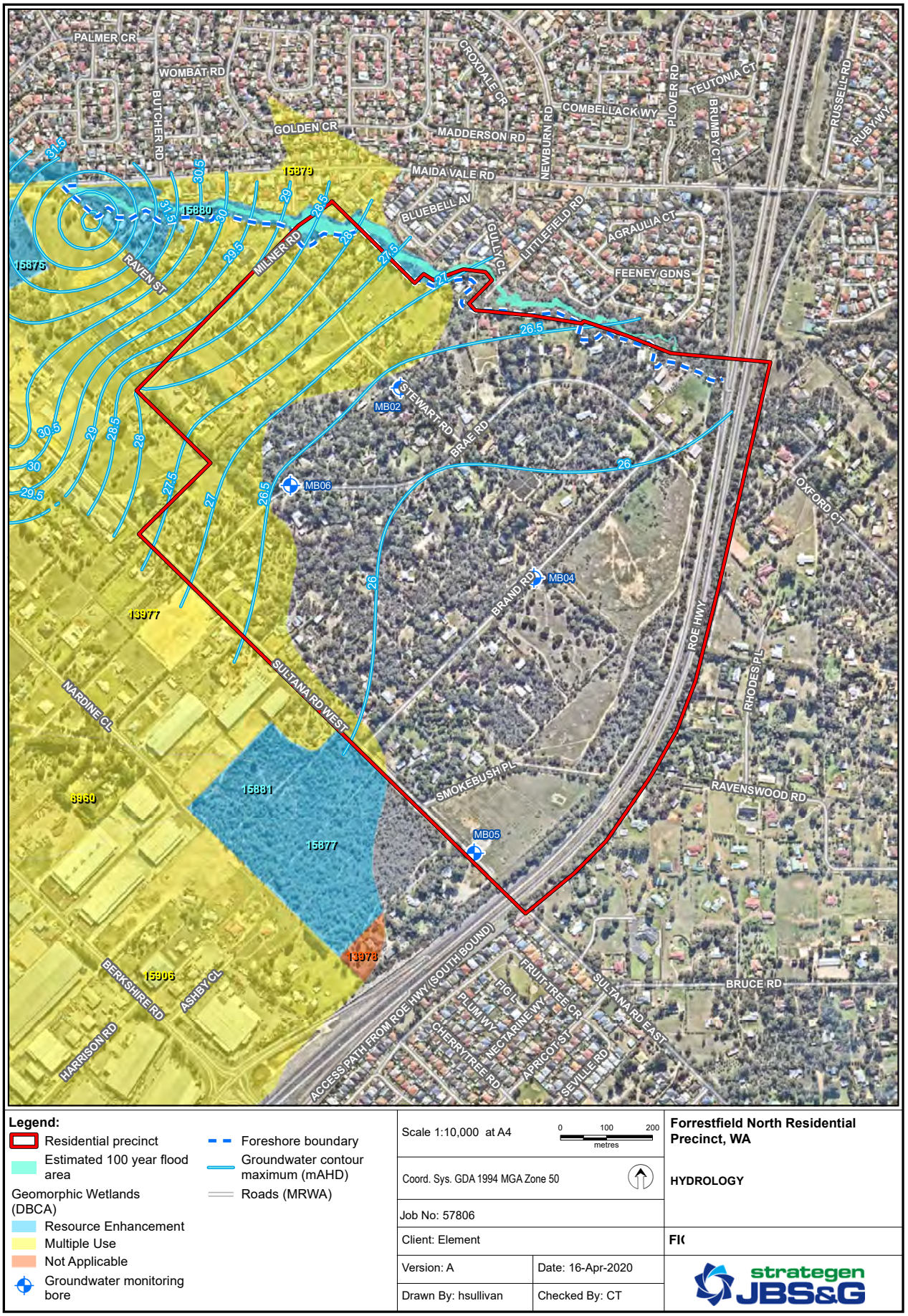
The MNES applicable for the site is listed threatened species and ecological communities:

- Banksia Woodlands of the Swan Coastal Plain Threatened Ecological Community (TEC)
- *Conospermum undulatum* (Wavy-leaved Smokebush)
- Black Cockatoo foraging habitat and breeding trees.

Under the *EPBC Act* an action that could be a significant impact on any MNES in accordance with the Significant Impact Guidelines 1.1-Matters of National Significance (Department of the Environment, Water, Heritage and the Arts, 2013) should be referred to the DEE for assessment by the minister.

The existing environmental challenges for the site include the following:

- the distribution of MNES is across the precinct
- lots within the precinct (proposed Environmental Conservation Reserves -EC) are vested in different landowners (multiple stakeholders) and vary in size.



Legend:

- Residential precinct
- Estimated 100 year flood area
- Geomorphic Wetlands (DBCA)
  - Resource Enhancement
  - Multiple Use
  - Not Applicable
- Groundwater monitoring bore
- Foreshore boundary
- Groundwater contour maximum (mAHD)
- Roads (MRWA)

Scale 1:10,000 at A4 (0 100 200 metres)		**Forrestfield North Residential Precinct, WA**
Coord. Sys. GDA 1994 MGA Zone 50		**HYDROLOGY**
Job No: 57806		
Client: Element		**FI**
Version: A	Date: 16-Apr-2020	strategen JBS&G
Drawn By: hsullivan	Checked By: CT	

Figure 17. Hydrology (Source: Strategen JBS&G)

To provide a consolidated approach for the future direction and approvals for the site, there are two options to ensure long-term legislative protection of the key environmental areas within the precinct:

1. Strategic Assessment of the LSP area - identification of the potential impacts associated with the implementation of the LSP and the identification of areas to be retained within the precinct.
2. The potential impact on MNES that occurs within the precinct can be referred on a case-by-case basis by the landowner/proponent. While ECs have been incorporated within the LSP design to retain a significant portion of MNES (i.e. Banksia Woodland TEC, black cockatoo foraging habitat and breeding trees and Wavy-leaved Smokebush individuals). An assessment to whether development of a particular area within the Residential Precinct would be considered a significant impact on any MNES in accordance with the Significant Impact Guidelines 1.1-Matters of National Significance (Department of the Environment, Water, Heritage and the Arts, 2013) and warrant referral under the *EPBC Act* would be at the landowner/proponent discretion.

2.1.8.2 State and Local

Applicable legislation includes *Environmental Protection Act 1986*, the *Planning and Development Act 2005* (PD Act) and Planning and *Development (Local Planning Schemes) Regulations 2015* (*PD Regulations*).

Other relevant State legislation and local strategies, local planning policies and by-laws relevant to the management of the Residential Precinct are provided in the EAMS.

Refer to EAMS provided at Technical Appendix A for additional information.

2.1.9 Management Strategy

As part of the formulation of the LSP, the documentation and assessment of the opportunities and constraints of the existing environment was undertaken which influenced the design of the precinct according to placement of POS areas, drainage basins/swales and EC and ecological linkages.

2.1.9.1 Landforms

Policy and management objectives

Where possible, maintain the gentle sloping topography across the precinct and to retain the rural lifestyle amenity of the precinct. To also ensure that the subdivision and development of land containing ASS is planned and managed to avoid potential adverse effects on the natural and built environment.

Local Structure Plan considerations

The opportunity and constraints analysis of regional landform mapping (i.e. topography, soils and potential ASS) environmental elements has indicated that there are no significant elements that are required to be considered or potentially impede development opportunities.

Management requirements

Management measures have been identified to assist in achieving the Landforms management objectives (refer to Table 12 of EAMS provided at Technical Appendix A).

Predicted environmental outcomes

Through the implementation of the management recommendations outlined in Table 12 of the EAMS, the quality of land and soils can be maintained so that landform values within the Residential Precinct are incorporated through LSP design.

2.1.9.2 Potential Contamination and Future Land Use

Potential impacts

The Brand Road former landfill (Lot 13, 14 and 18 in plan 24292) is located within the precinct, without further investigation (and potential remediation) there are currently limited opportunities to re-develop and/or effectively utilise the site.

Policy and management objectives

To incorporate the former Brand Road Landfill within the Residential Precinct.

Local Structure Plan considerations

Within the City there is a lack of active recreation open space. The LSP has identified the former Brand Road landfill area as a potential recreation field area which will meet the existing and future recreation needs for the regional catchment.

Management requirements

A series of site investigations and reporting have already been completed for the former landfill. A preliminary review of the key site investigation reports provided highlighted the following:

- preliminary indications are that contamination by leachate is within the boundary of the former Brand Road Landfill and is consistent with previous land use. Further testing is necessary to determine the nature and extent of leachate
- further landfill gas assessments should be undertaken to determine the potential risk to surrounding land use and to determine if permanent landfill gas bores should be installed
- it appears there have been no soil investigations on-site, and this should be undertaken to determine the suitability of the soil for any proposed change in land use
- it was noted that an Accredited Contaminated Sites Auditor has not been engaged for this site.

Management measures have been identified to assist in achieving the management objectives (refer to Table 13 of EAMS provided at Technical Appendix A) and to ascertain with certainly the incorporation and transformation of this area into a key regional recreational facility.

Predicted environmental outcomes

Further investigations (as recommended above) have commenced within the landfill area and will confirm the appropriateness and suitability of changing the current land use to support recreation facilities and identify appropriate controls for the operation / management of the site into the future.

Secondary approval requirements

Sites where potential contamination exists will be managed through the land use planning process in accordance with the *Contaminated Sites Act 2003* (CS Act). The *CS Act* specifies that to clear any conditions relating to the assessment and management of contaminated sites requires the approval of resulting investigations by a Western Australian accredited contaminated sites auditor. Approval to commence recreational activities/facilities within the former Brand Road landfill area will be required under the *CS Act* and prior to subdivision.

2.1.9.3 Biodiversity and Natural Assets

Potential impact

The following potential impacts have been identified associated with the redevelopment of the residential precinct in accordance with the DSP:

- removal of individual *Conospermum undulatum* plants
- removal of TEC *Banksia Woodland of the Swan Coastal Plain*
- removal of significant black cockatoo trees and foraging habitat for black cockatoos
- potential removal of a roosting site.

Policy and management objectives

To consolidate existing fragmented environmental areas and to retain and conserve viable significant flora, TEC and fauna habitat. Create a planning outcome which will ensure the long-term protection and management of the proposed ECs. In regard to the retention of these matters (i.e. black cockatoo habitat trees) within proposed POS areas is subject to drainage, landscaping, bushfire and engineering requirements and will be finalised in subsequent planning processes i.e. subdivision.

Local Structure Plan considerations

As part of the opportunity and constraints analysis of environmental matters within the precinct, the outcomes of AECOM (2017) Level 2 Flora and Fauna Survey and previous documentation (Strategen JBS&G, 2012) was analysed, which included the following key matters:

- Banksia Woodlands of the Swan Coastal Plain TEC
- *Conospermum undulatum* (Wavy-leaved Smokebush)
- black cockatoo habitat trees
- black cockatoo foraging habitat.

Figure 18 provides an overlay indicatively represents which areas have a higher density of DRF and/or a high value i.e. (black cockatoo habitat trees with hollows). Upon comparison, there were similarities within the figures which assisted in addressing and prioritising areas to be retained within the Residential Precinct. Consultation with Stakeholders (KEAC, TAG, DWER (OEPA) DBCA) confirmed that the key natural areas containing Banksia Woodland TEC, DRF and black cockatoo foraging and potential breeding trees are of state significance, particularly the retention and conservation of the *Conospermum undulatum* population within the Residential Precinct.

Refer to Figure 18 – Retention of Environmental Values

Local ecological linkages as identified by Strategen JBS&G (2012) and regional ecological linkages were also considered during the Residential Precinct design, the POS width within the linkage between Bush Forever Site 123 and Poison Gully Creek is approx. 50 metres to 100 metres. A minimum width for ecological linkages of 50m was recommended in accordance with Del Marco et al. (2004).

In response to the above, proposed ECs were developed and are depicted on the (LSP Plan 1).

The following ECs proposed to be retained and conserved within the Residential Precinct are presented in Table 16 of the EAMS (refer to EAMS provided at Technical Appendix A) and Figure 18.

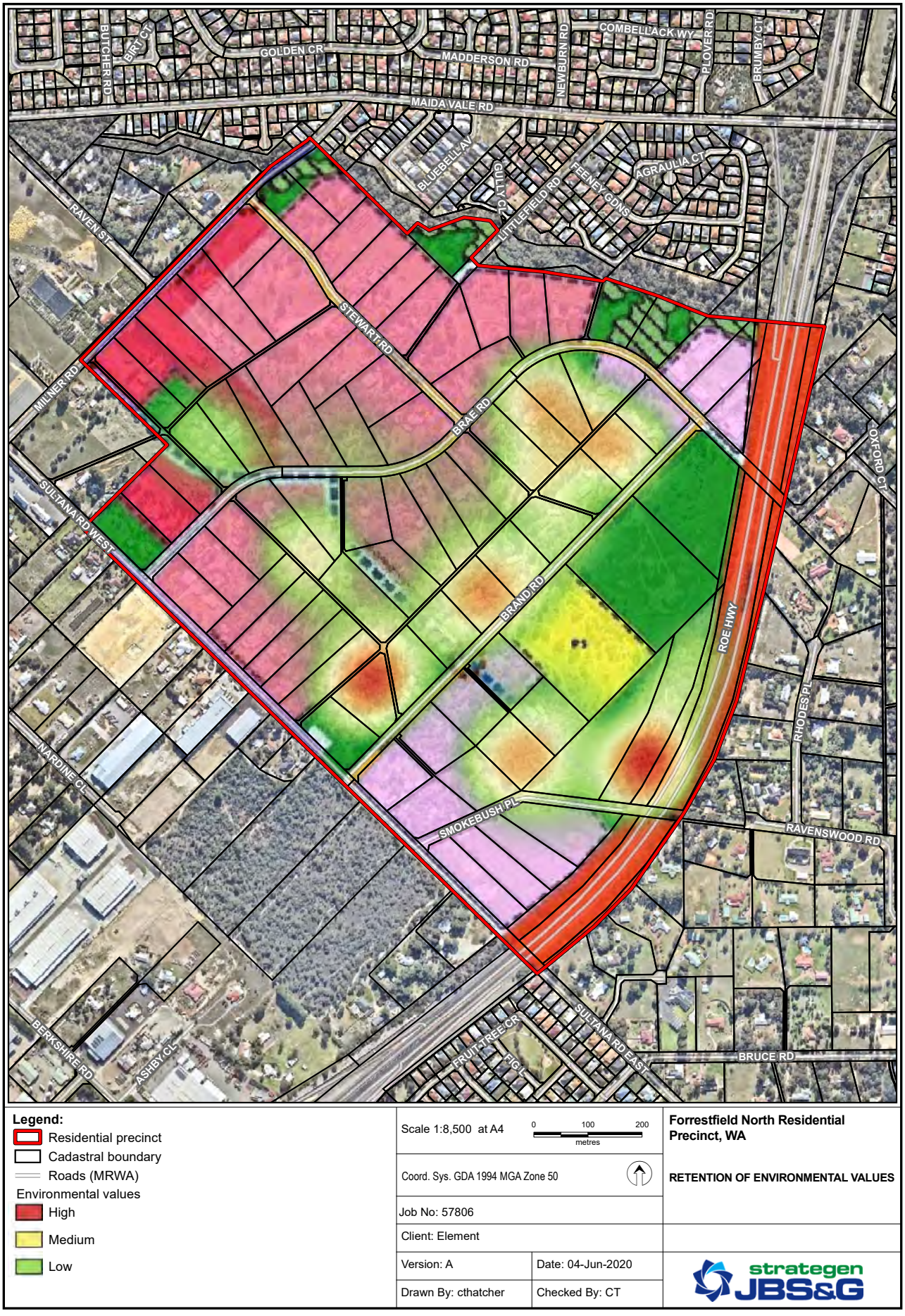
There are also key environmental matters mapped within proposed POS areas, which also include:

- Banksia Woodlands of the Swan Coastal Plain TEC
- *Conospermum undulatum* (Wavy-leaved Smokebush)
- black cockatoo habitat trees
- black cockatoo foraging habitat.

The occurrences of these matters within the POS areas are provided in Table 17 of the EAMS (refer to EAMS provided at Technical Appendix A). The environmental and recreational values (i.e. vegetation type and condition and usage) of POS No. 3, 4 and 5 (refer to Development Plan - Plan 2) will significantly contribute to the ecological function between Sultana Road West Bush Forever site (No. 123) and Poison Gully Creek, which will assist in maintaining the ecological viability of the ECs and linkage (fauna) corridor.

Management requirements

Management measures have been identified to assist in achieving the Biodiversity and Natural Assets management objectives (refer Table 18 of EAMS provided at Technical Appendix A).



Legend:

- Residential precinct
- Cadastral boundary
- Roads (MRWA)

Environmental values

- High
- Medium
- Low

Scale 1:8,500 at A4 (0 100 200 metres)

Coord. Sys. GDA 1994 MGA Zone 50

Job No: 57806

Client: Element

Version: A | Date: 04-Jun-2020

Drawn By: cthatcher | Checked By: CT

Forrestfield North Residential Precinct, WA

RETENTION OF ENVIRONMENTAL VALUES

strategen JBS&G

Figure 18. Retention of Environmental Values (Source: Strategen Environmental)

Predicted environmental outcome

ECs have been committed to by the City, which has been reflected in the LSP, within the Residential Precinct these retention areas, conserve:

- 43% Banksia Woodland TEC
- 88% Wavy Smoke Bush
- 17% black cockatoo habitat trees of which 12% contain hollows
- 37% black cockatoo foraging habitat

Secondary approval requirements

As discussed previously, due to the presence of MNES within the precinct, the LSP or its implementation (developable areas and areas to be retained) may be subject to an *EPBC Act* referral subject to the proposed action and the significance of potential impact.

Under the PD Act, application for subdivision to implement the development areas will be required. It is likely that there will be subdivision conditions associated with key environmental matters as identified in Table 16 of the EAMS (refer to EAMS provided at Technical Appendix A).

2.1.9.4 Management: Acquisition of Environmental Conservation Reserve and POS Areas

Consultation with key Stakeholders (KEAC, TAG, DWER (OEPA), DBCA, SWALSC and a selection panel of relevant Aboriginal people) confirmed the significance of environmental and heritage values within the Residential Precinct. These key natural areas support Banksia Woodland TEC, DRF and/or black cockatoo foraging and potential breeding trees. The ecological linkage across the site and along Poison Gully Creek is also an important feature of the LSP design.

The proposed EC areas are currently within multiple private ownerships, the acquisition and management of the ECs will ensure the long-term retention and security of the key environmental matters (particularly the Waxy-leaved Smokebush) within the Residential Precinct. The following acquisition strategy is proposed.

Bush Forever sites

The management structure of the existing Bush Forever sites within the Residential Precinct includes land within private ownership, Crown Land Vested in Local Government and the WAPC (refer to Table 1 of EAMS provided at Technical Appendix A).

It is proposed that the current management regime of existing Bush Forever sites is upheld and any future Bush Forever sites (including EC becoming bush forever sites) are purchased under the Metropolitan Region Improvement Fund (MRIF). The MRIF has previously been used to purchase Swan River foreshores, to protect the face of the Darling scarp, to implement the Bush Forever program and has also enabled the WAPC to create the outstanding system of regional open space which is emblematic of Perth (WAPC, 2007).

Environmental conservation reserve areas

A Strategic Conservation Management Plan for the ECs has been prepared which provides an overarching objective to maintain or improve the conservation status of existing key environmental matters within each EC and mitigate threats that may impact on the reserves long-term viability. The EC areas may be purchased through a third party acquisition (i.e. for an environmental offset requirement), LGA or DBCA. The ECA will be managed by the purchaser until there is an agreement of handover (ownership and /or management) to the City, WAPC or DBCA.

Management of environmental conservation areas and local open space areas

Land identified as 'Environmental Conservation' on the Structure Plan (Plan 1) are to be protected initially via a Planning Control Area with a view to ultimately reserving these areas as 'Parks and Recreation' under the Metropolitan Region Scheme. Landowners who have property affected by the reservation can find more information about their options at: https://www.dplh.wa.gov.au/your-property-and-region-schemes.

Areas identified as 'Local Open Space' on the Structure Plan (Plan 1) will ultimately be ceded to the City of Kalamunda with its reservation to be recognised under Local Planning Scheme No. 3 which has due regard to the land use classifications under the Forrestfield North Residential Precinct Local Structure Plan. These areas will ultimately be reserved 'Local Open Space' under LPS3 upon normalization of the Structure Plan into LPS3.

'Environmental Conservation Areas' and 'Local Open Space' are to be managed and protected as described by the approved Strategic Conservation Management Plan and Management Agreement.

POS and drainage area

A DCP is being prepared for the Residential Precinct in accordance with SPP 3.6.

The DCP will identify and appropriately apportion costs for POS and drainage storage areas.

2.2 Landform and Soils

2.2.1 Existing Topography, Soils and Geology

The topography of the precinct ranges from approximately 46 metres Australian Height Datum (AHD) in the north-eastern section to approximately 35 metres AHD in the south-western corner. Topographic contours for the site are shown in Figure 19.

Refer to Figure 19 – Topography, Geology and Soils

Regional Mapping indicates that the geology of the Residential Precinct consists of a mixture of Bassendean Sands and sands of the Yoganup Formation (Gozzard 1986). The Yoganup Formation predominantly occurs in the east of the precinct and consists of yellow, fine to medium grained quartz sand with some felResidential Precinctar and variable silt content of colluvial origin (Gozzard 1986). EMRC (2013) reports that eastern portion of the precinct is underlain by superficial deposits of Bassendean Sand and Guildford Formation which comprise approximately 25-30 metres of saturated thickness of the superficial aquifer.

Geological soil unit mapping indicates that the site is characterised by Sand, consisting of:

- S10: Thin layer of SAND – very light grey at surface, yellow at depth, fine to medium grained, sub- rounded quartz, moderately well sorted, of eolian origin over alluvial silts and sands of the Guildford formation
- S12: SAND – yellow, fine to medium grained, sub-angular to rounded quartz, with some felResidential Precinctar, well sorted, variable silt content, of colluvial origin (Gozzard 1986).

In 2011, several bores were drilled across the precinct, the lithology of the bores were:

- MB02: predominantly sand with clayey sand at depth
- MB04: gravelly sand at surface with sand at depth
- MB05: predominantly sand (coarse to medium grained)
- MB06: sand with clayey sand at depth (Strategen JBS&G 2012a).

Relative permeability rates and Phosphorus Retention Index (PRI) for Bassendean Sands are 30+ m/day and 0-0.5 respectively (DoW nd). Currently, a geotechnical investigation for the precinct has not been undertaken to confirm soil properties/characteristics.

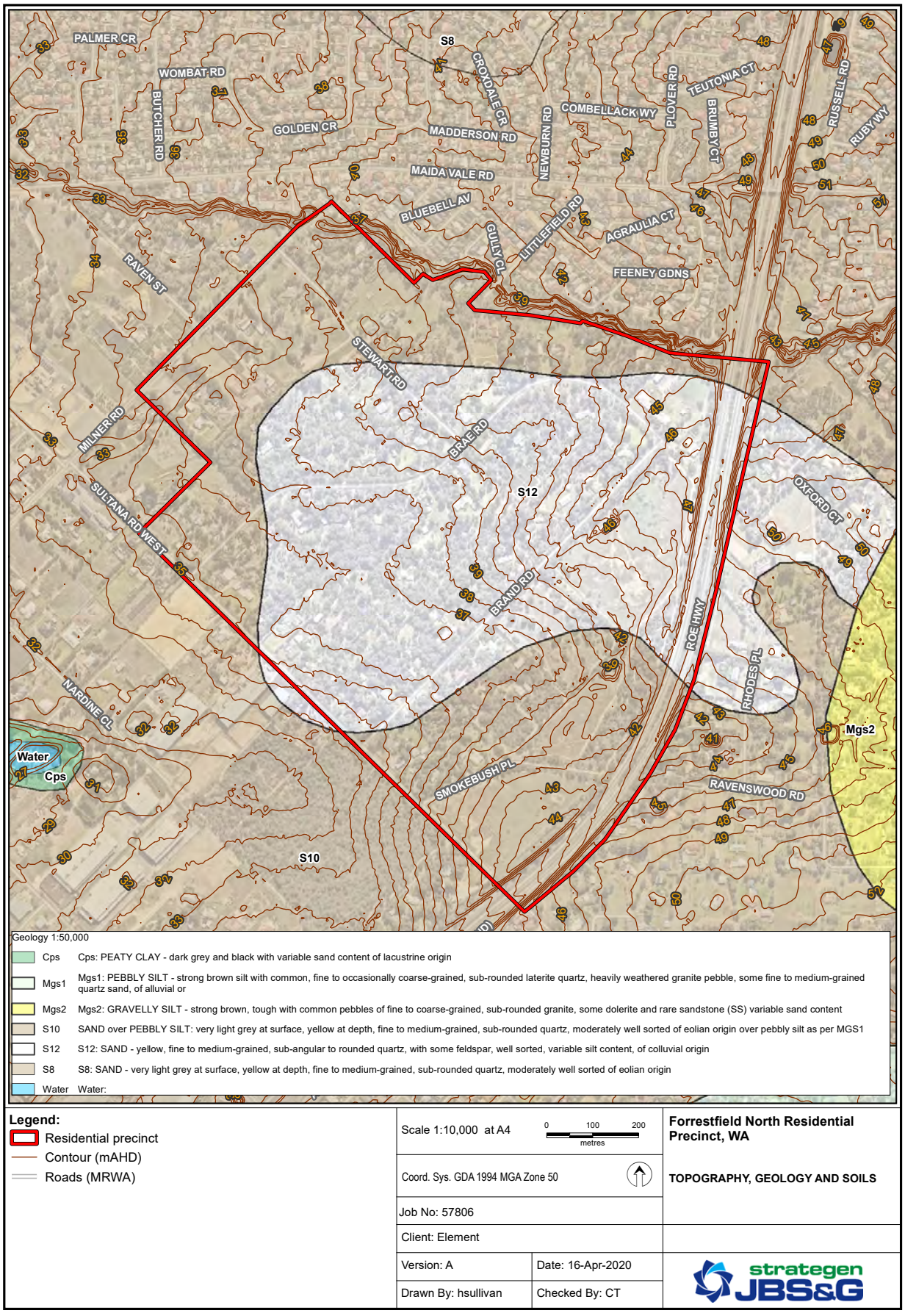


Figure 19. Topography, Geology and Soils (Source: Strategen JBS&G)

Legend:

- Residential precinct

Acid sulfate soil risk mapping

- High to moderate risk
- Moderate to low risk
- Contour (mAHD)
- Roads (MRWA)

Scale 1:10,000 at A4 (0, 100, 200 metres)		**Forrestfield North Residential Precinct, WA**
Coord. Sys. GDA 1994 MGA Zone 50		**ACID SULFATE SOILS**
Job No: 57806		
Client: Element		
Version: A	Date: 16-Apr-2020	strategen JBS&G
Drawn By: hsullivan	Checked By: CT	

Figure 20. Acid Sulfate Soil (Source: Strategen JBS&G)

2.2.1.1 Acid Sulfate Soils

ASS are naturally occurring, iron-sulphide rich soils, sediments or organic substrates, formed under waterlogged conditions. If exposed to air, these sulphides can oxidise and release sulphuric acid and heavy metals. This process can occur due to drainage, dewatering or excavation.

Review of regional mapping indicates that the precinct has a low to moderate risk of ASS occurring within 3 metres of natural soil surface (Class 2) (DER 2015). Nearest high to moderate risk of ASS occurring within 3 metres of natural soil surface is approximately 400 metres south east of the precinct (refer to Figure 20).

Refer to Figure 20 – Acid Sulfate Soil

2.2.1.2 Management

As part of the formulation of the LSP, the documentation and assessment of the opportunities and constraints of the existing environment was undertaken which influenced the design of the precinct including the placement of POS areas, drainage basins/swales and EC and ecological linkages.

Policy Management Objectives

Where possible, maintain the gentle sloping topography across the precinct and to retain the rural lifestyle amenity of the precinct. To also ensure that the subdivision and development of land containing ASS is planned and managed to avoid potential adverse effects on the natural and built environment.

Local Structure Plan Considerations

The opportunity and constraints analysis of regional landform mapping (i.e. topography, soils and potential ASS) environmental elements has indicated that there are no significant elements that are required to be considered or potentially impede development opportunities.

Management Requirements

Management measures have been identified to assist in achieving the Landforms management objectives (Refer Table 12 of EAMS provided at Technical Appendix A).

Predicted Environmental Outcomes

Through the implementation of the management recommendations outlined the quality of land and soils can be maintained so that landform values within the Residential Precinct are incorporated through LSP design.

2.3 Groundwater and Surface Water

A District Water Management Strategy (DWMS) was prepared by Strategen JBS&G (2015) for the DSP area and approved by the Department of Water (DoW) (now Department of Water and Environmental Regulation [DWER]) and the City. The DWMS provides guidance on groundwater management, water sources for POS and sizing of stormwater systems.

A LWMS has also being prepared by Strategen JBS&G (2018a) in accordance with Better Urban Water Management guidelines (WAPC 2008) on advice from DWER. The LWMS is consistent with regional and district scale urban water management planning, including the State Water Plan (DPC 2007) as well as State Planning Policy 2.9 Water Resources (WAPC 2006). The LWMS aims to meet the principles and objectives of stormwater management in Western Australia, as detailed in the Stormwater Management Manual for Western Australia (DoW 2007).

Refer to LWMS provided at Technical Appendix D for additional information.

2.3.1 Ground Water

There are three aquifers underlying the Residential Precinct area; each assigned the name of the major geological unit in which the aquifer occurs (DWER 2017). In descending order of depth from natural surface they are:

- Superficial Aquifer (unconfined)
- Leederville Aquifer (confined)
- Yarragadee North (confined).

The Leederville and Yarragadee aquifers are both fully allocated in the Residential Precinct and adjacent areas. However, there are two options in satisfying future precinct groundwater requirements through the following options:

- a total of 137.4 ML is allocated for private use within the TOD and Residential Precinct areas. The two largest of these allocations are for 89.3 ML associated with a landscaping nursery and 32.1 ML associated with an orchard/market garden. Refer to LWMS (Strategen-JBS&G 2020b).
- the City currently have an allocation for irrigation of public open space (POS) in the superficial aquifer within the Perth Groundwater Area. This allocation is not being fully utilised and City has identified that 100 ML/year can be made available for irrigation within the DSP area if required (Varelis P [City of Kalamunda] 2017, pers. comm. 12 October).

Groundwater flow is in an approximately south-easterly direction. This is consistent with the findings of ENV (ENV 2012) reported in the LWMS for the adjacent industrial precinct and groundwater modelling (Strategen JBS&G, 2018). There are currently no Department of Water and Regulation (DWER) groundwater bores within the precinct. The closest DoW bore with a long monitoring record is at the corner of Abernethy and Kewdale Roads in Kewdale, approximately 4 km south-east of the Residential Precinct area (DoE 2004). Groundwater levels within the Residential Precinct range from 28.5mAHD to 26mAHD.

Hydrogeological features of the Residential Precinct area are dominated by surface water/groundwater interactions resulting in variable groundwater gradients and flow directions across the site (EMRC, 2013). The local groundwater flow appears to be influenced by a combination of geology and drainage systems to the west and northwest of the site such as localised recharge features associated with industrial areas, Perth Airport and new developments (EMRC 2013:8).

As part of the LWMS, preliminary groundwater modelling (clearance from groundwater) has been completed. Depth to groundwater is indicated to be approximately 5 mbgl and is not considered likely to pose a constraint to development within the precinct.

Across the Residential Precinct area, groundwater is generally acidic to neutral with pH ranging between 4.62 to 7.21 (median of 5.84) (Strategen JBS&G 2012). Groundwater is fresh with a median electrical conductivity (EC) level of 0.438 mS/cm. This mean EC level was identified to be within the expected range of 0.3–1.5 mS/cm for slightly disturbed ecosystems in south-west Australia (Strategen JBS&G 2012).

Nutrient levels are slightly elevated. Groundwater monitoring conducted by Strategen JBS&G in 2011 for the DWMS identified that total nitrogen (TN) levels varied from 0.31 mg/L to 25 mg/L throughout the monitoring period with a median of 2.1 mg/L. This median exceeds the Swan Canning Water Quality Improvement Plan's (SCWQIP) long-term and short-term target for TN (1 mg/L and 2 mg/L respectively) (Strategen JBS&G 2012).

Total phosphorus (TP) results varied from <0.01 to 5.7 mg/L, with a median value of 0.72 mg/L. These levels are above the SCWQIP long-term and short-term target for TP (0.1 mg/L and 0.2 mg/L respectively) (Strategen JBS&G 2012).

Groundwater attributes within the precinct are presented in Figure 17.

2.3.2 Surface Water

Poison Gully Creek, is located immediately north and follows the precinct's cadastral boundary. Poison Gully Creek is an ephemeral creek that flows in a westerly direction via Limestone Creek (a tributary of Perth Airport Northern Main Drain) into the Swan River during the winter months. Previous monitoring has reported water present within September and October (Strategen JBS&G 2011 and ERMC 2013).

Poison Gully is part of the City's and the Water Corporation drainage network and has an extensive catchment to the east of the LSP area (Water Corporation 2010). It is estimated that Poison Gully has a catchment area of approximately 770 ha at the intersection of Maida Vale Rd and Dundas Rd.

No stream gauging data is publicly available for either drainage lines. It is understood that Water Corporation have previously maintained a stream gauging station for Poison Gully at Littlefield Rd (station 616015).

In 2012, a Foreshore assessment of Poison Gully was completed by Strategen JBS&G and included in the DWMS which was approved by the Department of Water (now DWER) in 2015. The assessment considered the following biophysical criteria; vegetation, hydrology, soil type, geology, topography, habitat, land use and heritage, based on the guidelines in Determining Foreshore Reserves (WRC 2001). The Creek is deeply incised, with vertical exposed banks of 3 m to 5 m in height at some points, with the steepest gradient occurring on the eastern extent of the creek. Evidence of erosion was observed along the length of the creek line to varying degrees and is likely due to the steep gradient and degraded nature of fringing vegetation, which if intact would serve to stabilise the banks. Heavy infestation with a number of introduced plant species including Watsonia (*Watsonia bulbillifera*) and Spanish bamboo (*Arundo donax*) was recorded (Strategen JBS&G 2012b). Poison Gully Creek's estimated foreshore boundary (in accordance with WRC, 2001 guideline) is depicted in Figure 17.

2.3.3 Flood Potential

1 in 100 year Average Return Interval (ARI) flood level modelling for Poison Gully Creek was undertaken by the Water Corporation (2010). This flood modelling indicates a 1 in 100 year ARI flood level ranging between 39.81 mAHD at Roe Highway and 32.36 mAHD at Maida Vale Road (Strategen JBS&G 2015), which is mostly contained within the valley area of the creekline. The flood height at Roe Highway was expected to be underestimated, as the invert level of the creek at this point is greater than 40 mAHD, above the Water Corporation Flood level. Based on the Water Corporation modelling, Poison Gully will overtop the road at Milner Road in the 1 in 100-year ARI event. However, as indicated the 1 in 100-year ARI event is contained within the foreshore boundary.

2.3.4 Management

Previous site investigations (DWMS, 2012a) demonstrate that the hydrology features within the Residential Precinct are influenced by a combination of relatively complex geology, surface water/groundwater interactions resulting in variable groundwater gradients and flow directions across the LSP area.

2.3.4.1 Potential Impacts

While the precinct pre-development and post-development surface water flows are to coincide in accordance with the WAPC (2008) Better Urban Water Management Guidelines, the estimated surface water volumes are expected to increase through urbanisation within the precinct. Therefore, the allocation of detention or infiltration basins and underground storage are proposed as per the LWMS (refer to LWMS provided at Technical Appendix D).

As discussed in previously, a generic buffer to REWs are usually required as per EPA policy (EPA, 2008). There is currently no buffer associated with the REW (UFI 13997). The area surrounding the REW within the Residential Precinct is highly modified and currently provides minimal protection to the wetland function area i.e. management of land degradation processes - edge effects, weed encroachment, rubbish dumping and uncontrolled access.

2.3.4.2 Policy and Management Objectives

The key principles and objectives for sustainable water management for the Residential Precinct is provided in the following:

- Liveable Neighbourhoods Edition 4 (WAPC 2009)
- Water Resources Statement of Planning Policy 2.9 (WAPC 2004)
- Stormwater Management Manual for WA (Department of Water 2007)
- Decision Making Process for Stormwater in Western Australia (Decision Process, DWER 2017)
- Better Urban Water Management (WAPC 2008)
- Interim: Developing a Local Water Management Strategy (DoW 2008)
- Forrestfield North DWMS (Strategen JBS&G 2015).

The key points of these policies are detailed in Table 14 of the EAMS (refer to EAMS provided at Technical Appendix A). For further information refer to the LWMS provided at Technical Appendix D.

2.3.4.3 Local Structure Plan Considerations

The LSP northern boundary is allied along Poison Gully Creek, there is one section of a REW (Poison Gully) intersects the Residential Precinct, the design of the LSP has incorporated the following:

- REW (UFI 13997) and most of the associated buffer (<30m) is within POS No. 9 (refer to Development Plan - Plan 2). Other areas along Poison Gully Creek area is bounded by a hard edge (i.e. road). Fencing (i.e. conservation style) can be incorporated to control access along this interface.
- Poison Gully Creek foreshore area which intersects the LSP boundary has been incorporated within EC areas (i.e. No. 9, 10, 12 and 13) (refer to Development Plan - Plan 2).
- Establishment of a formal pedestrian connection between Littlefield Road and the LSP area (where there is an existing road/culvert over Poison Gully).
- Detention/infiltration basins area (refer to LWMS).

2.3.4.4 Management Requirements

Management measures have been identified to assist in achieving the hydrology management objectives (Refer Table 15 of EAMS provided at Technical Appendix A). Refer to the LWMS provided at Technical Appendix D for management objectives for specific surface water /drainage basin requirements for the project.

2.3.4.5 Secondary Approval Requirements

Refer to Section 2.6.1 (Aboriginal Heritage Section) Heritage for further information regarding the *Aboriginal Heritage Act 1972* and the LWMS provided at Technical Appendix D.

2.4 Potentially Contaminating Activities

2.4.1 Contaminated Sites Register Database

The DWER (2017) Contaminated Site Database was searched and there are currently no registered contaminated sites within the precinct existing on the register.

2.4.2 Previous Land Use(s)

2.4.2.1 Brand Road Landfill

Brand Road landfill operations (Lot 13, 14 and 18 on plan 24292) commenced in approximately 1978. It was operated by Western Excavating from the beginning of the sand mining activities until 1989. The sanitary landfill operations started in 1989.

DWER has classified the Site as "*Possibly Contaminated – Investigation Required*" under the *CS Act* (DEC Reference: DEC10015) and has requested further assessment of *"current groundwater quality beneath this site, and delineation of the extent of any contamination identified, both beneath the site and off-Site"*.

A series of site investigations and reporting has been completed for the former landfill. A summary of these are provided in Table 5 of the EAMS (refer to Table 5 of EAMS provided at Technical Appendix A). Potential sites contaminated by landfill have been identified in Figure 21.

Refer to Figure 21 – Potential Contaminated Sites

2.4.2.2 Orchards

Based on historical aerial photography, there have been several hobby farms and/or orchards within Lots 94 and 98 Brae Road and Lots 100, 101, 102 and 103 Smokebush Place High Wycombe (refer to Figure 21). These land uses and their associated activities are potentially contaminating due the uses of metals, Organochlorine pesticides, Organophosphate pesticides, Carbamate and fuels (Total petroleum hydrocarbons) (DoE 2004).

2.5 Bushfire Hazard

2.5.1 Bushfire Risk

Based on regional Bush Fire Prone Mapping (DFES 2017) all of the precinct is mapped within the designated bushfire prone area.

As a result of the bushfire prone status of the site, a BMP is required to accompany the LSP to address the following requirements of SPP 3.7 and Policy Measure 6.3):

1. Bushfire hazard level assessment or where lot layout is known a BAL assessment.
2. Identification of any bushfire hazard issues arising from the above assessments.
3. Assessment against the bushfire protection criteria requirements contained within the Guidelines demonstrating compliance can be achieved in subsequent planning stages.

The BMP is required to be prepared in accordance with Guidelines for Planning in Bushfire Prone Areas (the Guidelines). The BMP is a separate document and should be read concurrently with the EAMS.

Refer to BMP provided at Technical Appendix B for additional information.

2.5.1.1 Policy and Management Objective

Ensure that the bushfire risks to future life, property and environmental assets are minimised through appropriate development design and implementation of bushfire management measures.

2.5.1.2 Local Structure Plan Considerations

The preparation of the LSP has taken into consideration the following:

- a Strategic Bushfire Overlay was provided initially to inform early design stages of the LSP. The indicative bushfire advice assumed post-development conditions (i.e. all land within proposed development cells would be cleared, with any temporary internal hazards to be managed through specialised staging works). The following was provided/recommended at that time.
- key areas of intact vegetation that may pose a post-development bushfire risk were identified.
- application of BAL ratings via AS 3959 will need to be considered for any proposed development located within 100 metres of classified vegetation.
- critical bushland interfaces were depicted, which may result in development being situated in areas of BAL-40 or BAL-FZ, which would be non-compliant in regard to the siting and location of development under current bushfire planning guidelines.

Legend:
- Residential precinct
- Historical orchard activity
- To be confirmed through further investigation
- Indicative landfill (source: GHD 2010)
- Roads (MRWA)

Scale 1:10,000 at A4 (0, 100, 200 metres)		**Forrestfield North Residential Precinct, WA**
Coord. Sys. GDA 1994 MGA Zone 50		**POTENTIAL CONTAMINATED SITES**
Job No: 57806		
Client: Element		
Version: A	Date: 16-Apr-2020	strategen JBS&G
Drawn By: hsullivan	Checked By: CT	

Figure 21. Potential Contaminated Sites (Source: Strategen Environmental)

- these interfaces should be considered for potential redesign to introduce road reserves at the bushland interface and/or actively managed, low fuel POS areas. Should these options not be achievable, then the development cells will need to cater for internal building setbacks to ensure the future buildings within the cells are not situated in areas of BAL-FZ/40 and can achieve a rating of BAL-29 or lower. It is noted that some of the development cells identified at the critical bushland interfaces (particularly residential cells to the north) may be too small to fully cater for the necessary internal building setbacks. Some setbacks may be required to be as large as 20- 27 metres, particularly those adjacent to down-slope forest vegetation, which is likely to be the case along the northern interface with Poison Gully Creek.
- eight potential cul-de-sacs/dead-ends in early concept planning for the precinct may be considered non-compliant with guideline requirements.
- potential Vulnerable Land Uses (as defined under the Guidelines) i.e. Primary School appear capable of achieving the necessary bushfire compliance requirements and will require preparation of an Emergency Evacuation Plan at the DA stage.
- all other areas of the proposed development site appear to be capable of achieving the necessary bushfire compliance requirements. Staging measures (e.g. clearing in advance, POS implementation in advance and provision of access in advance), will be an important consideration throughout any proposed staged subdivision to ensure active stages of development are not subject to unnecessary/temporary BAL impact or non-compliances imposed by adjacent undeveloped stages.
- the LSP has incorporated or considered the above recommendations. The BMP for the precinct has been prepared, which includes the following:
    - proposal details
    - environmental considerations
    - bushfire assessment results, including results of site assessment (classified vegetation, effective slope and exclusions) and bushfire hazard level assessment for pre-and post- development conditions
    - identification of bushfire hazard issues
    - assessment against the bushfire protection criteria of the Guidelines
    - responsibilities for implementation and management.

Refer to BMP provided at Technical Appendix B for additional information.

2.5.1.3 Post Development Vegetation Classification

On completion of development, the majority of the Residential Precinct area will be modified to a low threat state. Classifiable vegetation remaining within the site will be located within the environmental conservation areas, POS areas, Brae Road Bush Forever site and drainage basins. Roe Highway is adjacent to the Residential Precinct, but the development does not propose any modification of vegetation within this corridor.

The post-development vegetation classifications external to the Residential Precinct are expected to remain the same as per pre-development classifications. If vegetation within the 150 metre buffer is altered prior to future planning stages, the Bushfire Hazard Level (BHL) assessment and/or future BAL contour map is to be updated to reflect the change in vegetation conditions.

A summary of the expected post-development classified vegetation within the Residential Precinct is as follows:

Class A Forest vegetation will occur within:

- the Environmental Conservation reserves sited along the northern site boundary identified as EC-09, EC-10, EC-12 and EC-13
- the Environmental Conservation reserve identified as EC-01, which is existing Lot 50 Smokebush Place
- POS-06, which lies within the Town Park site
- a portion of DB-04, located along the northern site boundary
- both the western and eastern sides of Roe Highway

Class B Woodland vegetation will occur within:

- the Environmental Conservation reserves sited adjacent to the future TOD connector boulevard, identified as EC-02 and EC-03
- the Environmental Conservation reserves sited within the central corridor linkage, identified as EC-04 to EC-08
- the POS areas located within the central corridor linkage and throughout the Residential Precinct, identified as POS-01, POS-02, POS-03, POS-04, POS-05 and POS-07
- POS-02, situated adjacent to the future TOD connector boulevard
- POS-07, situated along the northern site boundary
- Brae Road Reserve (existing Bush Forever site; BF-01)
- all drainage basins (DB) 01, 02, 03, a portion of 04, 05 and 07 – these drainage basins have been classified as Class B Woodland as a precautionary measure given that the majority will lie immediately adjacent to external Bush Forever sites or internal EC reserves; however, the likely classification will be a combination of Class B Woodland, Class C Shrubland and Class G Grassland and any exclusions identified at the detailed landscape planning stage.

A summary of the expected post-development exclusions within the Residential Precinct are as follows:

- Clause 2.2.3.2 (b) will occur within POS-08/POS-09/EC-11 in the northwest of the Residential Precinct. This area is less than 1 ha and not located within 100 m of any other classified vegetation
- Clause 2.2.3.2 (e) will occur throughout the Residential Precinct and will include all permanently non-vegetated areas such as roads, footpaths, building footprints, carparks, hardstand areas and private driveways
- Areas of Clause 2.2.3.2 (f) exclusions will occur within the POS areas, which will include low threat turf, manicured plantings and low threat buffers to residential development
- DB-06 will comprise managed turf and parkland trees and will meet exclusion clause 2.2.3.2(f)
- All street tree plantings are assumed to meet the low threat criteria of AS 3959 Clause 2.2.3.2 (f)
- Clause 2.2.3.2 (f) will occur throughout the Residential Precinct and will include all land maintained in a low threat state, including cultivated gardens and maintained lawns within residential properties, portions of the school site and associated playing fields and all other actively maintained POS areas (including a portion of POS-01).

On completion of development, maintenance of all land in a low threat state will be enforceable under the City's Firebreak and Fuel Load Notice, which requires that all vacant and occupied land is to "have all flammable matter slashed, mowed or trimmed down by other means to a height no greater than 50mm across the entire property".

Refer to Figure 22 – Post-development Vegetation Class and Effective Slope

2.5.1.4 Post Development Bushfire Hazard Levels

Strategen JBS&G has mapped the post-development bushfire hazard levels to demonstrate that the future bushfire hazard levels will be acceptable for future development to occur within the Residential Precinct. The bushfire hazard levels have been assigned on the basis of the vegetation discussed in Section 3.1.1 of the BMP and the future expected vegetation within and surrounding the Residential Precinct.

A summary of results is provided below:

- all Class A Forest has been assigned a bushfire hazard level of Extreme
- all Class B Woodland has been assigned a bushfire hazard level of Extreme
- all Class G Grassland has been assigned a bushfire hazard level of Moderate
- in accordance with the bushfire hazard level assessment methodology detailed in Appendix Two of the Guidelines, vegetation that has a Low hazard level but is within 100 metres of Extreme or Moderate hazard level vegetation has been assigned a Moderate hazard level
- all remaining areas have been assigned a bushfire hazard level of Low.

Legend

- Residential Precinct
- 100m wide assessment area
- 150m wide assessment area
- Cadastral boundary
- Development cell
- Bush Forever
- Drainage basin
- Environmental Conservation Reserve
- POS

Vegetation classification

- Class A Forest
- Class B Woodland
- Class G Grassland
- Area to be modified to low threat state
- Excluded Clause 2.2.3.2 (b)
- Excluded Clause 2.2.3.2 (e) and (f)

- Proposed cadastre
- Poison Creek Gully
- Topographic contours (mAHD)
- Roads (MRWA)

strategen JBS&G

0 200 metres

Job No: 57806		Scale 1:6,500 at A3	
Client: Element		Coord. Sys. GDA 1994 MGA Zone 50	
Drawn By: cthatcher	Checked By: LR	Version: A	Date: 25-Jun-2020

Forrestfield North Residential Precinct, WA

POST-DEVELOPMENT VEGETATION CLASSIFICATION AND EFFECTIVE SLOPE

Document Path: \\008PMPMR004V001.jbsg.aust\JBS Perth\Projects\L1\Open\Element (TPG)\57806 - FF North TOD & Res LWMS\GIS\Maps\BMP\57806_04_PostDev_VegClassSlope.mxd

Image Reference: www.nearmap.com© - Imagery Date: 17 February 2020.

Figure 22. Post-development Vegetation Class and Effective Slope (Source: Strategen JBS & G)

The post-development BHL assessment demonstrates that on completion of the development, the areas of the Residential Precinct that supporting habitable development will be within an area of Low or Moderate hazard level and all future development will avoid Extreme bushfire hazard level areas, meeting acceptable solution A1.1 of the Guidelines.

Refer to Figure 23 – Post-development Bushfire Hazard Levels

For additional information in respect to bushfire context, bushfire hazard issues, and responsibilities for implementation and management refer to the BMP provided at Technical Appendix B.

2.5.1.5 Management Requirements

Management measures have been identified to assist in achieving the Bushfire management objectives (refer to Table 19 of the EAMS provided at Technical Appendix A).

2.5.1.6 Predicted Environmental Outcome

The revegetation within the POS areas including ECs particularly along the urban interface (development area) will need to incorporate bush fire requirements and management measures (i.e. low threat status).

2.6 Heritage

2.6.1 Aboriginal Heritage

The Forrestfield area including the Residential Precinct and surrounds hold significant value to Nyungar people and are known to contain many places of major significance to Perth Nyungars i.e. Allawah Grove Reserve, Monday Swamp located at the Perth Airport and Poison Gully Creek, which is located along the northern boundary of the Residential Precinct. Ongoing heritage investigations in and around the airport indicate that Munday Swamp is still being used for hunting and foraging (Turner *et al.* (Ethnosciences) 2018).

Nyungar families have continued to use areas in and around Forrestfield for camping, hunting and rural- based employment. Of particular interest is the old Welshpool Reserve or Maamba (DPLH ID 3773) located in Forrestfield to the south of the LSP area. The old reserve(s), which is a Registered Aboriginal Site, is depicted on the AHIS as continuous with the boundaries of the present-day Hartfield Park, Forrestfield/Wattle Grove, Kalamunda, though the exact boundaries of the place are problematic as there seems to have been at least two Aboriginal reserves in the area with different reserve numbers and which may have overlapped (Turner *et al.* (Ethnosciences) 2018).

The DPLH (2017) Aboriginal Heritage Inquiry System (AHIS) was searched are there is one registered site Poison Gully Creek (Site ID 25023) as it is a water source and a historical birth place. This place has been assessed as meeting Section 5 of the AH Act. There is one Other Heritage site, High Wycombe Brooklands (ID3637) for Artefacts/ Scatter. In regard to this site, information has been received by the DPLH in relation to the place, but an assessment has not been completed at this stage to determine if it meets Section 5 of the AHA.

2.6.1.1 Aboriginal Heritage Ethnographic Assessment

An ethnographic heritage assessment was completed by Turner *et al.* (Ethnosciences) (2018) for the Forrestfield North DSP area (which included the Residential Precinct). The assessment involved both desktop research and community consultation (South West Aboriginal Land and Sea Council [SWALSC] and selection of a panel of relevant Aboriginal people having association and knowledge of Poison Gully) and separate ethnographic consultations with women's and men's on-site meetings. A summary of the assessment outcomes is provided below. A copy of the full assessment is provided in Appendix 3 of the EAMS (refer to EAMS provided at Technical Appendix A).

The search of the online AHIS and other archival sources confirmed that Poison Gully Creek (DPLH ID 25023) is the only Registered Aboriginal Site in the DSP study area. Two 'Other Heritage Places' (DPLH ID 3667 Crumpet Creek and DPLH ID 3637 High Wycombe: Brooklands Estate, both artefact scatters) are also listed.

Poison Gully Creek (DPLH ID 25023) was the only place within the Residential Precinct reported by the Aboriginal consultants that might reasonably be considered to be an Aboriginal Site within the meaning of s5 of the AH Act. Turner *et al.* (Ethnosciences) (2018:27) reports that as the site file is 'Closed', the boundaries on the AHIS are 'restricted' and therefore 'dithered'; i.e., the spatial representation published on the AHIS website is broader than the actual boundary, because of the site's reported significance and hence confidentiality regarding the place's precise boundaries.

Turner *et al.* (Ethnosciences) (2018) discusses that areas around the Residential Precinct, such as the Perth Airport land and the Newburn Marshalling Yards, have been intensively surveyed and as a result many archaeological sites, typically artefact scatters, have been recorded. The Residential Precinct has not been surveyed in detail, forming only a part of a previous regional survey. Based on regional information it is reasonable to assume, that should an archaeological survey of the Forrestfield North DSP (including the Residential Precinct) be completed it is likely that additional archaeological sites to DPLH ID 3667 and DPLH ID 3637 would be found. As noted above, the Forrestfield North DSP/LSP area has not been specifically surveyed archaeologically.

Both the women's and the men's consultations confirmed the cultural significance of Poison Gully Creek and highlighted its importance to Nyungar women in particular as a 'birthing place' with associated rituals and still seen as a place for teaching and learning about traditional cultural knowledge, both specific to the site and country more generally. The key issues raised during the consultation included:

- protection of remnant vegetation and creek and foreshore between Dundas Road and Milner Road and in particular the open space adjacent to the Dundas Road crossing.
- improvement and restoration of water flow and water quality within Poison Gully Creek to reflect the waterways original state.
- Poison Gully Creek as a place of significant values and is related to other significant areas such as Munday Swamp and Allawah Grove, traditionally linked by the flow of water and the bidi or tracks and part of a meshwork in which place is to be understood as an outcome of movement, practice and event, which result in the experience of 'biographical entanglements'.
- continuing access to and control of the land as its traditional owners and custodians.
- linkages between the Forrestfield North DSP/LSP area and the surrounding landscape.

2.6.2 European Heritage

The Heritage Council (2017) InHerit database was searched for registered sites, there are currently no sites within the precinct.

2.6.3 Management

2.6.3.1 Policy and Management Objectives

Ensure that the heritage values associated with Poison Gully Creek are preserved and where possible incorporated into the POS landscape design.

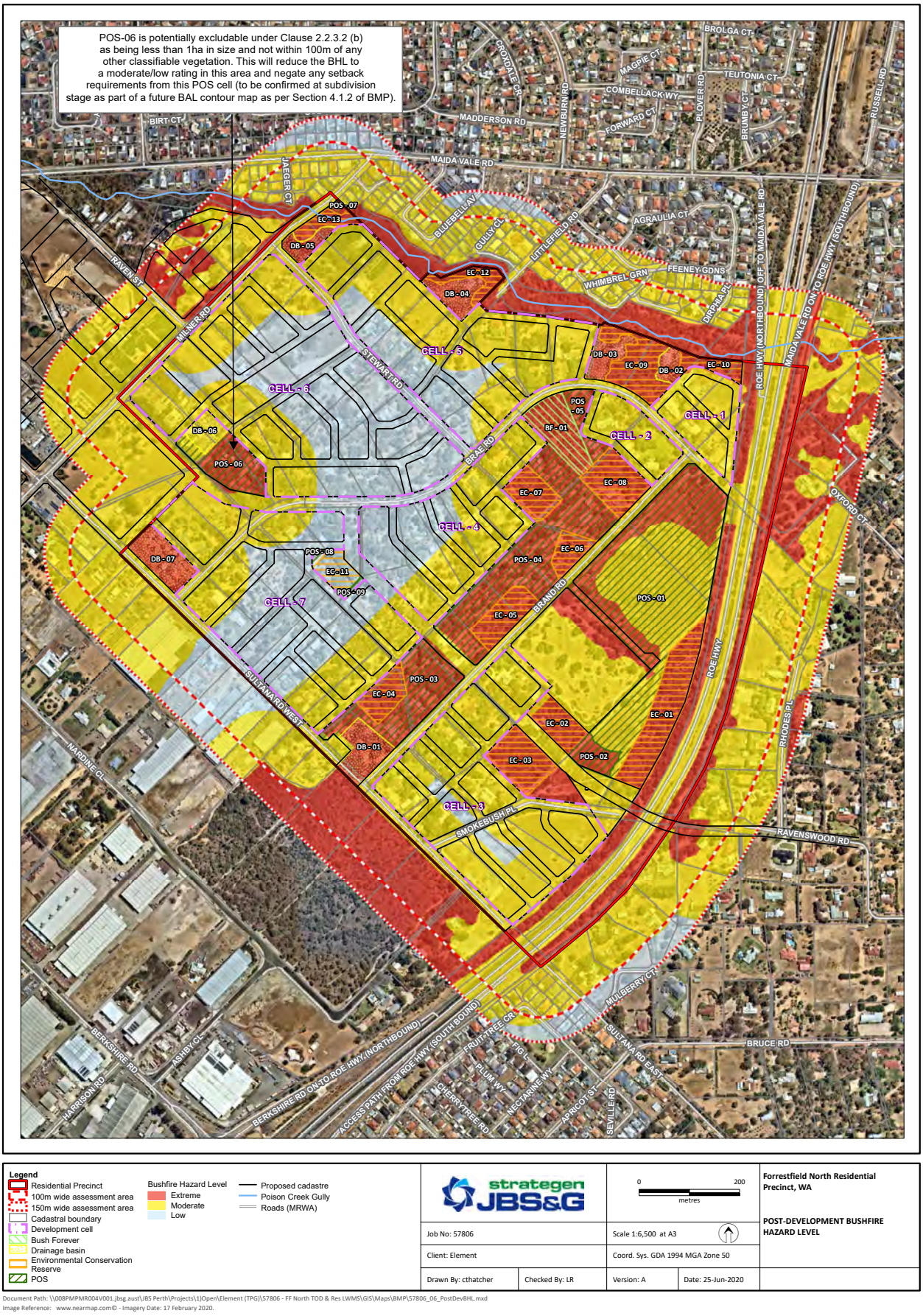


Figure 23. Post-development Bushfire Hazard Levels (Source: Strategen JBS & G)

2.6.3.2 Local Structure Plan considerations

The LSP is reflective to the heritage values associated with Poison Gully Creek including:

- incorporating existing crossing (Maida Vale Road, Milner Road and Littlefield Road). Littlefield road will be a pedestrian/cycle access linking the High Wycombe area with the LSP area.
- control access along the interface of the precinct and Poison Gully foreshore area through designated paths, bollards, and fencing.
- EC has been allocated where the creek foreshore area impedes the precinct boundary, while potential drainage storage and outflow (via upgrades to existing culverts may be required), the focus of these areas will be passive recreation and revegetation to compliment the natural assets of the creek.
- ecological linkage connection from Bush forever site 321 through the precinct and along Poison Gully Creek (Bush forever site 45) which will assist with fauna movement within the area.

2.6.3.3 Management requirements

Management measures have been identified to assist in achieving the Heritage management objectives. Refer to Table 20 of the EAMS provided at Technical Appendix A.

2.7 Land Use and Subdivision Requirements

2.7.1 Local Structure Plan

2.7.1.1 Design Response to Site Constraints

The proposed LSP is a considered response to the constraints presented by the Residential Precinct. Considerations have included the following:

- The retention of the significant environmental values of the area to the greatest extent practical. This has included the identification of significant environmental areas accommodating rare flora and TECs and the provision of a green link (ecological corridor) to connect the existing Bush Forever site on Sultana Road West with Poison Gully Creek to the north of the LSP area. The 'green link' is designed to incorporate areas of active parkland, conservation (including the wavy-leaved smoke bush), significant stands of vegetation and existing Bush Forever areas. These POS areas will provide the community with active and passive recreation opportunities and high levels of amenity while also achieving and balancing environmental conservation and ecological value protection objectives. The green link also provides opportunities for fauna to co-exist within the urban environment and biodiversity to propagate and be rehabilitated where appropriate.
- The ecological value of Poison Gully Creek will be further enhanced through the provision of additional local open space, buffering it against adjacent residential development and providing an opportunity for passive recreational use and the potential for use as part of the pedestrian and cyclist movement network within the precinct.
- A District Open Space (Sporting Precinct) is proposed to utilize the land at the former landfill site on Brand Road to meet existing and emerging community need. This site is currently undergoing detailed site investigations to determine the level of remediation required to develop the site as playing fields. It is understood that the utilisation of this area as sports space will help alleviate a shortfall in the City as identified in its draft Public Open Space Strategy and provide a high quality active recreational space for residents of the district.
- A primary school is proposed to be co-located with the Sporting Precinct to create a combined education and sporting precinct within the area, allowing for shared use of sports and other infrastructure, including car parking.
- The proposed Town Park will provide both passive and active recreational opportunities in a central location in close proximity to the TOD Precinct and Forrestfield Train Station.

- Where possible, existing roads have been re-purposed as part of the new development. The broader intention of the project is to frame roads with vegetation and provide longer vistas to conservation and POS areas to retain and build on the bush character of the locality.
- Cycle and pedestrian access within and through the Residential Precinct to connect to the Forrestfield Train Station has been carefully considered. Depending on projected traffic volumes, roads with the area have been appropriately designed to incorporate dedicated cycle lanes, shared paths or a safe on road cycling environment. Key connections to adjoining areas are proposed via a connection across Poison Gully Creek and at the future Roe Highway overpass. Pedestrians and cyclists using the facilities provided will have the opportunity to access the future Town Park and Activity Centre at the core of the Forrestfield North project area before accessing the train station in the TOD Precinct.
- Existing bridle trails in the precinct will be repurposed where possible, either as part of ECs or the proposed POS network. Bridle trails within the green link are proposed to be used to provide pedestrian and potentially cyclist access to the primary school and Sporting Precinct to the east of Brand Road and will serve to break down the perception of the green link as a barrier between different parts of the precinct.
- Bushfire management has been a key consideration in the design of the LSP, with perimeter roads proposed at the interface with both external and internal bushfire prone vegetation where possible.
- The residential interface to the Forrestfield / High Wycombe Light Industrial Area on the western side of Sultana Road West is intended to be treated by one or a combination of the following treatments to ensure an acceptable level of acoustic and visual amenity is maintained:
    - An acoustic wall;
    - A landscaped buffer strip; and
    - A local road running parallel to Sultanta Road West to provide adequate separation between the land uses.
- The first row of residential development will be required to also incorporate notifications on title, warning of the potential for higher than normal noise levels, opposite the light industry located on the western side of Sultana Road West.
- Drainage areas have been sensitively located to respond to pre-existing catchment characteristics and flow directions. Where possible these areas have been collocated with POS and in some instances underground storage is proposed due to POS size limitations and the need to manage potential impacts on the future urban form.
- Noise and vibration from road traffic, Perth Airport, Forrestfield Train Station and nearby freight rail have been carefully considered with treatments and notification requirements identified for implementation.
- The transitional arrangement and interface between the Residential Precinct and the TOD Precinct is to be carefully considered, particularly across Milner Road. The design of Milner Road is to be conducive to allowing movement between the precincts and to the new train station. Associated built form within the two precincts is to be compatible and complementary in terms of scale and street relationship so as to present as a coordinated urban environment.
- The intersection of the TOD Connector Boulevard and Milner Road is to be appropriately treated to facilitate ease of movement to the new train station, with consideration being given to signalisation of this key connection.

2.7.1.2 Population Projections

Population projections for the entire Forrestfield North area based on associated development yield projections are provided in Table 7 below.

Table 7 – Population Projections (Forrestfield North Project Area)

	Dwellings	Persons per Dwelling	Total Persons
R60 Compact Dwellings & Apartments			
• House Dwellings	539	2.7	1,455
• Apartment Dwellings	31	2.2	68
- One Bedroom	10	1.4	14
R80 Compact Dwellings & Apartments			
• House Dwellings	1,621	2.7	4,376
• Apartment Dwellings	538	2.2	1,183
- One Bedroom	179	1.4	250
R100 Apartments			
• Apartment Dwellings	1,397	2.2	3,073
- One Bedroom	466	1.4	652
RAC3 Apartments			
• Apartment Dwellings	1,168	2.2	2,569
- One Bedroom	390	1.4	546
Updated Yield Projections	**6,339**	**2.2**	**14,186**

The projected population for the precinct is 8,582, representing 60% of the whole Forrestfield North project area.

2.7.1.3 Development Yields

Projected development yields for the LSP area are provided in Table 8 below. The anticipated development yield equates to 75.24 dwellings per hectare.

Table 8 – Projected Development Yields

Cell	Area (Hectares)	Yield (Dwellings)	
		Single and Grouped Dwellings	Multiple Dwellings (Apartments)
01	1.5496	82	6
02	1.4804	73	6
03	9.0449	384	29
04	5.1739	261	115
05	7.8923	396	177
06	12.6313	428	797
07	9.7501	414	408
Totals	**47.5228**	**2,038**	**1,538**

Based on the projected development yields it is anticipated that there will be approximately 2,612 lots within the precinct.

2.7.1.4 Indicative Built Form

An indicative built form plan has been prepared to depict the potential future development configuration for the Residential Precinct and is provided at Figure 24.

It is anticipated that most future residential development forms will be one to two storeys in height with additional three to four storey development towards the western and south western areas of the precinct close to the amenities offered by the future TOD and Activity Centre Precincts and Town Park. Depending on prevailing residential market conditions it is hoped that higher density development forms will also be able to be delivered along Milner Road and to the immediate north of the Town Park.

Refer to Figure 24 – Indicative Built Form Plan

2.7.2 Land Use

The proposed LSP comprises the following key elements:

- Seven (7) separate development cells to assist with land assembly and project delivery, defined by key road infrastructure and a POS network.
- Nine (9) POS areas, (POS-01 to POS-09).
- Thirteen (13) environmental conservation areas (EC-01 to EC-13).
- Seven (7) designated drainage areas forming part of the POS network (DB-01 to DB-07).
- New TOD connector road to assist future land assembly and project delivery.
- A proposed flyover across Roe Highway.
- A Town Park (POS-06).
- A public purpose primary school site.
- Residential development ranging in density from Residential R40 to Residential R100 with densities increasing as you move west through the precinct towards the Forrestfield Train Station.

Refer to Development Plan (Plan 2) for further information.

It is intended that the LSP will promote a future housing environment that encompasses high quality medium to high residential development, with consistency of quality ensured through the application of comprehensive private realm design guidelines. Future development forms are expected to encompass single houses, grouped dwellings and apartments.

Densities are proposed to range between Residential R40 – Residential R100 with densities increasing as you traverse west across the precinct towards the Forrestfield Train Station, Activity Centre and Town Park. A key focus of the future residential development will be the delivery of the 'missing middle', a significant gap in Perth's housing market, generally comprising more efficient high amenity medium density housing in terraces or other innovative forms.

It is anticipated that up to 150m^2 net lettable area of commercial floor space may be developed in the Sporting Precinct.

2.7.2.1 Community Facility Provision

A Community Infrastructure Strategy (CIS) has been prepared for the Forrestfield North Project Area by CCS Strategic.

Refer to CIS at Technical Appendix E for additional information.

The CIS outlines the community infrastructure requirements for the Forrestfield North (FFN) area. Community infrastructure need has been determined consistent with the DSP, stakeholder feedback, demographic profile and projections, community facility guidelines and capacity and provision in surrounding areas.

A principal focus has been to ensure that sufficient appropriate land is set aside to allow future development. The actual detail of each type of facility development may vary as the community establishes and people take up residence in the area. However, the broad requirements outlined in this CIS will provide the community with an adequate and flexible suite of community facilities. The approach taken has been to identify those services that are likely to be required and provide opportunities for those services to be efficiently delivered.

In terms of community infrastructure provision there are two key precincts and a series of general amenity provisions to be accommodated throughout the remaining areas. These are discussed below.

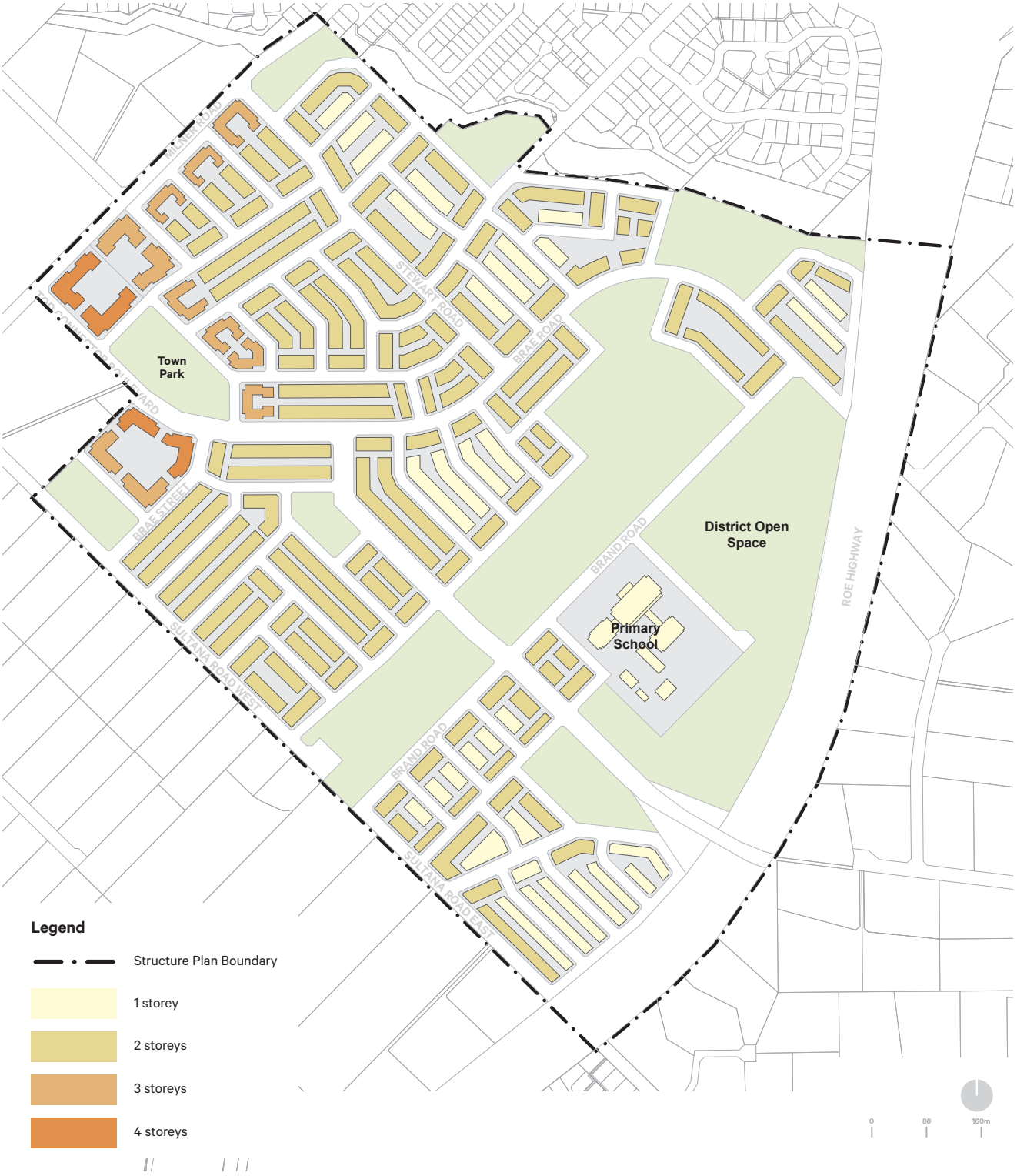


Figure 24. Indicative Built Form Plan

Education and Sporting Precinct

The area comprising the old Brand Road Landfill site is well situated and offers a large enough area to accommodate district level sporting facilities. The virgin land adjacent to the land fill site is suitable for the accommodation of a primary school. It is noted that the land area allocated for the school is in excess of 3.5ha and accordingly it is anticipated that the education provider (public or private) will most likely seek a joint use/shared development arrangement to access portion of the playing fields.

Refer to Sporting Precinct Preliminary Concept Plan at Appendix 1.

Town Park Precinct

This area contains a Town Park which will provide a high level of amenity to the surrounding high density residential.

The Town Park will accommodate existing mature trees and a separate drainage basin function in conjunction with passive recreation opportunities.

Refer to Preliminary Concept Plan at Appendix 2.

Implementation Timeline

Population projections indicate that residential development will occur early in the 2020's, and reach 3,393 by 2026. This will represent a rapid influx of residents once land release has occurred. The majority of community infrastructure milestones are triggered by a catchment population of around 5,000 and this is anticipated to occur in the late 2020's, approximately around 2028 noting that the population is forecast to hit 5,890 by 2031.

A key question to consider is should facility and amenity provision lead or lag population arrival. Developers will typically provide a range of lead amenities such as local recreation parks and playgrounds and footpaths as part of the marketing package to launch a new estate. This is to be encouraged, and accordingly a range of these features are anticipated to be provided as early as 2022 during estate development.

Given the central location of the Town Park it is anticipated that this feature facility will be developed in the early stages. Perimeter roads, parking areas and landscaping in this precinct is anticipated to occur early commencing in 2022. It is anticipated that the full suite of community infrastructure is achieved by 2036 when a resident population is forecast to exceed 10,000 within FFN.

Refer to CIS provided at Technical Appendix E for additional information.

2.7.3 Public Open Space Provision

The LSP provides for approximately 21.3ha of open space in the form of local open space, environmental conservation areas and pre-existing Bush Forever. Several areas of the local open space wlll also be used as part of water management across the precinct.

A landscaping concept plan has been prepared by Place Laboratory to broadly depict the open space intent and support the approach to water management and includes indicative information in respect of the following:

- Extent of tree canopy
- Street trees
- Ecological protection zone
- Turf areas
- Manicured planting (ground covering vegetation)
- Street swales and rain gardens

Refer to Landscaping Concept Plan at Appendix 3.

The landscaping concept plan is based on the ambition to create a 'Forest Neighbourhood', a medium to high density area with a bush character. This would provide the overall Forrestfield North project area and the Residential Precinct in particular with a competitive difference in regards to other comparable medium density developments around the Perth Metropolitan Area.

To realise the forest neighbourhood, the landscaping concept plan works on two main ingredients:

- Spaces for people - creating an attractive public realm for people of all demographics, with a comfortable microclimate, safe paths and an abundance of elements that support activation.
- Forest character - creating a continuous urban forest that supports the bush character, provides a suitable microclimate for people, connects to nature and contributes to the biodiversity.

The landscaping concept plan translates the framework of the LSP to the Residential Precinct Public Realm Design Guidelines, incorporating the technical demands of the LWMS, the BMP, the TIA and the CIS.

The schedule at Table 9 demonstrates that open space provision significantly exceeds the minimum 10% land provision requirement of LN.

Table 9 – Public Open Space Schedule

Residential Precinct Public Open Space Schedule				
Residential Precinct Gross Site Area				**1,230,591**
Deductions				
Regional Road Reserve (Roe Highway)		125,055		
Primary School		3,983		
Bush Forever		33,974		
Environmental Conservation		81,062		
Drainage (1 in 1 yr Inundation)		8,665		
Total Deductions				**252,739**
Net Subdivisible Area (NSA)				**977,852**
Creditable Public Open Space Required (10%)	0.1			**97,785**
Unrestricted Open Space (as shown on plan)				
Total Public Open Space			222,386	
less 1 in 1 yr Inundation		8,665		
1 in 5 yr Inundation		5,437		
Sub - Total			**14,102**	
Total Unrestricted Open Space				**208,284**
Min. Required (80% of Original 10% Req.)	0.8	78,228		
Total Unrestricted Credited				**78,228**
Restricted Open Space				
1 in 5 yr Inundation		5,437		
Total Restricted				**5,437**
Max. Permitted (20% of Original 10% Req.)	0.2	19,557		
Total Restricted Credited				**19,557**
Unrestricted POS				208,284
Restricted POS				5,437
Total Public Open Space Provision				**213,721**
% of Provision				**21.9%**
incl. Brand Road District Sporting Precinct (POS-01)				**70,222ha 7.2%**

2.7.4 Land Assembly

The approach to future land assembly within the precinct has a been a key focus of the preparation of the LSP. Using the proposed road and public open space network, seven (7) separate development cells (Development Cells 01 – 07) have been defined to facilitate future development as depicted in the Development Plan (Plan 2).

The development of the cells independently of each other will be facilitated by the provision of key infrastructure under the DCP for the precinct, reducing reliance on typical estate land developers and providing a wider range of future development options for existing landowners with the precinct. Development consistency across the precinct will be delivered through the implementation of public realm and private realm design guidelines.

Refer to Forrestfield North Residential Precinct – Development Plan (Plan 2) for additional information.

2.7.4.1 Acquisition of Environmental Conservation Areas

The majority of conservation areas which protect vegetation that is of State and Federal significance within the LSP area are within private landownership. These areas have been identified in addition to the POS areas and are required by relevant State Environmental Agencies to be secured.

Land identified as 'Environmental Conservation' on the Structure Plan (Plan 1) is to be protected initially via a Planning Control Area with a view to ultimately reserving these areas as 'Parks and Recreation' under the Metropolitan Region Scheme. The EC areas may also be purchased through a third party acquisition and managed by the purchaser until there is an agreement of handover (ownership and/or management) to the City, WAPC or DBCA.

Refer to clause 2.1.9.4 for additional information.

2.7.5 Stakeholder Engagement

Prior to the preparation of the LSP, the broader Forrestfield North project included a significant Preliminary Community and Stakeholder Engagement Phase between May – June 2017, where the following engagement methods were utilised:

- **Council Briefings/Briefing Notes**: Councillors were kept informed as the project progressed.
- **Landowner Survey:** targeting current landowners in the area, to understand their future plans and development expectations. This was open for landowner respondents between Monday 29 May 2017 to Thursday 22 June 2017.
- **Landowner Forum:** was held on Monday 29 May 2017 between 6:40pm to 8:10pm and provided existing landowners with a project update and invited landowners to share their future plans and development expectations.
- **Community and Stakeholder Survey:** was open to the general public between Thursday 1 June 2017 to Thursday 22 June 2017. This survey sought to understand community and stakeholder understanding of the existing context and gather ideas for the future of Forrestfield North.
- **Community and Stakeholder Workshop:** was held on Thursday 1 June 2017 between 6:30pm to 9:00pm and sought to understand community and stakeholder understanding of the existing context and gather their ideas for the future of Forrestfield North. Key areas of interest included: buildings, streets and landscapes, transport and movement, community infrastructure and environment.
- **Technical Advisory Group (TAG):** a group of technical stakeholder representatives, including key State Agencies, was established to test project outputs and focus on technical issues. This remains an ongoing process and the feedback provided by the TAG has been captured as part of the preparation of the LSP.

Key themes emerging from the workshops and surveys are:

- **Location:** many participants noted the location as important; being close to employment, transport and recreation (the Hills, Swan Valley). Due to the location transport and movement was discussed as a core issue.
- **A Connection to the Natural Landscape and Rural Feel:** residents appreciate the bush feel and the feeling of open space; they wish for this connection and feeling to continue.
- **Sense of Community:** participants communicated a strong sense of community and belonging, which they wish to continue with a focus on local business, local produce and providing spaces and places for local connection.
- **Active Recreation:** participants focused on active recreation, with some tables suggesting the need for a recreation centre, not just space 'to kick a footy'. Active transport was also focused on, with many suggesting the need to include and promote high quality walking and cycling paths (there were suggestions of built walkways over busy roads, wide footpaths to accommodate prams and wheelchairs and enough space for all).
- **Entertainment and Retail:** many participants discussed the need for entertainment and retail, with many identifying the need for a cinema, along with small bars/cafes and family- friendly pubs. Both small scale boutique retail and large-scale retail were discussed.
- **Security Concerns:** many people have asked for police presence/police station and CCTV or similar. Well-lit areas were also mentioned several times.
- **Tourism:** participants focused on the tourism opportunities due to the area's location (including its proximity to the hills and wineries). There was more than one suggestion of placing a tourism and/or WA-based souvenir hub in the new development. Accommodation was also discussed; many tables suggested short-term apartments and/or hotels for visitors coming from the airport.
- **Professional Services and Employment:** Participants discussed the need for more professional 'white collar' services, such as finance and law. Additionally, some participants felt that the City offices should be moved to a more central location, such as Forrestfield.

In addition to specific State Agency engagement by the consultant team as part of the preparation of the supporting technical reports, and close liaison with relevant officers at the City throughout the project, issues based meetings have been held with the following State Agencies on an as needs basis to resolve issues:

- Metronet
- PTA
- OEPA
- DBCA
- DPLH
- Department of Premier and Cabinet
- Main Roads WA
- Department of Transport
- Department of Education

2.7.5.1 Primary School Location

Initial advice from the Department of Education confirmed that a high school would not be required in the precinct but that a primary school would need to be accommodated. Upon being provided with the draft LSP, advice from the Department of Education (Muldoon S [DoE] 2018, pers. comm. 1 March), confirmed that 'the Department appreciates that a full 4 ha primary school site and shared public open space can be accommodated within the development. This will assist in accommodating the anticipated large student yield from the residential development.

The Department notes the Sporting Precinct Preliminary Concept Plan and advises that further discussion would need to take place re the orientation of the school building footprint, shared parking and the interface with the shared oval at a convenient time into the future.

The Department will also need to carry out a due diligence site inspection through its appointed consultants to ensure that there is no impediment to build the primary school on this location.'

2.7.6 Key Sustainability Initiatives

A key focus in the preparation of all the supporting technical reports prepared for the LSP has been the consideration of innovation and sustainability within the Residential Precinct. This has resulted in a structure planning outcome that:

- Ensures that the future development of the area retains those existing elements that the community already values and that delivers a high level of liveability in that it will be comfortable and welcoming, vibrant, safe, walkable and connected.
- Retains the ecological and environmental values within the precinct to the greatest extent possible, including the provision of significant environmental conservation areas, ecological linkages and POS areas to protect remnant vegetation and rare flora and fauna well above that normally expected (approximately 21.3ha or 21.9%).
- Focuses on creating a high amenity and safe environment for pedestrians and cyclists, including future linkages to High Wycombe and Maida Vale South across Poison Gully Creek and Roe Highway respectively.
- Proactively considers how enhanced public transport services can be provided within the area, including along the future TOD connector to the Forrestfield Train Station, providing excellent access for future residents throughout the precinct.
- Considers the evolution of new transport technologies with provision for a driverless shuttle service and ample charging stations for electric vehicles.
- Provides for the future needs of the local and wider community through provision of a District Open Space (Sporting Precinct) on a former landfill site.
- Promotes an advanced approach to water management as detailed in the following section.
- The transitional arrangement and interface between the Residential Precinct and the TOD Precinct is to be carefully considered, particularly across Milner Road.

The design of Milner Road is to be conducive to allowing movement between the precincts and to the new train station. Associated built form within the two precincts is to be compatible and complementary in terms of scale and street relationship so as to present as a coordinated urban environment.

Further innovation and sustainability initiatives are being considered for the Residential Precinct and will be detailed in the Public Realm Design Guidelines and Private Realm Design Guidelines for the precinct, including but not limited to:

- Greenhouse Gas (GHG) emissions abatement, including the mandated use of Solar PV production and accommodating peer to peer energy trading technology and energy efficiency in the public and private realm.
- Waste reduction, including construction waste minimisation and maximisation of recycling opportunities.
- Ensuring optimised building orientation and massing and appropriate levels of solar access into new housing.
- The use of SMART energy metering and monitoring.
- The provision of cyclist facilities.

Additional information in respect to the innovation and sustainability initiatives can be found in the relevant LSP Technical Appendices.

2.7.6.1 Water Sustainability Initiatives

A key focus of the scope of works for the Residential Precinct involved the assessment of potential water sustainability initiatives for use at a precinct and lot level. Because of the relatively high density of development proposed (R40 to R100), the development is anticipated to consist of a mixture of small individual lots and groups of apartments and/or townhouses constructed and operated by a strata body. The water sustainability measures proposed are cognisant of the type of development proposed in the Residential Precinct.

Potential water sustainability measures have been assessed against the sustainability principles outlined in the *Water Resources Statement of Planning Policy 2.9* (WAPC 2004). This requires that an integrated approach is needed to address these issues and achieve sustainable outcomes and an acceptable 'prioritisation and balance' between competing interests (WAPC 2004). This requires that sustainability is pursued through integration of:

- environmental protection (including protection of water resources)
- social advancement
- economic prosperity (WAPC 2004).

Initiative options have consequently been evaluated against environmental, social and economic criteria.

The Residential Precinct is anticipated to consist of a mixture of single dwellings and strata developments in the form of apartments and townhouses. Consideration was given to both precinct and lot/strata scale options.

Precinct scale options considered were:

1. Stormwater Managed Aquifer Recharge (MAR)
2. Wastewater recycling
3. Improved water and fertiliser efficiency in POS irrigation through installation of soil amendments or water efficient irrigation systems at construction
4. Use of pervious pavements to increase infiltration in paved areas of POS, car parks and pedestrian pavements.

Lot/strata options considered were:

1. Water efficient gardens at a lot/strata scale
2. Installation of water efficient fixtures
3. Rainwater tanks for in-house water use
4. Rainwater tanks for ex-house water use
5. On-lot greywater/wastewater recycling
6. Roof gardens.

Initiative options have consequently been evaluated against environmental, social and economic criteria consistent with the principles outlined in SPP 2.9 (WAPC 2004) with consideration given to practicability. Where initiatives show benefits but may have significant costs or logistical issues (such as pervious pavements), trials have been recommended to assess the suitability of these initiatives for use in the Residential Precinct.

Further evaluation of these options is available in Table 6 of the LWMS provided at Technical Appendix D.

2.7.7 Movement Network

A detailed Transport Impact Assessment (TIA) has been prepared for the Forrestfield North LSP by KCTT. An overview of the TIA is set out below.

Additional transport statements and/or assessments will be provided in support of future subdivision and development applications within the Structure Plan area in accordance with the Department of Planning, Land Use and Heritages Transport Impact Assessment guidelines.

Refer to TIA provided at Technical Appendix F.

Most notable changes to the existing road network proposed external to the Residential Precinct and under the LSP include:

- The addition of the TOD Connector and accompanying proposed overpass connecting Forrestfield North and Maida Vale South.
- Realignment of Dundas Road for the purposes of constructing the Forrestfield North Station.
- Realignment of part of Brae Road; Milner Road upgrade and Maida Vale Road upgrade.

Since the entire surrounding area is about to go through significant changes, it is expected that many changes will occur in the provision of public transport services. Until the future road network is in detailed stages of planning, no precise information is available. It is expected that buses will operate along Berkshire Road, Dundas Road, Maida Vale Road and along the future overpass connecting the TOD Connector and Ravenswood Road. In order for new public transport routes to be introduced, the overpass on Roe Highway needs to be constructed. After completion of the overpass, new routes will likely be introduced connecting Maida Vale South and other suburbs east of Roe Highway with the Forrestfield Train Station.

A driverless shuttle servicing the residential area and providing direct connection to the railway station should be considered in the future. The potential route would include Stewart Road, Brand Road and the TOD Connector. Once the overpass is constructed, the service can be expanded further into Maida Vale South.

Every major road within the LSP area will have either a shared path or a separate cycling path while all minor roads will have pedestrian paths. On-street parking should be provided through each of the main linkages in the overall Forrestfield North project area and the LSP area specifically. It is considered that the following streets as a minimum should have some form of on-street parking:

- Milner Street north from the intersection with Sultana Road West
- Imperial Street
- Ibis Place (in the vicinity of the railway station forecourt, mainly for kiss and ride parking)
- TOD Connector and Brand Road

Well-designed on-street parking will contribute to overall street amenity and will help reduce average operating speeds on the road. In the section of the TOD Connector south of the intersection with Milner Road a dual use for the parking lane can be considered. Parking lanes can potentially function as AM / PM bus priority lanes if high frequency bus routes are introduced on this section of the road.

Parking / charging points for electrical vehicles should be considered and provided at a minimum rate of 1 in 20 standard parking bays, preferably 1 in 10. This requirement should be applied to all public parking areas and parking in multi-dwelling complexes.

It is assumed that residents will store their bicycles and equipment within their respective dwellings. It is considered that there is no need for additional bicycle parking requirements in the residential component of the area; however, bicycle storage should be provided in the primary school, district and local open space areas. There is also the potential to consider a smart bike network within the City that would complement the new Cycling Plan for the City.

It is expected that delivery and service vehicles (such as waste removal vehicles) servicing the residential area will not require designated parking spaces given that they can operate safely within the road reserve.

Total residential precinct generated traffic is 33,619 vehicles per day and 5,071 vehicles per hour. However, the modelling includes generated traffic from residential and all other precincts. Refer Appendix 4 of the TIA provided at Technical Appendix F for more details on traffic modelling. All proposed roads are sized to successfully cater for the additional traffic volumes.

The use of electrical vehicles is on the rise and given the reduction in pollution they provide their use should be further encouraged. While in individual dwellings, private owners / developers can choose to implement charging points for electrical vehicles, in multiple dwelling complexes and non-residential buildings it is important to provide charging points so that the residents have an option for using electrical vehicles. The mandatory rate should be reviewed and revised every 5 years given rapid technology advancement.

2.7.7.1 Road Network

The proposed road network changes and traffic expectations within the LSP area are detailed on the LSP Map (Plan 1).

The most notable changes to the network are the:

- Addition of the TOD Connector and accompanying proposed overpass connecting Forrestfield North and Maida Vale South
- Realignment of part of Brae Road west of the TOD Connector intersection.

Refer to Figure 25 – Road Types Within Development
Refer to Figure 26 – Daily Traffic – Internal Network - 2031

An overpass is proposed connecting the Forrestfield North area with Maida Vale South. In Perth and Peel Transport Plan @3.5million it is stated that by 2050 Roe Highway will be upgraded to an 8-lanes freeway standard. The TIA also details the following changes to the road network outside of the LSP area:

- Realignment of Dundas Road for the purposes of constructing the Forrestfield Train Station
- Grade separation of Kalamunda Road / Roe Highway intersection
- Roundabout at the realigned intersection of Dundas Road / Berkshire Road / Milner Rd.

The TIA via a table on page 51 details the expected future traffic volumes for the road network within and surrounding the LSP area.

2.7.7.2 Road Cross Sections

Where appropriate, road cross sections have been designed to comply with Liveable Neighbourhoods street reserve requirements relative to the road hierarchy. However, this local structure plan provides for flexibility to vary Liveable Neighbourhood requirements where it can be demonstrated at subdivision stage that:

- traffic modelling supports the variation;
- the variation is necessary to achieve an environmental outcome(s); and
- that Liveable Neighbourhood principals are not compromised.

The following figures detail conceptual road cross section designs for the key roads in the LSP road network. Descriptions and dimensions of all proposed road cross sections are available in the TIA (refer to section 2.21 of TIA provided at Technical Appendix F).

Refer to Figure 27 – Road Cross Section - Brand Road at District Open Space
Refer to Figure 28 – Road Cross Section - Brand Road South of District Open Space
Refer to Figure 29 – Road Cross Section - Brand Road South of TOD
Refer to Figure 30 – Road Cross Section - Maida Vale east of Milner
Refer to Figure 31 – Road Cross Section – Maida Vale between Milner and Ibis Road
Refer to Figure 32 – Road Cross Section – Milner Road between Sultana and Stewart
Refer to Figure 33 – Road Cross Section – Milner Road north of Stewart Road
Refer to Figure 34 – Road Cross Section – Safe Active Street
Refer to Figure 35 - Road Cross Section - Stewart Road
Refer to Figure 36 - Road Cross Section - Sultana between Milner and Brae Roads
Refer to Figure 37 - Road Cross Section - TOD Connector (Integrator B)
Refer to Figure 38 - Road Cross Section - TOD Connector Bridge

Intersection Treatments

Proposed intersection controls are depicted in Figure 39, with roundabouts proposed at the following key intersections:

- Dundas Road / Berkshire Road / Milner Road
- Milner Road / TOD Connector
- Milner Road / Maida Vale Road
- Milner Road / Stewart Road
- Milner Road / Raven Street
- Brand Road / TOD Connector

Further SIDRA analysis is required at subdivision stage to determine whether a roundabout or T-junction is required for the treatment of the intersection of the TOD Connector with Brae Road to ensure uninterrupted traffic flow is achieved.

Left-in / Left-Out (LILO) and sign controlled intersection treatments are also identified in other important locations.

Refer to Figure 39 – Intersection Control

2.7.7.3 Pedestrian Network

Existing pedestrian access through the Residential Precinct is very limited due to the low intensity of current land-uses. The extent of development for the area envisaged under the LSP will have a significantly higher intensity of activity therefore the requirement for good quality pedestrian linkages emerges. One of the key objectives of the LSP is to identify key linkages within the precinct.

A key focus of the LSP is to develop a solid and permeable network of pedestrian paths in order to encourage pedestrian movement. The Structure Plan also acknowledges the importance of providing direct and legible pedestrian and cycle connections between the Forrestfield Train Station and Structure Plan area to encourage public transport patronage.

The network of proposed pedestrian paths is shown in Figure 40.

Refer to Figure 40 – Proposed Pedestrian and Cyclist Paths

Every major road within the LSP area will have either a shared path or a separate pedestrian path.

All pedestrian and shared paths should be designed to be accessible by all members of the community in accordance with the City's Disability Access and Inclusion Plan 2012-2017 or any other subsequent document of this nature. The exact location of pram ramps and other elements is to be determined at a later stage in the project.

In addition to Figure 40, the provision of key pedestrian infrastructure is outlined below.

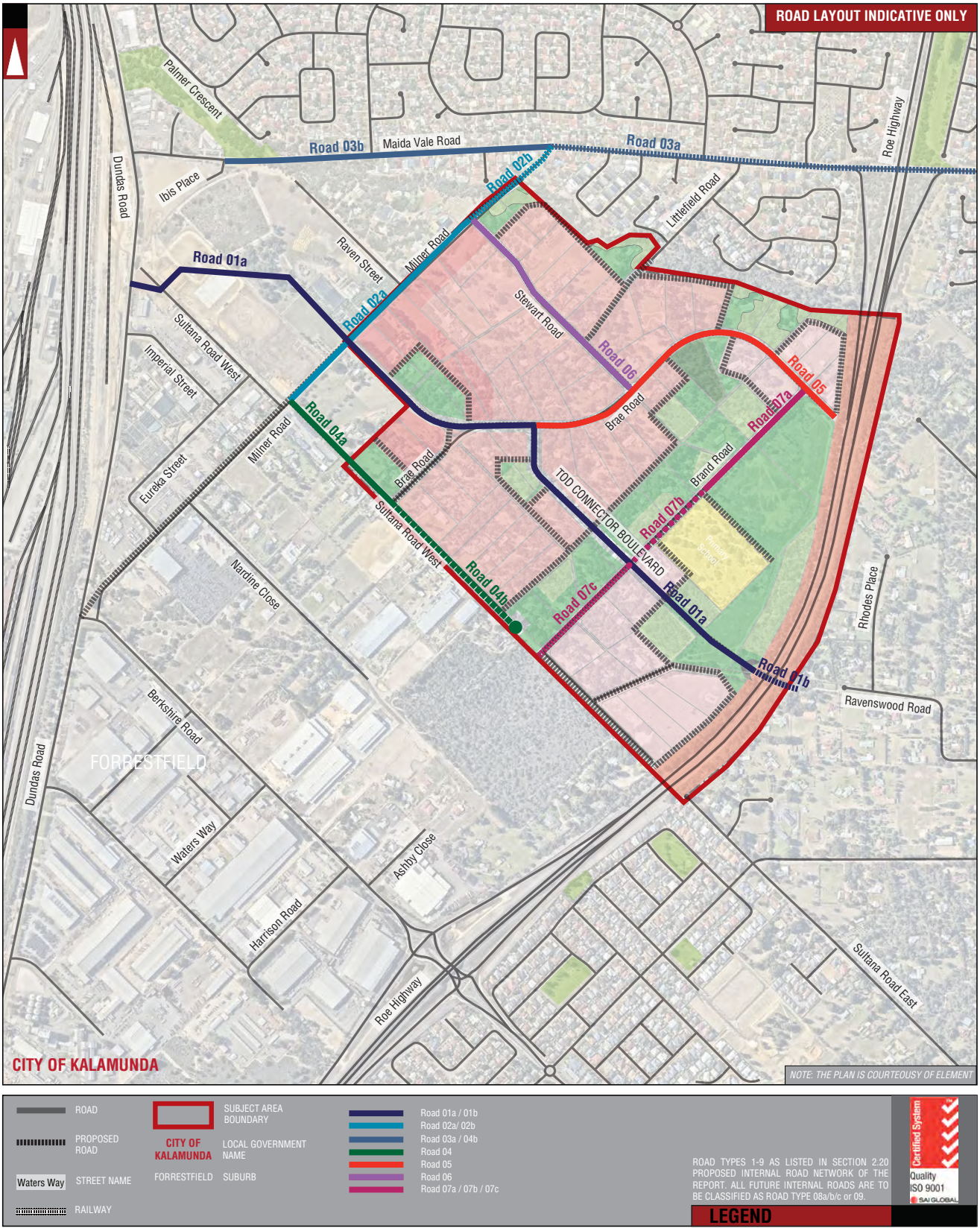


Figure 25. Road Types Within Development (Source: KCTT)

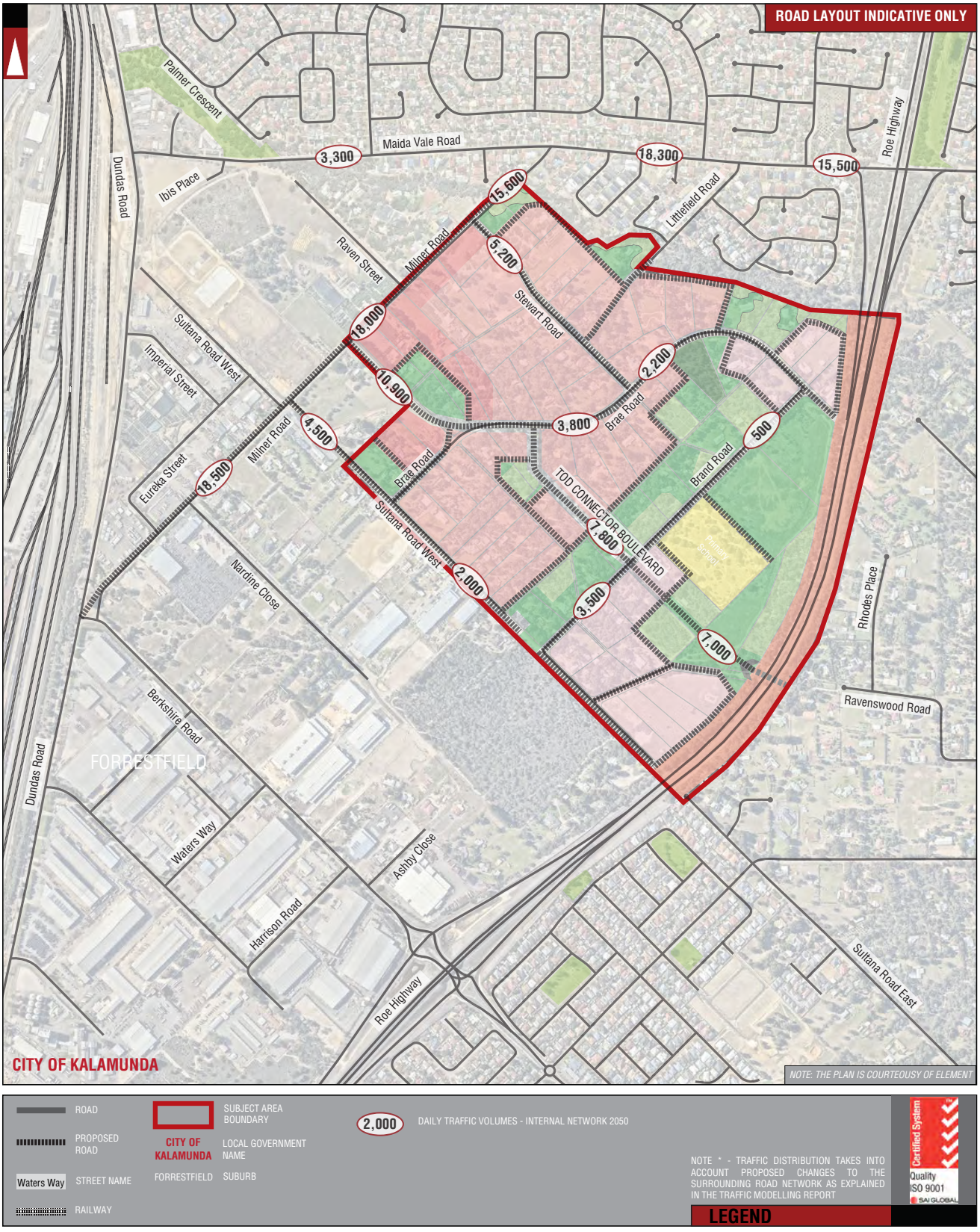


Figure 26. Daily Traffic – Internal Network - 2031 (Source: KCTT)

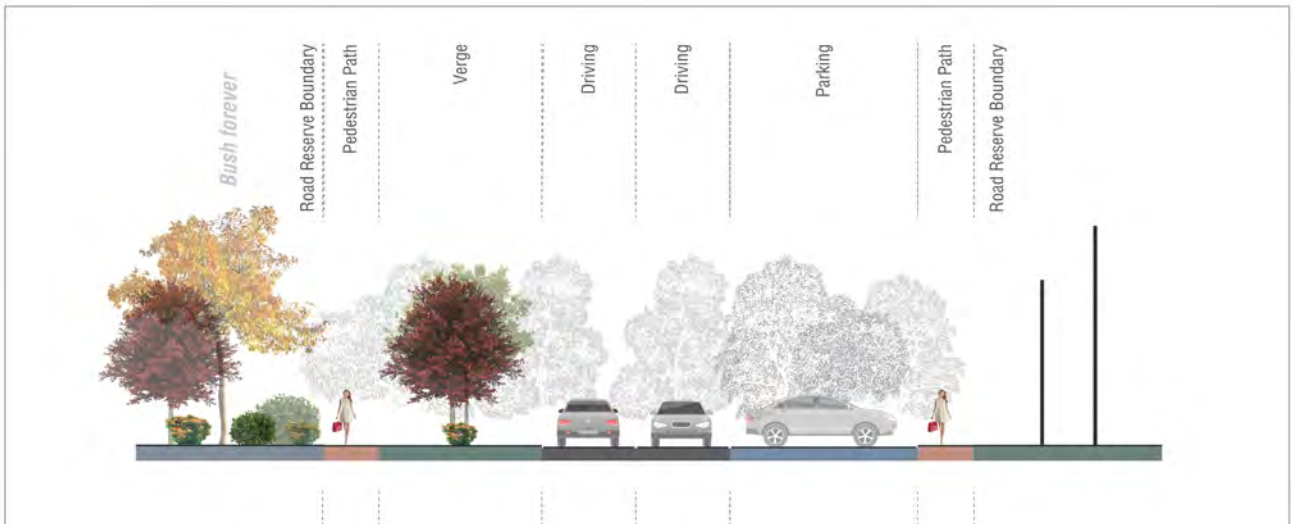


Figure 27. Road Cross Section - **Brand Road at District Open Space**

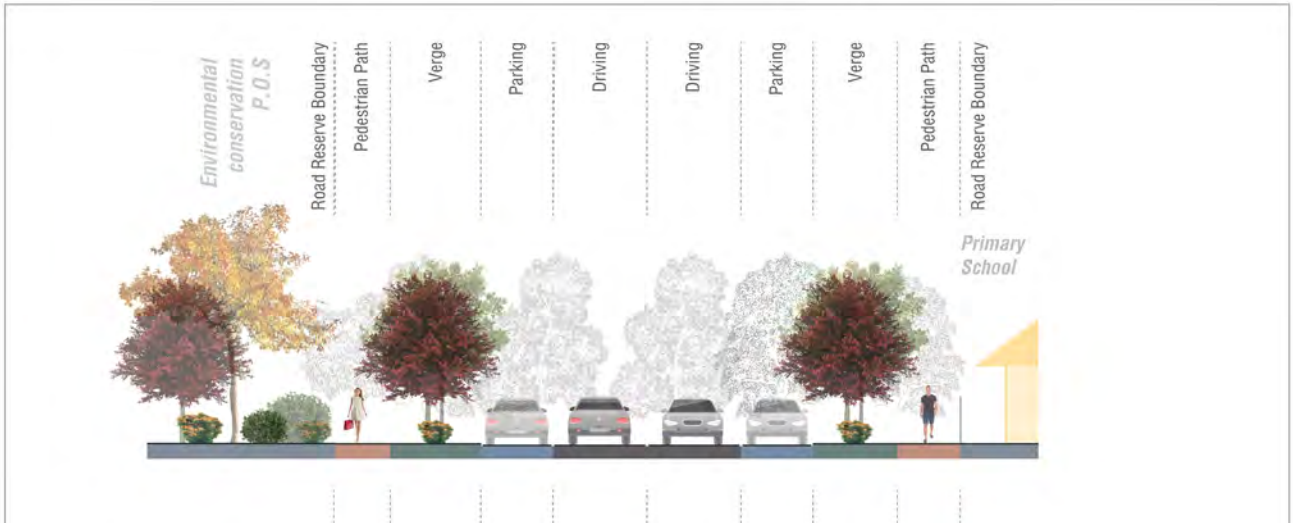


Figure 28. Road Cross Section - **Brand Road South of District Open Space**

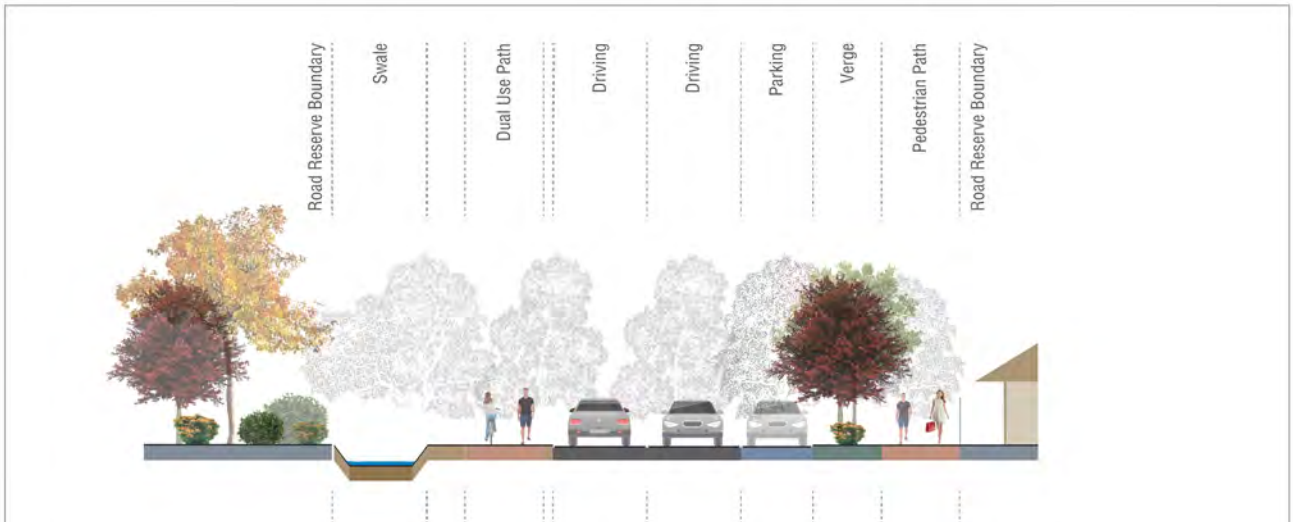


Figure 29. Road Cross Section - **Brand Road South of TOD**

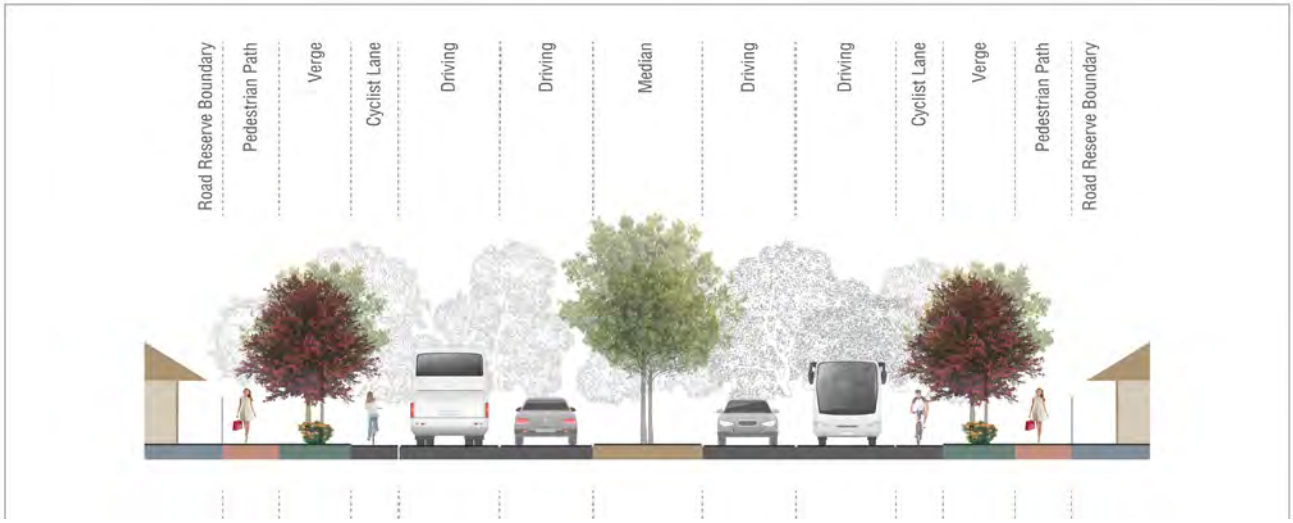


Figure 30. Road Cross Section - Maida Vale east of Milner

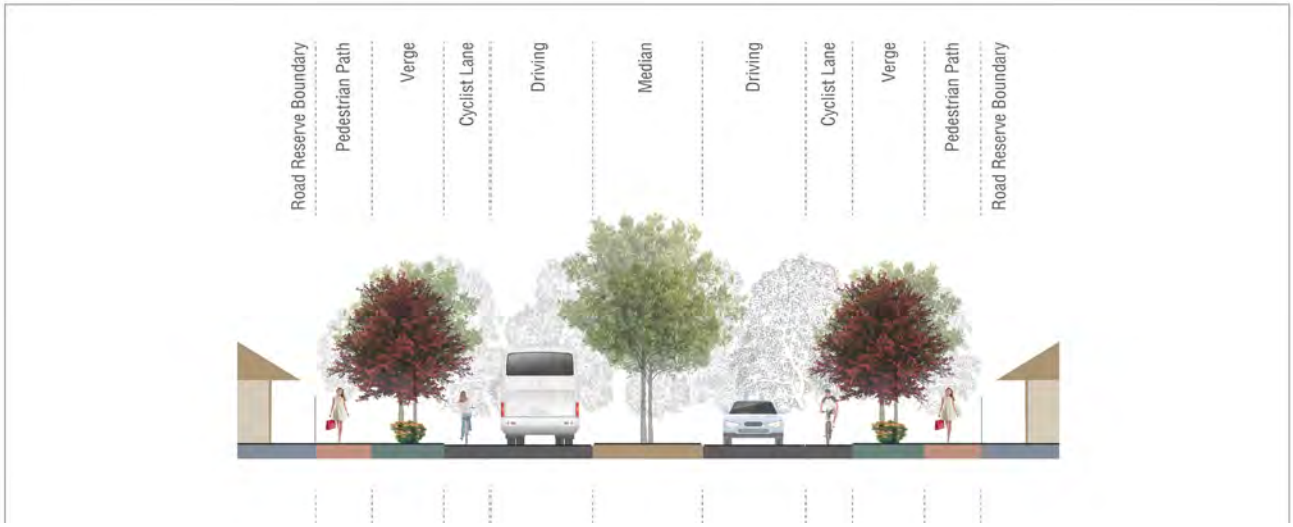


Figure 31. Road Cross Section – Maida Vale between Milner and Ibis Road

Figure 32. Road Cross Section – Milner Road between Sultana and Stewart

Figure 33. Road Cross Section – Milner Road north of Stewart Road

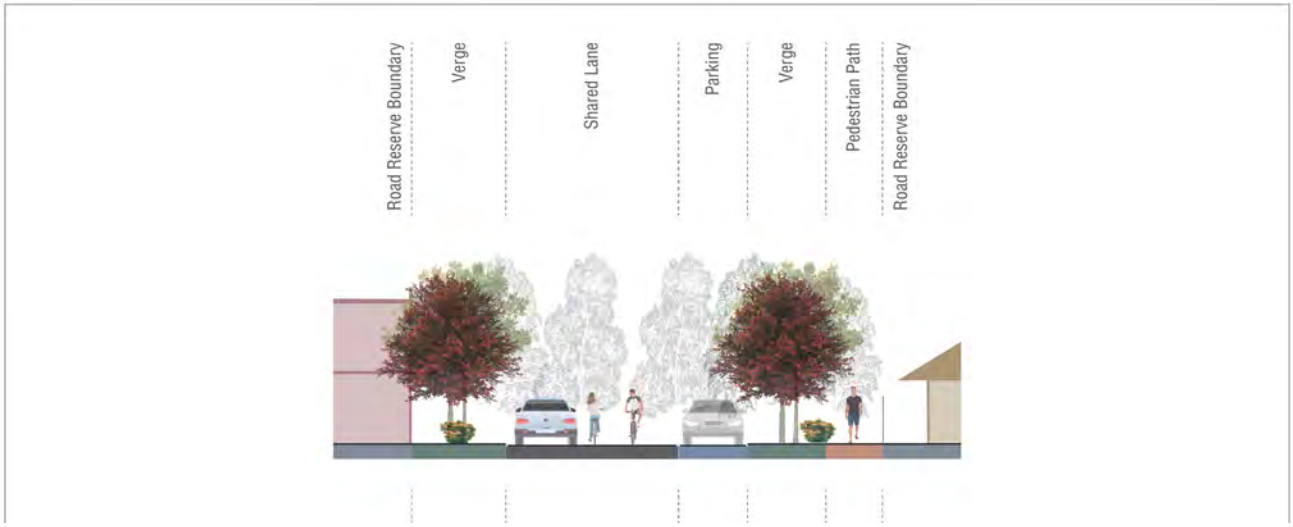


Figure 34. Road Cross Section – Safe Active Street

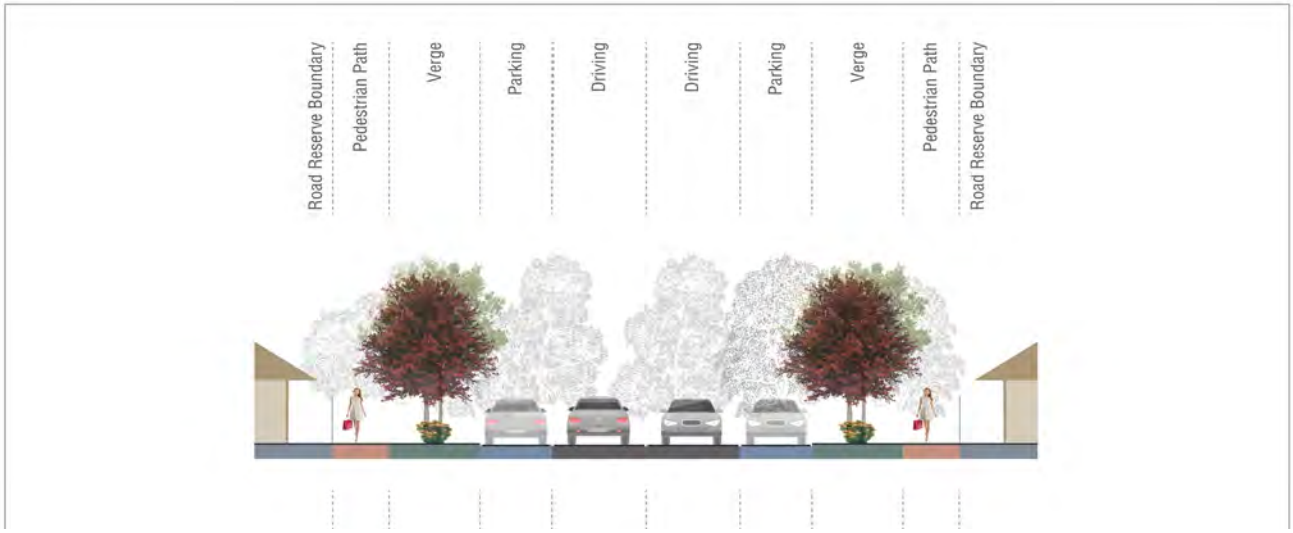


Figure 35. Road Cross Section - Stewart Road

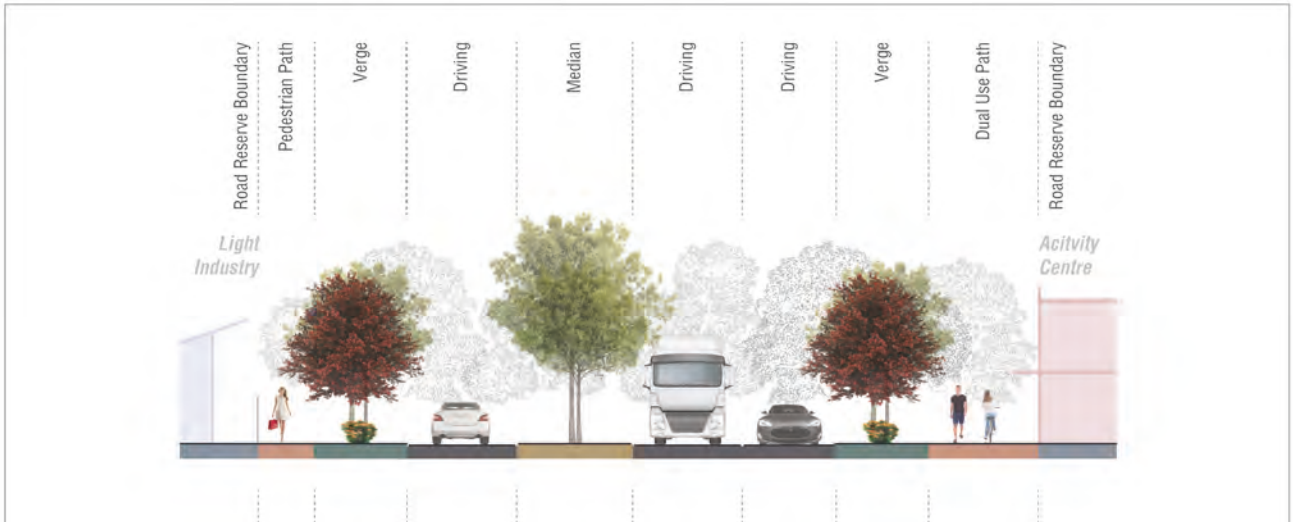


Figure 36. Road Cross Section - Sultana between Milner and Brae Roads

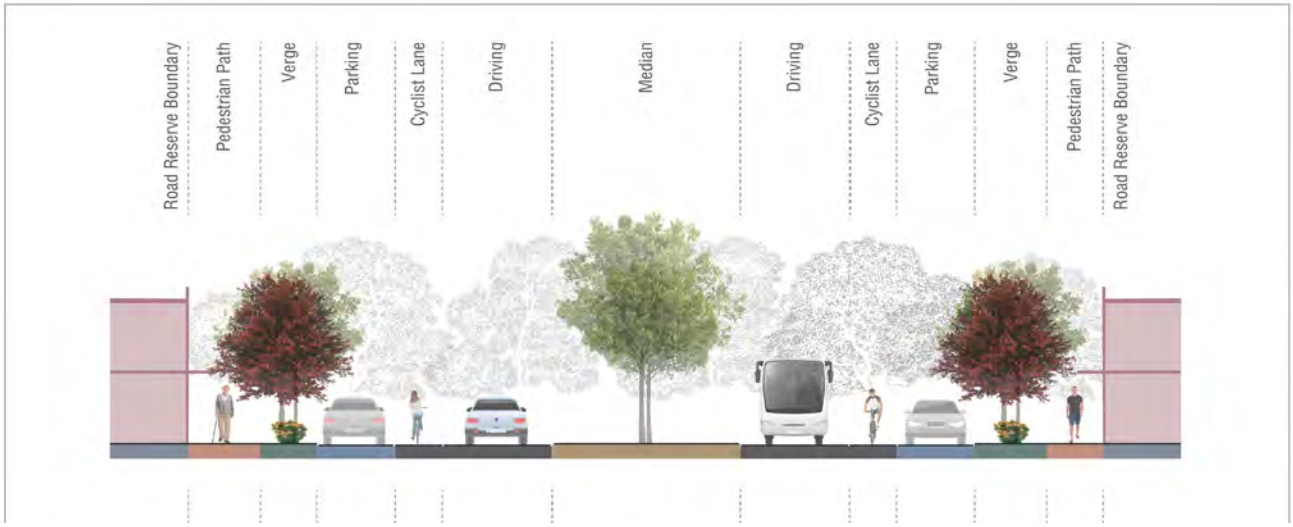


Figure 37. Road Cross Section - TOD Connector (Integrator B)

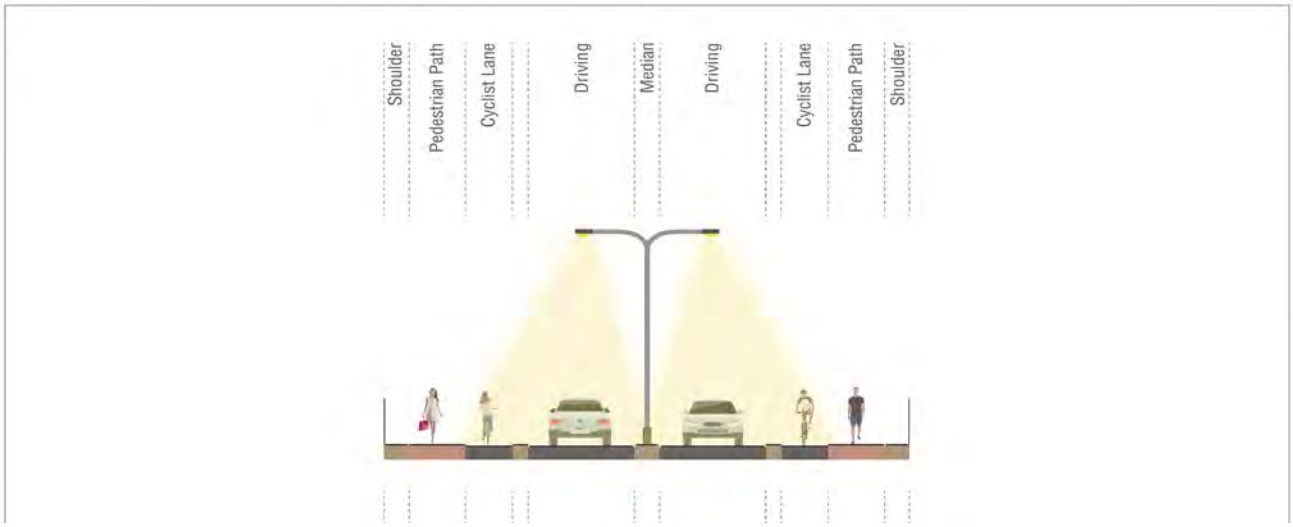


Figure 38. Road Cross Section - TOD Connector Bridge

Shared paths are proposed for:

- Berkshire Road
- Milner Road (South of Sultana Road West)
- Maida Vale Road (Between Dundas Road and Ibis Place)
- Sultana Road West

Separate Pedestrian Paths are proposed for:

- Berkshire Road
- Maida Vale Road
- Milner Road (North of Sultana Road West)
- Sultana Road West
- TOD Connector (between Brae Road and Roe Highway)
- Urban Residential Streets

Pedestrian Level Activity Area is proposed for:

- Milner Road (North of Sultana West Road)
- TOD Connector (From Forrestfield North Station to Brae Road)

2.7.7.4 Cyclist Network

Existing cyclist access through the Residential Precinct is also very limited due to the low intensity of current land-uses. The extent of development for the area envisaged under the LSP will have a significantly higher intensity of activity therefore the requirement for good quality cyclist linkages emerges. One of the key objectives of the Forrestfield North LSP area is to identify key linkages within the proposed LSP area. Figure 37 depicts all of the linkages.

Refer to Figure 40 – Proposed Pedestrian and Cyclist Paths

It is assumed that residents of houses will store their bicycles and equipment within their respective dwellings. Therefore, it is considered that there is no need for additional bicycle parking provision in the precinct, however parking should be provided at the primary school, and District Open Space (Sporting Precinct).

It is likely that the utilisation of bicycles within the precinct will be more viable and attractive to residents. Cycling is further promoted through a network of shared paths connecting all residential areas to the main attractors.

A new cycle link on the TOD Connector Road will be important to encourage cycling as a form of transport to the train station. The train station will include bicycle parking to encourage cycling as a mode of transport to and from the station.

In addition to Figure 40, the locations for the provision of separate cyclist lanes are outlined below:

- Maida Vale Road
- Brae Road
- Stewart Road
- Milner Road (North of Sultana Road West)
- TOD Connector

2.7.7.5 Public Transport

Since the entire surrounding area is about to go through significant changes, it is expected that many changes will occur in public transport services provision. Until the future road network is in detailed stages of planning, no precise information is available. It is expected however, that buses will operate along Berkshire Road, Dundas Road, Maida Vale Road and along the future overpass connecting the TOD Connector and Ravenswood Road.

A driverless shuttle should also be considered in the future. This shuttle can provide direct connection between the proposed railway station and the Residential Precinct with potential for expansion of service once the overpass is constructed.

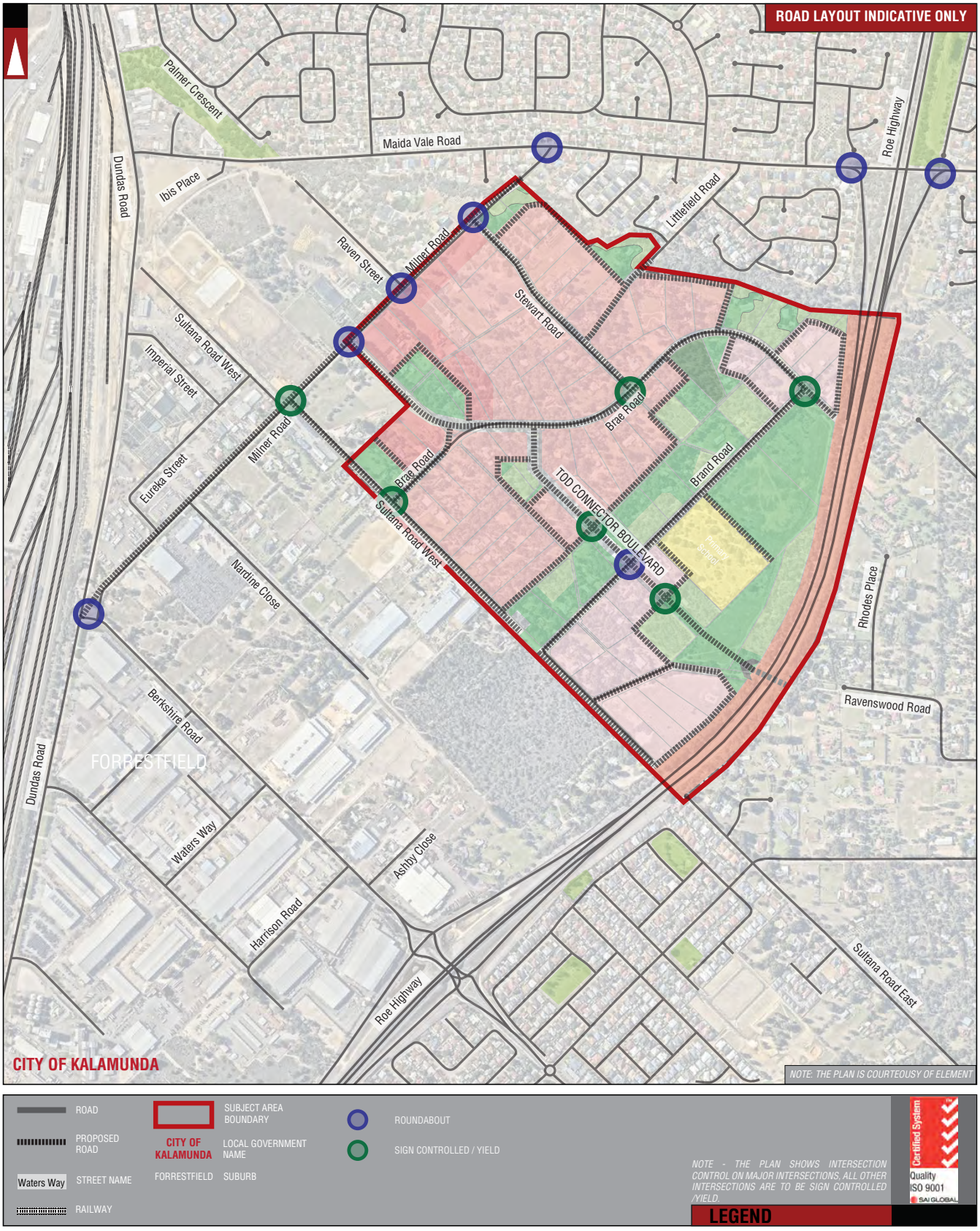


Figure 39. Intersection Control (Source: KCTT)

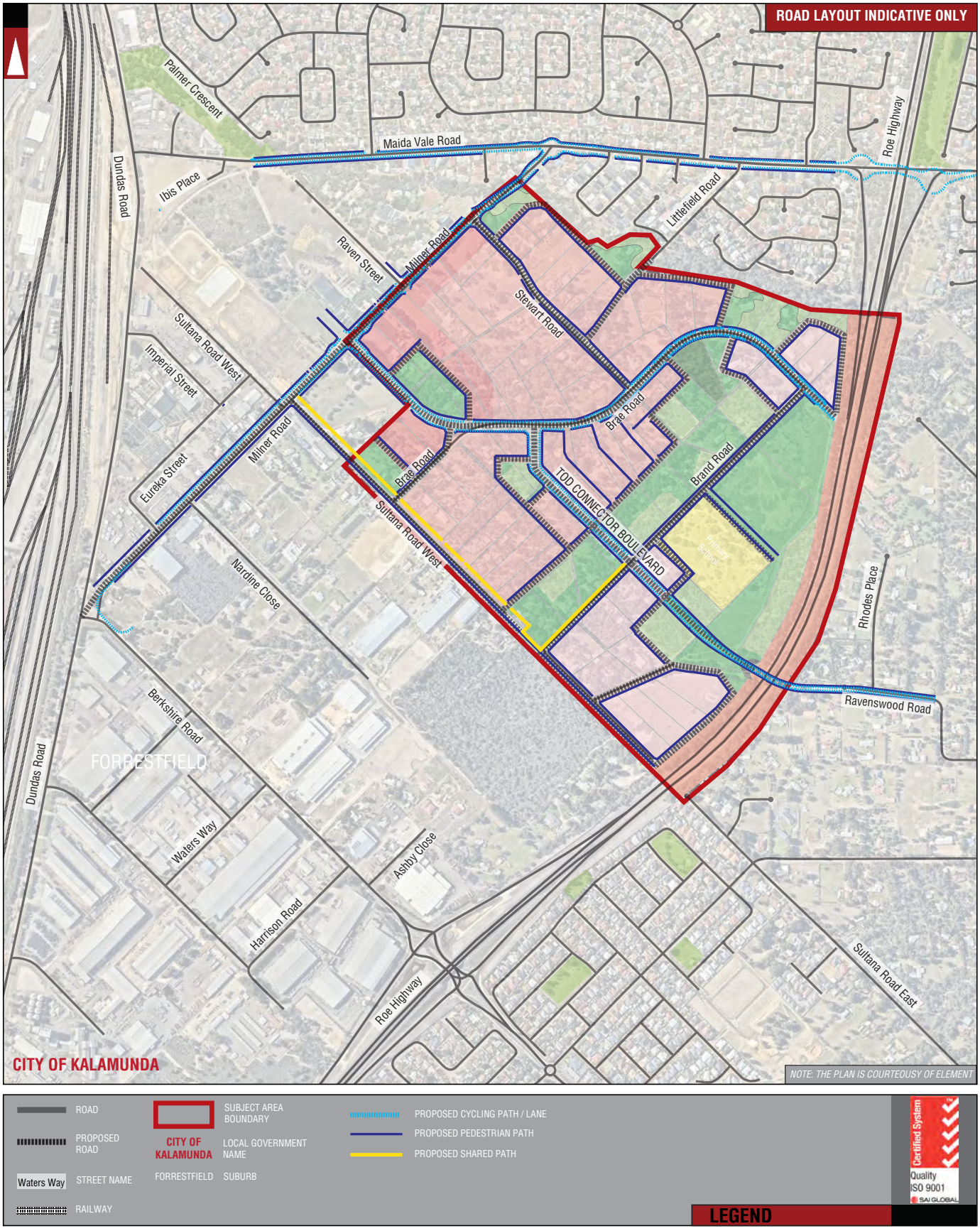


Figure 40. Proposed Pedestrian and Cyclist Paths (Source: KCTT)

Alternatively, a pool of smaller vehicles can be considered as it can be stored and operated locally (either as a part of a community service or as a part of the railway station complex).

The public transport plan for the LSP area and immediate surrounds is provided at Figure 41.

Refer to Figure 41 – Public Transport Plan

2.7.7.6 Parking

Forrestield Train Station

A Public Transport Authority Park and Ride facility will be provided at the Forrestfield train station, with final parking bay numbers and location of the facility to be determined through detailed planning and design.

This is in line with the general vision for the station which is meant to serve as an alternative transport option and promote the reduction of car usage and dependence.

Residential

The predominant use of the precinct is residential, and therefore it is expected that most residences will provide parking on the premises in accordance with the R-Codes or the WAPC's Apartment Design Policy. It is considered likely that every house will have their own garage, providing parking for the owner in the garage and visitors in front of the garage. Apartment dwellings will have to provide parking garages with the number of parking bays in accordance with the R-Codes or the WAPC's Apartment Design Policy depending on the location.

In accordance with LPS3 the approximate number of parking bays required for the Primary School is 108. This should be reassessed once more detail is known, and individual DAs are submitted.

Some provisional rates have been provided for the District Open Space (Sporting Precinct), however this development should be assessed on its own merits once the final composition and staging of the sporting fields and associated facilities is known. On street parking should be considered particularly in the area surrounding the District Open Space (Sporting Precinct) and other recreational areas.

The Community Infrastructure Strategy (CIS) prepared for the Forrestfield North Project Area outlines the proposed approach to deliver community infrastructure to cater for future residents in further detail.

Refer to CIS provided at Technical Appendix E.

2.7.7.7 Parking/Charging Stations for Electric Vehicles

Parking / charging points for electrical vehicles should be provided at a minimum rate of 1 in 20 standard parking bays, and preferably 1 in 10 standard parking bays.

The use of electric vehicles is on the rise and given the reduction in pollution they provide the use should be further encouraged. While in individual dwellings, private owners / developers can choose to implement charging points for electrical vehicles, in multiple dwelling complexes and non-residential buildings it is important to provide charging points so that the residents have an option for using electrical vehicles.

The mandatory rate should be reviewed and revised every 5 years given rapid technology advancements.

These requirements will be reflected in the Forrestfield North Residential Precinct Private Realm Design Guidelines.

2.7.7.8 Delivery and Service Vehicles

It is expected that delivery and service vehicles (such as waste removal vehicles) servicing the residential area will not require designated parking spaces given that they can operate safely within the road reserve.

Service and delivery vehicles for the primary school and District Open Space (Sporting Precinct) will require appropriate parking allocated on site. The crossovers should be designed to accommodate movement of service vehicles as a minimum.

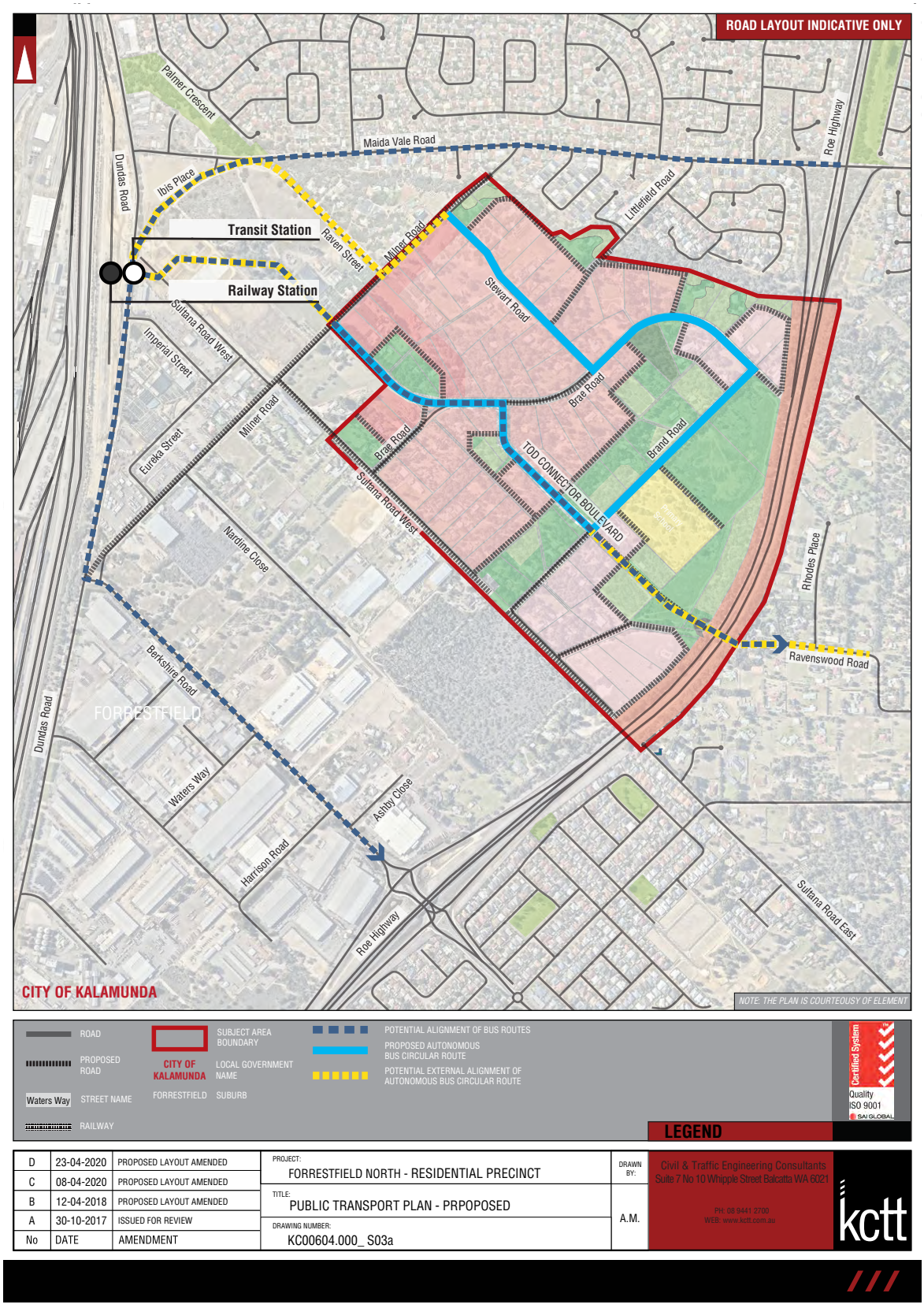


Figure 41. Public Transport Plan - Station and associated facilities are now under construction (Source: KCTT)

2.7.8 Water Management

The LWMS for the Residential Precinct and has been developed to inform and support the lodgement of the LSP. The principal objective of this LWMS is to achieve better urban water management outcomes by guiding development within the precinct which incorporates and manages the total water cycle in a sustainable manner and meets objectives for water sensitive urban design. This includes consideration of:

- water conservation and efficiency (water use)
- water quantity management (groundwater levels and surface water flows)
- water quality management (groundwater and surface water quality).

Potential water sustainability measures have been assessed against the sustainability principles outlined in SPP 2.9. This requires that an integrated approach is needed to address these issues and achieve sustainable outcomes and an acceptable 'prioritisation and balance' between competing interests (WAPC 2004) with consideration of the DWMS prepared for the Forrestfield North Area (Strategen JBS&G 2014). This requires that sustainability is pursued through integration of:

- environmental protection (including protection of water resources)
- social advancement
- economic prosperity (WAPC 2004).

Table 10 below summarises how the water management principles and objectives for the Residential Precinct will be met:

Table 10 - Compliance with Water Management Principles and Objectives

Category	Principles	Objectives	Methods for achievement
Water use	• consider all potential water sources in water supply planning • integration of water and land use planning • sustainable and equitable use of all water sources having consideration for the needs of all users, including community, industry and the environment.	• minimise the use of potable water where drinking water quality is not essential • achieve a significant reduction in water use below the 100 kL/person/year State Water Plan target.	• potable water use estimated at 66 kL/day through mandating water efficient fittings and appliances and reduced garden areas • irrigation volumes for POS and schools will be kept within the current City of Kalamunda licenced allocation volume • POS design will maximise retention of native bushland, include extensive rehabilitation and minimise the use of turf in POS where not required • trials of soil amendments and/or irrigation measures to reduce turf water and fertiliser use will be undertaken in the first two POS areas containing turf and result used to inform POS design.
Groundwater and surface water quantity	• to retain natural drainage systems and protect ecosystem health • to protect from flooding and water-logging • to implement economically viable stormwater systems • post development annual discharge volume and peak flow rates to remain at pre-development levels or defined environmental water requirements.	• where there are identified impacts on significant ecosystems, maintain or restore desirable environmental flows and/or hydrological cycles • for flood management, manage up to the • 1 in 100-year ARI event within the development area to pre-development flows and the requirements of Water Corporation (Water Corporation 2010).	• control of groundwater levels on the site is not proposed and thus impacts on groundwater regimes will be limited • maintain pre-development flows off the site through detention and retention on site, while minimising land take for drainage to improve public amenity.
Groundwater and surface water quality	• to maintain or improve groundwater and surface water quality • where waterways/open drains intersect the water table, minimise the discharge of pollutants from groundwater • where development is associated with an ecosystem dependent upon a particular hydrologic regime, minimise discharge or pollutants to shallow groundwater and receiving waterways and maintain water quality in the specified environment.	• maintain surface water and groundwater quality • ensure that the 1 in 1 year, 1 hour event (16 mm) receives treatment prior to discharge to a receiving environment.	• use of extensive raingarden network, including roadside raingardens to retain and treat the 1-year, 1-hour event through use of raingardens and tree pits • minimisation of turf areas and POS fertiliser use to reduce nutrient discharge to the environment • investigation and redevelopment of Brand Road landfill to manage and mitigate potential impacts to groundwater.

Climate

The Residential Precinct area exhibits a Mediterranean climate, characterised by hot dry summers and mild wet winters, similar to that of other coastal areas in the Perth Metropolitan region.

The closest Bureau of Meteorology (BoM) monitoring station to the Residential Precinct is situated at Perth Airport, approximately 4 kilometres away (BoM 2015). Temperature and rainfall data from this station are summarised in Table 2 in the LWMS EAMS (refer to Table 2 of LWMS provided at Technical Appendix D) .

Summer months extend from October to April, with maximum daily temperatures of between 22 and 32°C. The winter months extend from May to September, with mean minimum temperatures of approximately 18°C.

Rainfall at Perth Airport mainly occurs during winter with a mean monthly rainfall of 155.9 mm in June and 10 mm in January. The mean annual rainfall for the area is 766.1 mm.

2.7.8.1 Groundwater

Groundwater monitoring has been carried out across the LSP area. From these studies, maximum ground water, ground water quality and groundwater availability have all been determined.

Refer to LWMS provided at Technical Appendix D for additional information and analysis.

2.7.8.2 Surface Water

Surface water monitoring has been carried out across the LSP area. Particular sites such as Poison Gully were identified for further investigation and management. The importance of the Airport South catchment and the dependence of surrounding wetlands were also identified in these studies.

Refer to LWMS provided at Technical Appendix D for additional information and analysis.

2.7.8.3 Surface Water Management Strategy

The stormwater drainage system has been designed using a major/minor approach. The major drainage system includes the use of roads, detention storages and open spaces to provide safe passage of stormwater runoff from major storm events greater than 18% AEP and up to the 1% AEP. The minor system will focus on treatment of the 63% AEP, 1 hour event and involves the use of raingardens within road reserves and areas of POS identified for drainage purposes, outside of the areas of POS identified for Environmental Conservation purposes.

Minor drainage system

The minor drainage system is defined as the series of raingardens, kerbs (flush or no kerb), pipes and gutters designed to convey runoff generated by minor storms up to and including the 1 hour duration, 63% AEP storm event. The minor drainage system incorporates best management practice (BMP) water quality structural controls such as vegetated raingardens that provide water quality treatment in the RP area. Proposed locations of storages for the 63% AEP event are shown in the LWMS provided at Technical Appendix D. Storage details are presented in Table 9 in the LWMS provided at Technical Appendix D.

Key points of the minor drainage system strategy are as follows:

1. Treatment of stormwater from roads in vegetated storages within detention storages sized to treat the first 16 mm of rainfall from the roads. Storages will be located in car parks, streets and POS. This is approximately the 1 hour duration, 63% AEP storm event, which comprises 99% of the total annual runoff volume (DoW 2011).
2. Lots and laneways will be required to retain the first 16 mm, approximately equivalent to the 1 hour duration, 63% AEP storm event at source using methods as described in Section 5.1.3.

3. The following major streets have been designed to include roadside raingardens, with additional raingarden volume provided in drainage storage areas (DSAs), areas of public open space identified for drainage purposes:
    - New Main Connecting Road
    - Milner Road
    - Stewart Road
    - Brae Road
    - Brand Road
    - Sultana Road West.

    The use of raingardens/swales and tree pits on all roads to manage stormwater will be required for minor roads adjacent to the Poison Gully POS and encouraged for all other roads. Finalised raingarden designs and locations will be presented in the Urban Water Management Plans. Minimum design guidelines for raingardens are presented in Section 5.3 of the LWMS provided at Technical Appendix D.

    Opportunities for overland flow paths will be considered at a subdivision stage where these are consistent with structure plan requirements (e.g. Bush Forever, land ownership).
4. Kerb breaks and flush kerbing to be utilised around POS and raingardens to encourage overland flow.
5.. An outlet pipe of 600mm diameter is required from the corner of Sultana and Milner Rd (AS1) through to the basin at the corner of Milner and Berkshire Roads. This pipe is required along Sultana Rd, Milner Rd and across Dundas Rd to the existing outlet channel.

Major Drainage System

The major drainage system has been designed to maintain the pre-development flow off the site in events up to the 1% AEP, 48-hour event as requested by Water Corporation (Kanagaratnam K, 2017, pers. comm. 12 December). In most catchments, the critical storm duration is the 6-hour event and larger storages are required for this event.

Key points of the major drainage system strategy are as follows:

1. Minor roads will be graded to direct flow overland to the lowest point in each catchment. The ultimate road low point will be adjacent to POS, with overflow flood storage provided within the drainage storage area, an area of POS being prioritised for drainage, rather than conservation or recreation, purposes. The POS design will aim to create flood storage in an informal manner, minimising formal drainage storage areas. Major event storages are anticipated to be turfed to form useable POS areas.
2. To maximise POS amenity and minimise the impact of inundation on POS areas, a mixture of below and above ground storage is proposed.
3. All lot finished levels will have a minimum 0.3 m clearance above the estimated 1% AEP flood level in the road and POS.
4. All lot finished levels will have a minimum 0.5 m clearance above the estimated 1% AEP flood level of the detention storages and Poison Gully.
5. Overland flow pathways are proposed to Poison Gully in consultation with appropriate stakeholders, including Aboriginal communities.
6. Top water levels in a major event will be no greater than 1.2 m for safety and amenity reasons. Major event basins have been designed with a batter of 1 in 8.
7. The Storage layout and locations shown are conceptual and will be reviewed at the UWMP stage based on the detailed earthworks and civil designs.
8. To prevent building and critical infrastructure, commercial and industrial building habitable floor levels with the following minimum clearances above the 1% annual exceedance probability (AEP) flood level:
    - road drainage systems: 0.3 m
    - terminal retention or detention areas with no overflow relief: 0.5 m
    - major drainage system and waterways: 0.5 m.These clearances will be demonstrated through detailed design at the UWMP stage.

Details of storages are presented in Figure 12, Figure 13, Table 10 and Table 11 of the LWMS provided at Technical Appendix D. Figure 14 of the LWMS provided at Technical Appendix D provides a conceptual cross section of the proposed major event storage.

Refer to 1% AEP Stormwater Plan at Appendix 4 and Table 9 of LWMS provided at Technical Appendix D for detention storage volumes.

Lot scale water management

Lots (including strata developments) and laneways will be required to retain and infiltrate the first 26 mm of rainfall within the lot or strata development (equivalent to the 1 hour, 5-year ARI event) prior to the water entering the road drainage system.

Lot scale water management systems should aim to include a treatment element in the form of a lot scale bioretention system, biofiltration tree pits or a planted roof garden to clean stormwater prior to infiltration. The use of pervious pavements for outdoor spaces and driveways is encouraged to reduce stormwater volumes, consistent with *Decision Process for Stormwater Management in Western Australia*, November 2017. Water may be infiltrated through soakwells and subsurface soakage tanks and cells if required. Pervious pavements may also be used for driveways and outdoor paving to reduce the amount of runoff produced on the lot.

Pervious pavement

Pervious pavement (otherwise known as permeable and porous pavement) is a load bearing pavement structure that is permeable to water.

Pervious pavements fall into two broad categories:

1. Permeable pavements, which comprise a layer of paving blocks typically impervious, specially shaped to allow the ingress of water by way of vertical 'slots' or gravel-filled 'tubes'. There are generally large gaps between impervious paved areas for infiltration.
2. Porous pavements, which comprise a layer of highly porous material (DPLG 2010).

Pervious pavements can potentially be used in:

- private paved areas such as courtyards
- areas with low traffic volumes and light traffic weight (e.g. laneways, driveways)
- car parks
- pedestrian pavements
- POS (DPLG 2010).

Pervious pavements can have advantages compared to traditional pavements because of:

- increased infiltration of stormwater and reduced runoff
- reductions in sediment and nutrient loads (DPLG 2010).

Pervious pavements can be cooler than other pavements when wet due to evaporation but offer little or no benefit when dry (USEPA 2008). Pervious pavements are unlikely to reduce the urban heat island effect in the dry summer months when this effect is most needed.

The disadvantages of pervious pavements are:

- pervious pavements can become clogged with oil and sediment over time
- to remove or prevent clogging, maintenance is required in terms of:
    - high pressure hosing, sweeping or vacuuming to remove sediments and maintain infiltration rates
    - periodic replacement of aggregate layers (approximately every 20 years) and replacement of geotextile fabric
    - maintenance of surface vegetation (if present, permeable pavements only).

Such maintenance is higher and potentially more costly than that which is required for a conventional pavement. For these reasons, pervious pavements are not commonly installed in Western Australia.

The largest areas for potential use of pervious pavements in the Residential Precinct are laneways, and car parks associated with the District Open Space (Sporting Precinct) and the Primary School. Laneways and car parks constructed by the City such as at the District Open Space, offer an opportunity to trial the use of permeable pavement in the Residential Precinct.

2.7.8.4 Flows From Outside of the Precinct

Maida Vale

The Airport South catchment includes approximately 114 ha of land to the west of Roe Highway in Maida Vale which drains into a basin on the site via a Main Roads culvert, referred to as MV1 and MV2 (refer to 1% AEP Stormwater Plan at Appendix 4). Prior to development, any water not infiltrated in MV1 and MV2 or the small basin located on the site would have run through the Nardine Catchment to the south of Sultana Road West in larger events (anticipated greater than the 63% AEP event). The development of the Forrestfield-High Wycombe Industrial Area south of Sultana Road West has removed this historic flow path. This matter was discussed with the City who advised that their preferred option to manage this was installation of an infiltration basin within the Residential Precinct to infiltrate stormwater from MV1 and MV2 until the infrastructure can be rectified (Bartlett D [City] 2017, pers. comm. 3 November).

Surface water modelling undertaken as part of this project has identified that the current storage at MV5 is not adequately sized. A total volume of 10,012m^3 of storage is required for the 100-year event compared to the 2,400m^3 currently available. With the current basin, a 1% AEP event in the MV area would result in flooding of the Residential Precinct. Storage will be retained at this location until the primary school and associated sporting facilities are constructed.

The current storage is not considered suitable for long term infiltration because of its' location. The storage is located at a topographic low point and there is no obvious location within the precinct for relocation without construction of considerable additional pipework. Relocating this basin to an area east of Roe Highway will be required.

Stormwater modelling for the Maida Vale area shall be undertaken as part of future structure planning for the Maida Vale South Area. This modelling should allow for the relocation of the basin at MV5.

Works for the Maida Vale South area and a comparable issue in East Forrestfield will be excluded from the DCS as there is no nexus with the development of the precinct.

2.7.8.5 Surface Water Quality Management

The effective implementation of the structural and non-structural controls as part of the urban development will enhance water quality from the Residential Precinct as a result of the land use change. Non-structural source controls to reduce nutrient export from the Residential Precinct will focus on reducing the need for nutrient inputs into the landscape. The following non-structural strategies are proposed:

- species will be selected for drought tolerance and low fertiliser requirements
- street sweeping.

The UWMPs will outline the schedule and cleaning requirements for street sweeping, which will be co-ordinated with the City.

Structural source controls are proposed to compliment the non-structural source controls and provide a complete treatment train for stormwater movement through the Residential Precinct. The following structural controls are considered appropriate for the Residential Precinct:

- The use of bio-retention storages and raingardens to treat road runoff in events up to and including the 63% AEP 1 hour event.
- a trashrack installed downstream of each vegetated treatment area or at the upstream end of the storage overflow to manage gross pollutants.

The minimum specifications for all bio-retention systems (raingardens and storages, including on lot bioretention systems) are presented in Table 13 of the LWMS provided at Technical Appendix D.

The bio-retention systems should be sized to function correctly with a saturated hydraulic conductivity, ksat, of 3 m/day. The Adoption Guidelines for Stormwater Biofiltration Systems (CRC for Water Sensitive Cities 2015) indicate that the desired ksat is in the range of 2.5 to 7 m/day, to fulfil the drainage requirements as well as retain sufficient moisture to support the vegetation. The CRC for Water Sensitive Cities (2015) also identifies that for vegetated systems some clogging will occur in the first few years until the vegetation is established. Once the plants are established, the roots and associated biological activity maintain the conductivity of the soil media over time.

It should be recognised that data currently guiding the design of bio-retention systems is recent and largely based on laboratory testing. The specifications provided in this document should be considered as the best available information at the time. Some flexibility in the specifications will be required as the knowledge base increases.

2.7.8.6 Ground Water Management Strategy

Groundwater Quantity management

Based on the depth to MGL within the Residential Precinct it is not anticipated that control of groundwater will be required. Should control be determined to be required at the UWMP stage, then this shall be discussed with DWER and groundwater monitoring and/or modelling undertaken if required. Any subsoil drainage modelling shall consider the potential impact of subsoil drainage on any Environmentally Sensitive Areas (ESAs) and the need for treatment to remove nutrients from mobilised groundwater.

Groundwater quality will be managed through:

- effective treatment of stormwater to reduce nutrient loads
- sustainable landscaping practice, including use of soil amendments and minimisation of fertiliser use in POS

2.7.8.7 Water Conservation and Efficiency

Potable Water Consumption

A water balance was undertaken for the Residential Precinct to estimate potable water consumption at Forrestfield North based on the Water Corporation Water Use Calculator and the Alternative Technology Association (2010) rainwater tank calculator. In summary:

1. The total water use is 518,986 kL/yr or 85.4 kL/yr without water conservation measures. Of this, 12% or 10.6 kL/person/year is groundwater for irrigation of POS. The remaining 74.8 kL/person/year is potable water use. This volume is 25% below the State Water Plan potable use target of 100 kL/person/year. This is considered a favourable outcome and reflects the comparatively high density of the development, with limited external water use.
2. Of the 74.8 kL/person/year potable use, approximately 73.5 kL/yr is for domestic use.
3. An estimated 11% of potable use is for residential irrigation (approx. 8.5 kL/person/year) compared to perhaps 40% in a lower density development. Consequently, in-house water use (e.g. showers, toilets) reductions need to be targeted to reduce water use.
4. Water efficient fixtures are generally the most cost effective way of reducing water use as there is a small upfront cost difference and there is unlikely to be a difference in maintenance costs when compared to traditional fixtures. The use of water efficient fixtures in all buildings for toilets, showers and taps could reduce potable water demand by approximately 12% to approximately 66 kL/yr.
5. Providing rainwater tanks and plumbing these in for in-house use (toilet flushing and washing machines) alone would reduce potable water demand by approximately 17% to 62.3 kL/year. It is recommended that rainwater tanks should provide a minimum of 1000 L of storage capacity connected to a minimum

roof area of 55 m^2 per dwelling. If rainwater tanks are provided, these should be plumbed in for internal use as:
    - ex-house water use is a small component of the domestic demand (11%)
    - rainwater is available over the winter months (April to October) and domestic irrigation occurs predominantly over the summer months (October to March).

On the basis of these findings:

1. It is proposed that the use of water efficient fixtures will be mandated for new developments in the Residential Precinct to minimise water use in a sustainable manner. This will include the use of water efficient fixtures to the following standards in all buildings:
    - showerheads and taps that use ≤6 L/min in kitchens, bathrooms and laundries
    - dishwashers, where installed, that use ≤14 L per use
    - toilets that use ≤4.7 L per full flush.
2. The use of rainwater tanks for in-building water use is recommended, however not mandated. Where provided, rainwater tanks shall be plumbed in for in-building water use and provide a minimum of 1000 L of storage capacity and connected to a minimum roof area of 55 m^2 per dwelling.
3. Use of water efficient residential landscaping incorporating local species is encouraged as best practice.

With these measures, it is estimated that potable water demand will be approximately 66 kL/person/year, approximately one third less than the State Water Plan target of 100 kL/person/year. This is considered to be a sustainable outcome.

Public Open Space Water Efficiency

POS design will be undertaken to ensure that sustainable outcomes which reduce water and fertiliser use, are implemented through the following principles:

- improvement of the existing soil with 50 mm of soil conditioner certified to Australian Standard (AS) 4454 mixed into the native soil or fill to a depth of 100 mm in turf and 250 mm in garden beds
- landscape plantings primarily based on native Waterwise plant species with a focus on native species
- planting design based on watering requirements to allow for hydrozoning
- garden beds to be mulched to 75 mm or in accordance with BMP requirements
- turf areas to be focussed around facilities such as play spaces and picnic facilities, to ensure turf is located where it will be best utilised
- implementation of an appropriate management and maintenance program for POS that reduces irrigation rates and fertiliser use over the long term to promote future water savings.

For all areas, efficiencies will be sought during landscaping design at the subdivision stage to target a reduction in fertiliser and irrigation water use while maintaining a high standard of POS, including:

- retaining natural bushland where feasible
- reduce irrigated areas by minimising turf through prioritising turf in active areas
- utilise low water use vegetation and hard surfaces where feasible to reduce irrigation demand
- utilise efficient irrigation systems to reduce water use
- utilising establishment only irrigation for streetscapes and landscaping when feasible.

Water And Fertiliser Use Reduction Trials

The first two areas of POS that contain turf to be developed will be used as trial areas for soil improvements or irrigation systems that can significantly reduce irrigation water use without affecting the quality of turf and thus provide a more sustainable POS outcome without impacting upon amenity.

The sandy soils, such are present in the surface of the Residential Precinct, have poor water retention and high infiltration rates. Loam and sandy loam textured soils are

more suitable for turf growth because these contain a higher portion of clays, silts and organic matter that retain soil water and nutrients much more efficiently than sand. Soil amendments that add silt and clay to soil, such as Eclipse Aquamor Soil Improver and Soil Solver can be mixed into sands to achieve a sandy loam or loam soil classification. Other options for trials may include subsoil irrigation systems which reduce irrigation losses through evaporation, but these are less likely to reduce fertiliser use than soil amendments.

As technologies will develop over time, the methods to be trialled in each POS will be identified by the City at the time of subdivision, identifying the preferred methods. The trial construction, monitoring and reporting methods will be developed at the UWMP stage through consultation between the City and the developer. Findings of these studies will inform the future stages of POS development within the precinct.

Water Use Requirements

Water for the POS will be sourced from the existing City groundwater allocation.

POS irrigation water use has been based on the following assumptions:

- permanent irrigation of turf with an irrigation rate of 7,500 kL/ha/yr
- establishment irrigation of planted areas (POS and landscaped verges) at a rate of 7,500 kL/ha/yr for two years.

The projected long-term irrigation demand is 55,125 kL/yr excluding the school. With allowance of 15,000 kL/yr for the school, this brings the total volume to 70,125 kL/yr. This volume is within the 100,000 kL/yr allocated by City of Kalamunda from their existing superficial irrigation allocation (Section 3.5.4). The temporary establishment irrigation rate will vary depending on the development cycle, but an estimated total of 310,000 kL will be required for all establishment irrigation (based on a two-year establishment period). Estimated water use volumes for each POS and the street plantings are provided in Appendix 6 of the LWMS proved at Technical Appendix D.

Projected irrigation volumes include allowances for irrigation of the school and community purpose sites. The school volume will be provided by the City of Kalamunda to Department of Education on construction of the school site.

The landscaping concept plan prepared by Place Laboratory supports the approach to water management and includes indicative information in respect of areas of turf, manicured planning and street swales and rain gardens.

Refer to Landscaping Concept Plan at Appendix 3.

2.7.8.8 Implementation

Responsibility for the development of infrastructure in the Residential Precinct will be identified through a separately prepared Development Contribution Plan (DCP). The DCP will clearly articulate what infrastructure will be provided by the City with non-DCP subdivisional infrastructure being provided by individual developers.

2.7.8.9 Urban Water Management Plans

Processes defined in Better Urban Water Management (WAPC, 2008) require an UWMP at subdivision stage. With an approved LWMS, a UWMP is required to be prepared by the developer or proponent:

- as a condition of subdivision
- for any strata development or a development application for a site greater than 2,000$m^{2.}$

Further work that is identified for inclusion in the UWMP:

- results of geotechnical investigations, including measurement of hydraulic conductivity at locations where underground storages and roadside raingardens are proposed as part of the subdivision infrastructure
- present design of treatment structures, including tree pits, biofilters, median vegetated swales and vegetated swales at public car parks, streets and public open spaces

- present design stormwater management systems that provide serviceability, amenity and road safety during minor rainfall events
- consideration of art within stormwater management structures
- refinement of the final configuration (storage side slopes, type and invert level of underground storages etc) and exact location of the flood detention storage areas dependent on final earthworks, drainage and road design levels for the RP area
- construction details inverts and diameters of stormwater pipes
- confirmation of groundwater design levels
- confirmation of subsoil location and levels (if any)
- confirmation of finished levels and demonstration of adequate clearance to the 1% AEP flood levels to residential, commercial and industrial building habitable floor levels
- landscaping design and POS water use
- Foreshore Management Plan where the development includes open space adjacent to Poison Gully.

2.7.8.10 Construction Management

Dewatering

Dewatering may be required for some elements of subdivision construction, including servicing infrastructure. Given the depth of construction, dewatering is anticipated to occur in the Superficial Aquifer only.

Prior to the commencement of any dewatering, the developer must will apply for and obtain a "Licence to Take Water" from DWER. All dewatering should be carried out in accordance with the conditions of this licence. Where possible, construction should be timed to minimise impacts on groundwater and any dewatering requirement.

Dewatering will be managed through re-infiltration on site where feasible.

Acid sulphate soils and contaminated sites

Management of ASS and contaminated sites will be addressed as a separate process to the urban water management document approvals process.

ASS and potentially contaminated sites will be investigated and managed in accordance with the applicable DWER guidance and requirements of dewatering licences as they arise. Investigations and mapping indicate a low risk of ASS within the precinct.

Stormwater outlets to Poison Gully

The proposed construction of stormwater outlets to Poison Gully within the walls of existing culvert and bridge structures will minimise the potential impacts of works to Poison Gully. Depending on construction design and methods, a Bed and Banks Permit may be required from DWER for installation of new stormwater outlets. All such outlets will be installed by the City, who will seek advice from DWER on this matter prior to construction of any new outlets.

2.7.8.11 Stormwater System Operation and Maintenance

The operation and maintenance of stormwater infrastructure will be the responsibility of the City.

The operation and maintenance of subdivisional stormwater infrastructure installed in roads will initially be the responsibility of the developer, ultimately reverting to the local authority, the City.

The drainage system will require regular maintenance to ensure its efficient operation. It is considered the following operating and maintenance practices will be required periodically:

- removal of debris to prevent blockages
- street sweeping to reduce particulate build up on road surfaces and gutters.
- maintenance of vegetation in bio-retention systems/ storages
- cleaning of sediment build-up and litter layer on the bottom of storages
- undertake education campaigns regarding source control practices to minimise pollution runoff into stormwater drainage system
- checking and maintenance of subsoil drainage function.

2.7.8.12 Monitoring and Contingency Planning

The monitoring will focus on comparing post- development conditions to baseline conditions, as well as monitoring the BMPS to assess their effectiveness and that these structures are fulfilling their function. Prior to handover to the City, any BMPS constructed by developers must be assessed to confirm that these are in satisfactory condition and functioning appropriately.

Further information, criteria and scheduling in relation to monitoring is available in the LWMS provided at Technical Appendix D.

Post-Development Monitoring

Post development monitoring will be undertaken by the City on the basis of the monitoring schedule outlined in Table 14 of the LWMS (refer to LWMS provided at Technical Appendix D) at monitoring bores to be installed during POS construction. Water quality assessment criteria and contingency actions will be undertaken as outlined in Table 17 of the LWMS. Monitoring will be undertaken at the time of construction of the BMPS by the developer associated with the construction of each BMPS.

2.7.8.13 Responsibilities and Funding

Initially identified responsibilities for funding, construction and maintenance are presented in Table 11.

Table 11 – LWMS Table of Responsibilities

Management Issue	Responsibility and funding	
	Developer	The City
Non-Subdivision Infrastructure		
Construction and management of irrigation system		✓
Construction of planted raingardens, street drainage and detention storages		✓
Detention storages and planted raingardens		✓
Management of stormwater storage landscaping		✓
Post-development monitoring • Monitoring over a two year period, commencing immediately after the Practical Completion of the storage		✓
Street sweeping		✓

Management Issue	Responsibility and funding	
	Developer	The City
Installation of low water use fixtures and fittings		
• selection of fittings	✓	
• demonstration of compliance	✓	
review of compliance (as required).		✓
POS water and fertiliser use reduction trials (first two POS areas developed that contain turf)		✓
• selection of methods to be trialled		✓
• trial design and materials funding (in consultation with developer)		✓
		✓
• POS construction implementing trial methods		✓
• trial monitoring (two years) and reporting		
• implementation of findings (as required).		
Pervious paving trial by the City at the District Open Space for use in car parks and/or low traffic areas		
• selection of methods to be trialled		✓
• trial design and materials funding (in consultation with developer)		✓
		✓
• POS construction implementing trial methods		✓
• trial monitoring (two years) and reporting		✓
• implementation of findings (as required).		
Subdivision infrastructure		
Construction of planted raingardens, street drainage and any detention storages	✓	
Street drainage maintenance		
• between successful Practical Completion Inspection and written confirmation of the City acceptance (12 month defects liability period)	✓	
• after the City's acceptance.		✓
Detention storages and planted raingardens		
• between successful Practical Completion Inspection and written confirmation of the City's acceptance (12 month defects liability period)	✓	
• after the City's acceptance		✓
Street sweeping		
• up to the successful Practical completion of civil works	✓	
• after City's acceptance.		✓
Installation of low water use fixtures and fittings		
• selection of fittings	✓	
• demonstration of compliance	✓	
• review of compliance (as required).		✓

2.7.9 Noise and Vibration

A detailed Transportation Noise Assessment has been prepared for the Forrestfield North project area by Lloyd George Acoustics (LGA) using an indicative building heights plan prepared for the locality. It should be noted that assumed building heights, in particular those for the TOD and Activity Centre Precincts, are indicative only and prepared for modelling purposes. Noise assessments will be implemented at development and subdivision states in order to recognise noise impacts from the new Forrestfield Station.

Refer to Transportation Noise Assessment provided at Technical Appendix C.

2.7.9.1 Transportation Noise Impacts

The Transportation Noise Assessment details the potential noise impacts to the LSP area. Sources of potential noise impacts are:

- Aircraft: Perth Airport – Future parallel runway to the west;
- Freight and Passenger Rail: Railway – Immediately west of the site, east of the new runway;
- Road Traffic: Roe Highway – Immediately east of the site as well as other secondary roads.

Other noise sources may also be generated as a result of the LSP such as noise sensitive uses near light industry and the activity centre.

2.7.9.2 Aircraft Noise Assessment

With regards to aircraft noise, no parts of the proposed LSP result in development occurring in areas defined by *'AS2021 - 2015 Acoustics – Aircraft Noise Intrusion – Building Siting and Construction'* as unacceptable.

The recommendations of this report are to provide notification on titles for any residential development where there are expected to be 5 or more aircraft events above an external level of 65 dB LAmax. Any glazing is to incorporate minimum 6mm thick glass in awning style window frame and sliding door with seals as a minimum. Developers of such sites may wish to obtain specialist advice from a suitable qualified acoustical consultant.

The aircraft affected areas of the Residential Precinct are shown on Figure 42.

Refer to Figure 42 – Forrestfield North Residential Precinct - Aircraft Affected Areas

2.7.9.3 Freight Train Noise Assessment

With regards to vibration impacts from the freight railway, the Residential Precinct is outside of the affected area.

2.7.9.4 Road Traffic Noise Assessment

With regards to road traffic noise, SPP 5.4 applies to major roads, which can simplistically be thought of as roads that carry more than 20,000 vehicles per day (vpd). For the study, consideration was given to roads that carried less than this amount for completeness, as these will generate noise and will combine with noise from the major roads. From the results of the Transport Noise Assessment it can be seen that the all of the Residential Precinct may be road traffic noise affected.

The recommendations of this report for the Residential Precinct are:

- Where residences are located in close proximity (first row) to a road carrying reasonable volumes in 2050 (Milner Road and TOD Connector), a notification on the title is required. Developers of such sites may wish to obtain specialist advice from a suitably qualified acoustical consultant.
- To simplify this assessment, Table 2 of the SPP 5.4 Guidelines have been used for Roe Highway where the following is recommended:
    - Site specific acoustic assessment for noise sensitive developments within 60 metres of the northbound carriageway;
    - Package C for noise sensitive developments within 120 metres of the northbound carriageway;

Figure 42. Aircraft Affected Areas (Source: LGA)

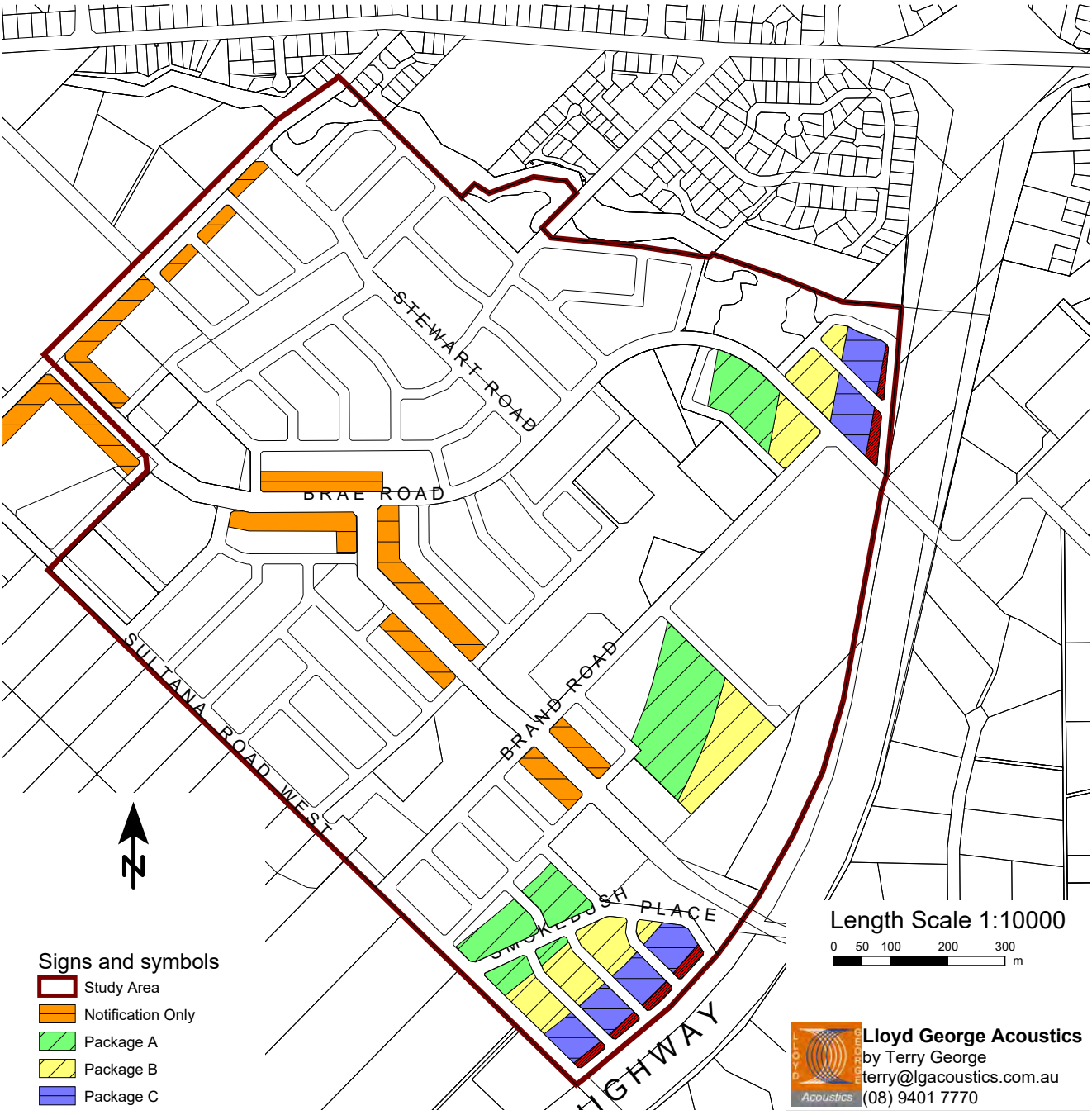


Figure 43. Road Traffic Affected Areas (Source: LGA)

- Package B for noise sensitive developments within 200 metres of the northbound carriageway;
- Package A for noise sensitive developments within 300 metres of the northbound carriageway.

- Note a noise wall will be required on the eastern boundary and this can be negotiated between the developer and Main Roads WA.

The road traffic noise affected areas are shown on Figure 43.

Refer to Figure 43 – Forrestfield North Residential Precinct – Road Traffic Affected Areas

There are proposed residences alongside Roe Highway, where the predicted noise levels are above 65 dB LAeq(Day). In these cases, a noise wall is to also be provided, the details of which would be determined at a later stage as the subdivision design progresses. However, for information purposes, the benefit of a four-metre high wall is shown in Figure 5-3 of the Transportation Noise Assessment provided at Technical Appendix C. It should be noted that the noise wall has been shown to continue the full length of the eastern noise sensitive boundary, providing protection to the playing fields area, however this requirement may be negotiable with WAPC and Department of Education. It is further noted that the site specific assessments can also be undertaken to deviate from the Package A, B & C of the Guidelines.

2.7.9.5 Other Noise Sources

In addition to the specific studies, it is further recommended that the first row of residential development incorporate notifications on title, warning of the potential for higher than normal noise levels, opposite the following locations:

- Land adjacent the light industrial area located on the south-western side of Sultana Road West; and
- Primary School and District Open Space (Sporting Precinct).

2.7.9.6 Noise and Vibration Conclusion

The Transportation Noise Assessment considers various noise sources that may affect the Residential Precinct of Forrestfield North for the purposes of the LSP. On the basis of the information available at this stage, Figures 42 and 43 show the affected areas that will require notifications on title and/or architectural treatment upgrades as per Appendix A of the Transportation Noise Assessment provided at Technical Appendix C.

It will be a requirement that as subdivision design progresses, including final layouts and finished lot levels, a more detailed assessment will be necessary to ensure compliance with the relevant policies and criteria and to determine appropriate levels of noise mitigation (noise walls, façade packages etc.).

2.7.10 Infrastructure Coordination and Servicing

2.7.10.1 Overview

The LSP has been carefully developed to promote equity between as many landowners as possible for the simple development of landholdings in accordance with the intent of the LSP. The Infrastructure Servicing Report (ISR) provide at Technical Appendix G. focuses on a wide range of infrastructure development strategies inclusive of:

- major road network upgrade requirements including upgrades to: -
  - Berkshire Road (upgrade to 4-lanes);
  - Milner Road (upgrade to 4 lanes, south of Sultana Road West);
  - Milner Road (upgrade to 2 lane divided carriageway between Sultana Road West and Maida Vale Road with parking and widened pedestrian environments plus cycling facilities);
  - Sultana Road West (improved industrial access road);
  - Maida Vale Road (upgrade to 4-lanes east of Milner Road);
  - Maida Vale Road (upgrade to 2 lane divided carriageway west of Milner Road);

    - Provision of new TOD Connector linking the Forrestfield North Railway Station, through the Residential Precinct to the Maida Vale South LSP Area.
- key intersection upgrades at the intersection of:
    - Berkshire Road / Dundas Road / Milner Road (dual lane roundabout);
    - Milner Road / Sultana Road West;
    - Milner Road / TOD Connector (new intersection)
- conceptual bridge and interchange upgrades at the Roe Highway / Maida Vale Road interchange. These existing t-intersections have been upgraded to roundabout intersections in accordance with current MRWA requirements.
- conceptual bridge design and incorporation of future widening requirements of Roe Highway to 4 lanes in each direction for the TOD Connector (connecting the future Maida Vale South LSP with the LSP area);
- infrastructure for alternative transportation modes, inclusive of public transport, consideration of future transport modes in design, pedestrian and cyclist requirements;
- provision of on-street car-parking on all major internal roads suitable for a high-density development for interim transportation modal choice requirements in Perth, but allowing for future modal shifts;
- incorporation of streetscaping, place-making and urban design requirements in the public realm as part of the overall infrastructure planning and civil concept designs;
- upgrade requirements to existing wastewater infrastructure to cater for the full development of Forrestfield North and Maida Vale South Structure Plan areas, to allow for development across the Residential Precinct;
- upgrade requirements for the reticulation of potable water;
- development of stormwater drainage strategies and the incorporation of Water Sensitive Urban Design (WSUD) strategies that will make Forrestfield North a strong proponent of WSUD, including: -
    - provision of swales as per the civil concept design plans in all major road networks;
    - consideration of provision of infiltration drainage cells and storage cells in all major road networks;
    - consideration of at-source treatment at drainage pits;
    - infiltration / underground storage / WSUD measures at drainage collection points minimising the wastage of open space at ground levels in all POS / town park / environmental conservation areas.
- future potential upgrade requirements for the reticulation of power assets into the Forrestfield North area, to be determined iteratively as development proceeds;
- future potential upgrade and relocation requirements for the connection of telecommunications and broadband internet, to be determined iteratively as development process; and
- future upgrade and relocation requirements for the provision of gas services.

Refer to ISR provided at Technical Appendix G for additional information.

2.7.10.2 Road Works

Road Network

The road network has been designed to accommodate an interface between industrial land uses to the south and residential and activity centre uses north of Sultana Road West, with design to suit turning movements for RAV 4 vehicles with key upgrades in Berkshire Road, Dundas Road, Milner Road (south of Sultana Road West) and in Sultana Road West. The TOD Precinct and Activity Centre Precinct are expected to be high attractors of traffic in the short to medium term, therefore robust designs need to be accommodated for Maida Vale Road, Milner Road north of Sultana Road West and the TOD Connector.

Intersection Upgrades

There are a series of key intersections that require upgrade, including the Berkshire Road / Dundas Road / Milner Road intersection which is designed to be a reconfigured 4-lane, 4-way roundabout with capability for RAV 7 vehicles. The intersection of Milner Road and Sultana Road West is of high importance to the overall form and function of the Residential and TOD / Activity Centre Precincts because it forms the boundary between the industrial land-uses to the south and the urban land-uses to the north. This intersection is designed to accommodate left and right turn manoeuvres for RAV 4 vehicles. Additional key upgrades include the intersection of Maida Vale Road and Milner Road, which will need to be upgraded to a roundabout featuring a mixture of 2 and 4 lane approaches and the on-off ramps for Roe Highway / Maida Vale Road which will be reconfigured as roundabouts.

Bridge Structures

The Residential Precinct is reliant on some significant improvements to road connectivity. The purposes of the increased connectivity are:

- To provide opportunities for future connection between Forrestfield North and the Maida Vale South Local Structure Plan area.
- Improve connectivity for all forms of existing transportation, but to provide specific focus on pedestrian, cyclist and public transport connectivity.
- To consider future transportation requirements and to develop road reservation widths that allow for future potential transportation options such as, autonomous vehicles, electric vehicles, demand responsive transportation etc.

To increase connectivity with the future Maida Vale South Local Structure Plan, a major crossing of the Roe Highway is proposed in a location north of Sultana Road West and lining up generally with the existing Ravenswood Close road reservation on both sides of Roe Highway. A concept bridge design for this location has been developed. The bridge extends to a total of 54 metres over Roe Hwy, connecting the TOD Connector, on the Forrestfield North side, with Ravenswood Road, on the Maida Vale side. The 54-metre length of the bridge is divided into two equal 27-metre spans which are separated by concrete reinforced tapered piers. The width of the bridge is shown in the TIA provided at Technical Appendix F.

The bridge launch commences 335 metres from the west side of the bridge due to existing topography, on the TOD Connector (Forrestfield North side) and is approximately 250 metres from the eastern side of the bridge, on Ravenswood Road (Maida Vale side). This information is presented in a series of concept design drawings produced for the City.

The Tonkin / Benara bridge, currently being built as part of North Link, was used as an example for the concept design of the proposed TOD Connector Bridge Design. The Tonkin / Benara bridge consists of two very similar spans (approx. 30 metres) and adheres to the requirements and clearances of the proposed Forrestfield North bridge. The components of the proposed bridge were drawn upon from the constituents of the Tonkin / Benara bridge. For instance, unique components such as the prestressed tee-roff beams and curved alignments used in the Tonkin / Benara bridge, were utilised in conceptual design for the proposed Forrestfield North bridge.

The concept design is based on the following key parameters:

- Min depth of bridge structure = 1.7 metres
- Min clearance to existing Roe Highway carriageways = 6.5 metres

As part of the design process, an additional two lanes were added upon instruction from MRWA so that an ultimate design configuration for Roe Highway could be considered in the design.

2.7.10.3 Alternative Transportation Infrastructure

The Residential Precinct has a series of major pedestrian and cycling path networks providing full inter-connectivity within the precinct, and also with Maida Vale South, High Wycombe and the TOD and Activity Centre Precincts to the west. All roads have minimum 1.8 metre width pedestrian paths, with on-road cycling in Milner Road (north of Sultana Road West) and the TOD Connector Boulevard and shared paths on roads with higher order function.

2.7.10.4 Wastewater

Detailed discussions have been held with the WC in relation to the upgrade and extension of wastewater infrastructure to service Forrestfield North and Maida Vale South as an interim measure, while the Water Corporation completes detailed planning for the Gooseberry Hill Planning Area. The interim plan involves the extension of wastewater infrastructure along Dundas Road for the TOD and Activity Centre Precincts and along Milner Road with 3 branch systems along Sultana Road West, picking up the proposed Activity Centre and into Raven Street and Stewart Road to service the majority of the Residential Precinct. Not all properties will be able to service directly off these extensions, however the premise is that the wastewater infrastructure provided for the area will accelerate development potential across a greater number of landholdings than presently exists.

Water Corporation's preferred strategy is that all connections within the structure plan area drain to the south west in accordance with Water Corporation planning.

Water Corporation may consider alternative sewer connections to the north where an engineer can demonstrate this is possible and that the capacity is available.

The WC Planning department will determine ultimate wastewater planning based on future land development requirements primarily in Forrestfield North and Maida Vale South, with potential for expansion of the network into Maida Vale and High Wycombe. The Water Corporation have confirmed verbally that the construction of infrastructure to suit the ultimate system will not be required by developers of Forrestfield North or Maida Vale South.

As part of the conceptual design process, it is considered that a 375mm diameter pipe is required in Milner Road between Dundas Road and Sultana Road West.

2.7.10.5 Water

Water infrastructure planning has commenced and has been submitted to the WC for consideration. The development of water infrastructure is generally simpler than wastewater planning because the water network does not need to be designed to consider depth of service as it's a pressurized system. This means that development can be catered for generally anywhere within the precinct with relation to the water infrastructure network.

At this stage, the Water Corporation are completing their planning for the ultimate development scenario. Table 11 in the ISR provided at Technical Appendix G shows the existing water infrastructure in the Residential Precinct.

Refer to ISR provided at Technical Appendix G for additional information.

2.7.10.6 Power

Initial discussions have been held with UPD in relation to current Western Power policies when considering large-scale / long-timeframe developments of this nature. The development of power infrastructure to suit developments of this type is an iterative process, as additional power capacity cannot be "stored". It is understood that Western Power is currently not utilising new 1-hectare transformer / substation sites but is preferring to increase the capacity of existing major substations. Some lead-in work may be required after the first 5 to 10 years of development, but this will be contingent on the rate of development in Forrestfield North and the rate of expansion of other land-use assets connected to local substations and feeders. The key infrastructure requirement will be the undergrounding of existing HV and LV assets in roads to be widened and in road reserves to be closed. The relocation of all existing assets due to road widening / road reservation closure will be required, and will allow for the undergrounding of all HV assets at 33kV and greater.

Existing power services are generally considered to be adequate for interim development to occur in the Residential Precinct. Table 14 in the ISR provided at Technical Appendix G shows existing power assets in the Residential Precinct. All existing services will need to be undergrounded as part of all development works, with key infrastructure in Sultana Road West, Brand Road, Brae Road, Raven Street and Milner Road to be undergrounded.

Refer to ISR provided at Technical Appendix G for additional information.

2.7.10.7 Gas

Gas infrastructure is available in the LSP area for immediate development. Table 13 in the ISR provided at Technical Appendix G shows existing gas services in the Residential Precinct.

Refer to ISR provided at Technical Appendix G for additional information.

2.7.10.8 Telecommunications

Telecommunications infrastructure is available in the LSP area for immediate development. Table 15 in the ISR provided at Technical Appendix G details existing major telecommunications assets in the Residential Precinct.

Refer to ISR provided at Technical Appendix G for additional information.

2.7.10.9 Earthworks

It is proposed that existing site levels are maintained within the Residential Precinct as much as possible. This is considered to be a key sustainability initiative and will assist in the retention of remnant vegetation across the precinct. For localized cut and fill (+/- 1.0 metre) it is highly likely that existing soil will be suitable for re-use and will avoid adverse economic and environmental impacts across the area.

2.7.11 Staging

The potential staging of the future development of the Residential Precinct is complex due to the fragmented land ownership within the area. Having regard to the availability of pre-existing services to the north of the precinct from High Wycombe and prevailing residential market conditions in the immediate locality and wider Perth Metropolitan Area, it is anticipated that the area will develop initially in the western and south-western parts of the precinct.

Water Corporation's preferred strategy is that all connections within the structure plan area drain to the south west in accordance with Water Corporation planning.

Water Corporation may consider alternative sewer connections to the north where an engineer can demonstrate this is possible and that the capacity is available.

The indicative staging is shown diagrammatically in Figure 44, with a further explanation provided below:

- Stage 1A is located adjacent to the TOD Precinct in the western section of the precinct adjacent to Milner Road and encompasses Cell 06 and the Town Park. This stage will see the delivery of medium and high density residential product with high density proposed to front the Town Park and Milner Road.
- Stage 1B is located south of the TOD connector and north of Sultana Road West generally encompassing Cell 07 with a mixture of medium and high density forms of residential development.
- Stage 2A is located south of Poison Creek Gully and High Wycombe and relates to Cell 05 which is proposed to provide medium density residential. This stage also includes the Bush Forever site.
- Stage 2B will unlock land centrally located within the precinct and comprises Cell 04, adjacent local open space and environmental conservation areas and will also see the delivery of the TOD connector. Medium density residential product is proposed within this stage.
- Stage 3A relates to land along the southern edge of the precinct fronting Sultana Road (Cell 03) which is proposed to provide medium to high density residential product.
- Stage 3B is located in the north-east corner of the precinct adjacent to Roe Highway and immediately south of High Wycombe, generally encompassing Cells 01 and 02 to provide medium density forms of development.
- Stage 4 will see the delivery of the primary school, District Open Space and environmental conservation areas.
- Stage 5 includes the construction of the flyover over Roe Highway.

Probable timing of POS development and road construction is also shown relative to the staging identified above in Figure 44.

Refer to Figure 44 – Indicative Staging

2.7.12 Developer Contribution Arrangements

Requirements for and implementation of development contributions for the LSP area will be considered as part of the preparation of a separately prepared DCP for the Residential Precinct. The DCP will identify infrastructure, associated costings and apportionment arrangements for a designated DCA established under LPS3. The DCP will also need to consider resolving the complexities of how to deal with shared infrastructure being provided to support development over the three precincts identified under the DSP.

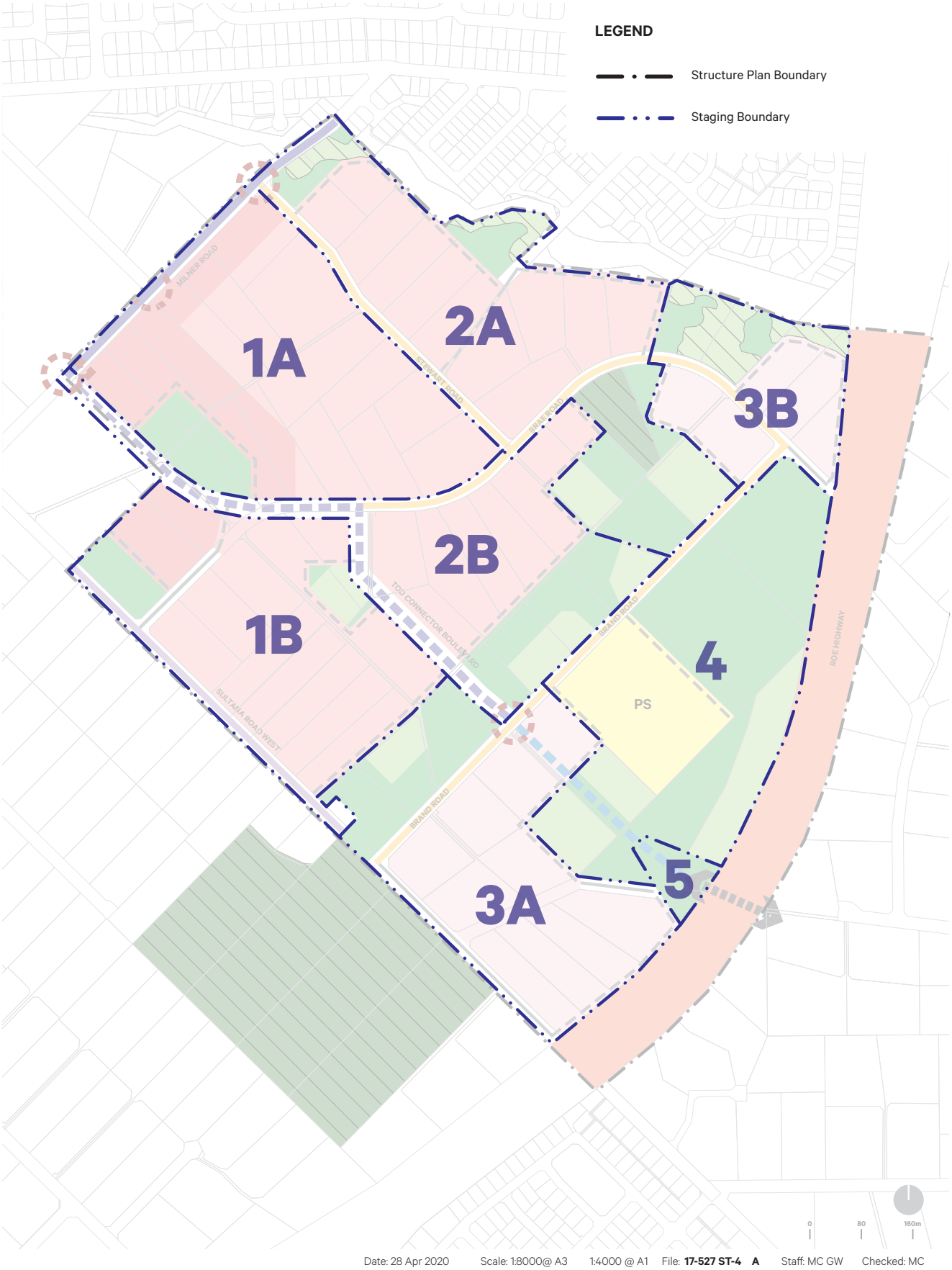


Figure 44. Indicative Staging

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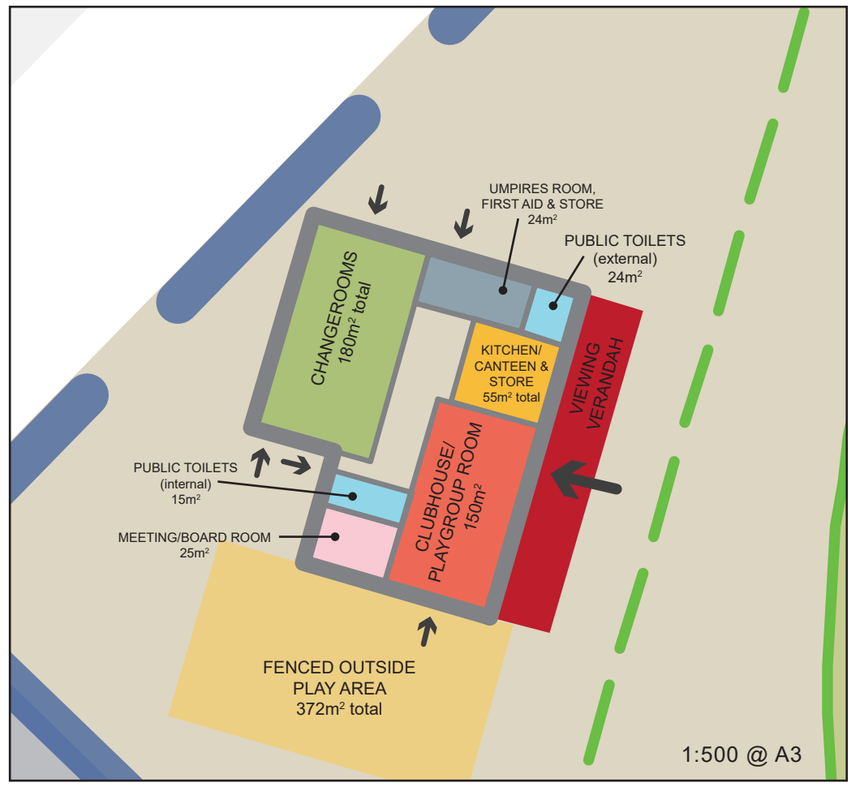
Appendix 1

District Open Space (Sporting Precinct) Preliminary Concept Plan

Amenities Block Detail



Sporting Precinct Preliminary Concept Plan

Date: 9 April 2018
Scale: 1:2,500 @ A3
Drawing No. 17-527 ST-15 A
Staff: MC_OP_BS

0 25 50m

Level 18, 191 St Georges Terrace
Perth Western Australia 6000

Telephone +61 08 9289 8300
Facsimile +61 08 9321 4786

Appendix 2

Town Park Concept Plan (Place Laboratory)

FORRESTFIELD NORTH
TOWN PARK FUNCTIONAL DIAGRAM

Date MAY 2020 REV A

Scale 1;1,000 @ A3

Client Element/City of Kalamunda

Project 1651_Forrestfield North

N

PLACE LABORATORY

Appendix 3

Landscaping Concept Plan (Place Laboratory)

Forrestfield North - Landscape Plan

Legend

- Trees (canopy coverage >70%)
- Trees (canopy coverage 30-15%)
- Street trees
- Ecological protection zone
- Manicured planting (ground covering revegetation)
- Turf
- Street swale / rain garden
- Community
- Framework streets
- Plan boundary

PLACE LABORATORY

FORRESTFIELD NORTH

© placelaboratory 2020

Client	Revision	Date
Element/City of Kalamunda	B	APRIL 2020

0 200 400

100 300 500

N

Appendix 4

1% AEP Stormwater Plan (Strategen JBS&G Environmental)

CATCHMENT AS1a

REQUIRED
1% AEP Volume: 7894m³

PROVIDE BASIN
Slope: 1:8
Base RL: 33.4m
TWL: 34.3m
TWL area: 10143m²
Volume: 7894m³
1 yr Volume (Split basin): 1050m³

CATCHMENT PG4

REQUIRED
1% AEP Volume: 1530m³

PROVIDE BASIN
Slope: 1:8
Base RL: 37.1m
TWL: 37.8m
TWL area: 3201m²
1% AEP Volume: 1530m³
1 yr Volume (Split basin): 378m³

CATCHMENT PG5

REQUIRED
1% AEP Volume: 941m³

PROVIDE BASIN
Slope: 1:8
Base RL: 39.3m
TWL: 40.0m
TWL area: 1778m²
Volume: 941m³
1 yr Volume (Split basin): 38m³

CATCHMENT PG6

REQUIRED
1% AEP Volume: 922m³

PROVIDE BASIN
Slope: 1:8
Base RL: 41.8m
TWL: 42.5m
TWL area: 1681m²
Volume: 922m³
1 yr Volume (Split basin): 162m³

CATCHMENT AS2

REQUIRED
1% AEP Volume: 1976m³

PROVIDE BASIN
Slope: 1:8
Base RL: 34.1m
TWL: 34.8m
TWL area: 3512m²
Volume: 1976m³

CATCHMENT MV5

REQUIRED
1% AEP Volume: 8895m³

PROVIDE BASIN
Slope: 1:8
Base RL: 38.8m
TWL: 40.0m
TWL area: 10016m²
Volume: 8895m³

CATCHMENT AS3

REQUIRED
1% AEP Volume: 8089m³

PROVIDE BASIN
Slope: 1:8
Base RL: 32.3m
TWL: 33.0m
TWL area: 12916m²
Volume: 8089m³
1% AEP Volume (Split basin): 1238m³

PS

Legend:

- 18% AEP (5yr ARI) (below ground) Storage tank conceptul shape stormtech MC3500 or similar
- 1% AEP (100 yr ARI) TWL conceptual shape
- Catchment boundary
- Flow direction

strategen JBS&G

Job No: 57806

Client: Element

Version: A	Date 16/04/2020
Drawn By: hsullivan	Checked By: CT

Scale 1:9,000

0 100 200
metres

Forrestfield North Residential Precinct, WA

1% AEP EVENT PLAN

File Name: W:\Projects\1)Open\Element (TPG)\57806 - FF North TOD LWMS\GIS\Maps\LWMS\57806_13_1%AEP.mxd
Image Reference: www.nearmap.com© - Imagery Date: January 2020. SLIP Public Services Locate 2020.

Appendix 5

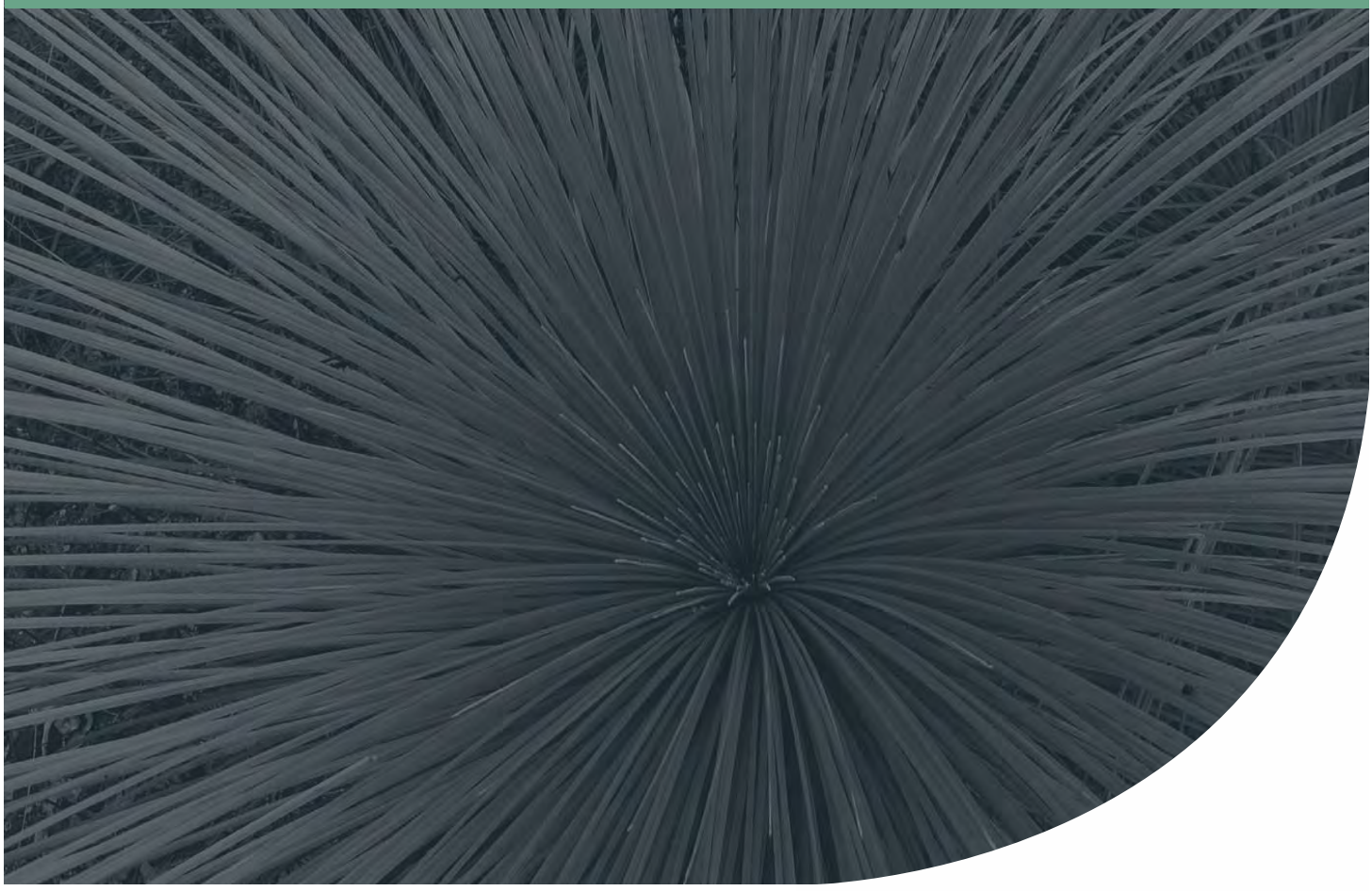
Strategic Conservation Management Plan

Forrestfield North Residential Precinct Local Structure Plan

Strategic Conservation Management Plan

Project No: EP19-071(08)

Prepared for the Department of Planning, Lands and Heritage
July 2020



Document Control

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Doc no.:	**EP19-071(08)--007**				
Version	**Date**	**Author**		**Reviewer**	
1	March 2020	Julia Morgan	JMM	Jason Hick	JDH
	Draft for client review				
A	April 2020	Julia Morgan	JMM	Jason Hick	JDH
	Revised from feedback provided by DPLH, DWER and City of Kalamunda				
B	May 2020	Julia Morgan	JMM	Jason Hick	JDH
	Finalised from feedback provided by DPLH				
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	Finalised from feedback provided by DPLH, DWER and City of Kalamunda				

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Executive Summary

The Forrestfield North Residential Precinct Local Structure Plan ('the LSP') has been prepared by the City of Kalamunda (Kal) as a response to the Forrestfield-Airport Link project (a METRONET initiative jointly funded by the Western Australian and Australian governments), and associated construction of Forrestfield train station. The LSP will guide future residential development in Forrestfield North, including the establishment of local open space, drainage reserves and environmental conservation areas.

Key biodiversity values historically identified within the LSP area include:

- *Conospermum undulatum* (Wavy-smoke bush), listed as vulnerable under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and *Biodiversity Conservation Act 2016* (BC Act).
- *Banksia Woodlands of the Swan Coastal Plain Threatened Ecological Community* (TEC), listed as endangered under the EPBC Act.
- Threatened Ecological Community Floristic Community Type 20a (TEC FCT 20a) *Bankia attenuata woodlands over species rich dense shrublands*, identified as endangered in the Western Australian Ministerially endorsed list of TECs. TECs will be afforded statutory protection within Western Australia under the BC Act when they are declared by the Minister.
- Foraging/potential breeding habitat for Carnaby's cockatoo (*Calyptorhynchus latirostris*) and forest red-tailed black cockatoo (*Calyptorhynchus banksii naso*), listed as endangered and vulnerable respectively under both the EPBC Act and BC Act.

These biodiversity values are supported by vegetation which is currently scattered in fragmented and semi-contiguous patches across the entire LSP area that ranges in terms of its intactness and condition. As the LSP extends almost entirely across private landholdings in freehold ownership, there are no existing planning or environmental controls in place or readily available to ensure the long-term preservation and appropriate management of biodiversity values. The exception being a small reserve referred to as Smokebush Place Reserve located at 39 Smokebush Place, High Wycombe (Lot 50 on D033847) which is managed by Kal.

The purpose of this Strategic Conservation Management Plan (SCMP) is to provide an overarching framework that will support the implementation of the LSP and ensure the long-term preservation of biodiversity values through:

- Specifying and guiding the required impact avoidance and conservation gain outcomes for identified biodiversity values in the LSP area.
- Providing greater certainty regarding conservation outcomes and management requirements for Kal, government departments (state and commonwealth), the local community and future developers of land within the LSP area.

<u>Strategic Mitigation Approach</u>

The LSP has applied a strategic mitigation approach based on a hierarchy of avoidance, mitigation and offsetting that seeks to reduce the likely impacts on the key biodiversity values. The following measures will be enacted by the state/local government through the implementation of the LSP:

Avoidance – the LSP designates thirteen environmental conservation areas and nine local open space (LOS) areas, spanning across the LSP area and located where there is the greatest potential to avoid impacts on key biodiversity values. The future acquisition and management of these areas is part of a broader conservation gain (see below) enacted by the state/local government.

Mitigation – in addition to avoidance of impacts, the LSP layout has sought to mitigate impacts on the retained biodiversity values through provision of a green linkage/ecological corridor, designed to incorporate areas of active parkland, conservation, significant stands of vegetation and existing Bush Forever areas. Management of this corridor by Kal will ensure that recreational uses within the LOS are complementary to the retention of identified biodiversity values, and provide buffers to the designated environmental conservation areas from the surrounding urban land uses and ensuring the long-term viability of the retained biodiversity values. The LSP also requires the preparation of construction environmental management plans (CEMPs) to support all future applications for subdivision and development of landholdings within 100 m of designated environmental conservation areas. The purpose of the CEMPs is to specify how threats and risks to biodiversity values within the environmental conservation areas will be managed both pre-construction and during construction to mitigate potential impacts.

Offsetting - taking into account the avoidance and mitigation measures proposed to be enacted by the state/local government, there will still be residual adverse impacts on key biodiversity values that will need to be addressed through the BC Act and EPBC Act in the future. Specifically, these include the potential loss of up to[1]:

- 48 individual *C. undulatum* plants (9% of known plants in the LSP area)
- 6.15 ha of vegetation potentially representative of Banksia Woodlands of the SCP TEC (40% of mapped TEC extent in the LSP area)
- 6.15 ha of vegetation potentially representative of TEC FCT 20a (40% of mapped TEC extent in the LSP area)
- 234 potential habitat trees suitable for black cockatoos (57% of identified potential habitat trees in the LSP area)
- 9.38 ha of high-quality foraging habitat suitable for black cockatoos (49% of high-quality foraging habitat mapped in the LSP area).

Based on these predicted impacts a measure of environmental counterbalance (i.e. environmental offsets) will be required. These residual impacts and where required environmental offsets will ultimately be considered as part of multiple individual/separate proponent-driven environmental approval processes, rather than as one single consolidated action. Notwithstanding this, in order to demonstrate that a balance between the competing objectives of environmental protection and urban intensification has been achieved, the WAPC and Kal have agreed to implement the following strategic conservation management approach (**Table ES1**), which ensures that there is a substantial strategic conservation gain.

[1] calculations are based on the assumption that all key biodiversity values outside of the conservation and LOS areas are likely to be lost through clearance of vegetation. This may not necessarily be the case, particularly in regards to scattered trees, some of which may be retained through future development design.

Table ES1: Forrestfield North Strategic Conservation Management Approach

Action		Description	Target Date
1	Forrestfield North Residential Precinct LSP	This SCMP forms part of the LSP which was approved by the WAPC on [to be inserted]. Under the LSP, Kal can only approve development that is for a purpose generally in accordance with the LSP. This will protect the areas identified in the LSP as Environmental Conservation and Local Open Space from urban development.	July 2020
2	Management Agreement	To ensure that the key biodiversity values are properly protected and enhanced over time, Kal will assume responsibility for ongoing management and maintenance of the Environmental Conservation and Local Open Space areas under a Management Agreement ('the Agreement') executed by Kal and WAPC on [to be inserted]. The Agreement provides for the making and execution of Management Plans referred to in Action 3 below.	July 2020
3	Management Plans	Separate Management Plans for the Environmental Conservation and Local Open Space areas will be prepared by Kal to the satisfaction of the WAPC on advice from DBCA. Actions to be addressed in the Management Plans are outlined in section 6.2.	Dec 2020
4	Metropolitan Region Scheme (MRS) Amendment	The WAPC to initiate an amendment to the MRS to reserve the Environmental Conservation areas as Park and Recreation. This provides the highest level of protection from incompatible development under the state planning system.	July 2020
5	Acquisition of Environmental Conservation Areas	Following initiation of the MRS amendment, the WAPC will progressively acquire the private land affected by the Environmental Conservation areas. Once acquired, the land will be managed and enhanced by Kal under the terms of the Management Agreement and Management Plan.	Progressively from July 2020
6	Acquisition of Local Open Space	Private properties identified as Local Open Space will be progressively acquired by Kal using revenue from the Forrestfield North Development Contribution Plan (DCP). Once acquired, the land will be managed and enhanced by Kal under the terms of the Management Agreement and Management Plan.	Progressively as funds accumulate in the DCP
7	Demolition and Enhancement	Once the affected private land is acquired, buildings and structures will be removed as required in preparation for enhancement under the relevant Management Plan.	Ongoing
8	Cell Density Plans	The LSP requires the preparation of Cell Density Plans for 10 identified development cells prior to subdivision or development. The Cell Density Plans must demonstrate, to the satisfaction of Kal on advice from DBCA, how residual biodiversity impacts have been mitigated through appropriate tree retention and/or creation of small parks or public spaces.	Prior to subdivision or development
9	Subdivision and/or development	Any applications for subdivision or development that trigger an action under the EPBC Act will be referred to the DAWE with the residual impacts to be considered individually.	Prior to subdivision or development
10	Construction Environmental Management Plans	The LSP requires all proponents of future developments located within 100m of an Environmental Conservation area to prepare a construction environmental management plan (CEMP) to ensures biodiversity values in these areas are protected. The CEMP's are to incorporate environmental elements pre-construction and during construction, including management of potential threats and risks associated with construction activities adjacent to the Environmental Conservation areas such as dieback, fauna and habitat management.	Prior to Development

Action		Description	Target Date
11	Proponent environmental offsets	As an option of last resort unlikely to be required, the securing of environmental offsets may be required. If and where required, individual proponents will address residual impacts through the provision of environmental offsets.	Prior to Development

This level of intervention is not typical and is only provided in this instance to support the delivery of a contemporary and responsible urban response to the Forrestfield-Airport Link project, a State and Commonwealth funded METRONET initiative.

It is envisaged this strategic approach will result in long-term conservation gains across the LSP area. Specifically, through the resolved tenure of the environmental conservation and LOS areas, as well as Kal assuming responsibility for long term management and maintenance of these areas. Management by Kal will not only prevent further loss of existing key biodiversity values, but ultimately enhance these biodiversity values through the implementation of a coordinated maintenance regime across a consolidated conservation area, currently absent due to these areas being in private ownership.

A formal mechanism does not exist for linking these overall conservation benefits achieved by the state/local government to future individual Commonwealth EPBC Act referrals and offset requirements within the LSP area. However, an analysis of the likely future EPBC Act offset requirements across the LSP area (utilising the EPBC offsets calculator) has indicated that theoretically a substantial portion of the potential future individual offset requirements for each MNES would be satisfied through the state/local government enacted conservation gains.

In the absence of a formal offset provision mechanism, and also given that not all impacts will need to be formally considered under either state or commonwealth legislative frameworks, it is envisaged that the committed actions under this SCMP can be presented in referrals to be informally taken into account if and when any future actions in the LSP area are referred under the EPBC Act and BC Act.

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Appendices

Appendix A

Forrestfield North Residential Precinct Structure Plan

Appendix B

Anticipated Retention of Key Biodiversity Values within Individual Lots of the LSP Area

Appendix C

Anticipated Impacts on Key Biodiversity Values within Individual Lots of the LSP Area

Abbreviation Tables

Table A1: Abbreviations – Organisations

Organisations	
Kal	City of Kalamunda
DBCA	Department of Biodiversity, Conservation and Attractions
DAWE	Commonwealth Department of Agriculture, Water and the Environment (formerly Department of the Environment and Energy)
DPLH	Department of Planning, Lands and Heritage
DWER	Department of Water and Environmental Regulation
DWER EPA Services	DWER Environmental Protection Authority Services
SPC	Statutory Planning Committee
TBB	Taylor Burrell Barnett
WAPC	Western Australian Planning Commission

Table A2: Abbreviations – General terms

General terms	
CEMP	Construction Environmental Management Plan
DCP	Development Contributions Plan
LSP	Forrestfield North Residential Precinct Local Structure Plan
FCT	Floristic Community Type
FNDSP	Forrestfield North District Structure Plan
LOS	Local Open Space
LPS	Local Planning Scheme
MNES	Matters of National Environmental Significance
MRIF	Metropolitan Region Improvement Fund
MRS	Metropolitan Region Scheme
SCMP	Strategic Conservation Management Plan
TEC	Threatened Ecological Community
TOD	Transit-Oriented Development

Table A3: Abbreviations –Legislation

Legislation	
BC Act	Biodiversity Conservation Act 2016 (WA)
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999 (Cmth)
EP Act	Environmental Protection Act 1986 (WA)
PD Act	Planning and Development Act 2005 (WA)

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1 Introduction

1.1 Background

The Forrestfield North Residential Precinct Local Structure Plan (referred to herein as 'the LSP') (**Appendix A**) has been prepared by the City of Kalamunda (Kal) as a response to the Forrestfield-Airport Link project (a METRONET initiative jointly funded by the Western Australian and Australian governments), and associated construction of the new Forrestfield train station. The LSP intends to guide the coordinated development of the Forrestfield North Residential Precinct, facilitating residential development, new road connections, a primary school site, local open space and drainage reserves, and environmental conservation areas.

Located 12 km east of the Perth central business district, the LSP covers 90 landholdings mostly in freehold ownership, as well as Bush Forever Site 45 (Poison Gully Creek). The LSP is approximately 123.05 ha in area and bounded by Sultana Road West to the south, Roe Highway to the east, Poison Gully Creek to the north and Milner Road to the west. The western boundary of the LSP abuts the Forrestfield North Transit-Oriented Development (TOD) precinct and associated new Forrestfield train station (**Figure 1**).

1.2 Key Biodiversity Values

Key biodiversity values historically identified within the LSP area include the following species and communities, listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and Western Australian *Biodiversity Conservation Act* (BC Act):

- *Conospermum undulatum* (Wavy-smoke bush), listed as vulnerable under the EPBC Act and BC Act.
- *Banksia Woodlands of the Swan Coastal Plain Threatened Ecological Community* (TEC), listed as endangered under the EPBC Act.
- Threatened Ecological Community Floristic Community Type 20a (TEC FCT 20a) *Bankia attenuata woodlands over species rich dense shrublands*, identified as endangered in the WA list of TECs. TECs will be afforded statutory protection within Western Australia under the BC Act when declared.
- Foraging/potential breeding habitat for Carnaby's cockatoo (*Calyptorhynchus latirostris*) and forest red-tailed black cockatoo (*Calyptorhynchus banksii naso*), listed as endangered and vulnerable respectively under both the EPBC Act and BC Act.

These values are supported by vegetation which is currently scattered in fragmented and semi contiguous patches across the entire LSP area that ranges in intactness and condition. Given the LSP extends almost entirely across private landholdings in freehold ownership, there are no existing planning or environmental arrangements in place to ensure the long-term preservation and management of the biodiversity values, with the exception of a small reserve referred to as Smokebush Place Reserve located at 39 Smokebush Place, High Wycombe (Lot 50 on D033847) which is managed by Kal.

1.3 Structure Plan Layout

From a planning and economic perspective, the LSP needs to facilitate a level of population density that will support the Forrestfield-Airport Link project and generally enable public transport investment and patronage outcomes. On this basis and taking into account the existing scattered and fragmented nature of the vegetation that supports key biodiversity values across the LSP area, it would be difficult to avoid all impacts to the identified biodiversity values while still facilitating the necessary public transport planning objectives.

Careful planning has been undertaken to design the LSP in a manner that seeks to avoid and reduce the likelihood of significant impacts on key biodiversity values relevant to the EPBC Act and BC Act. The proposed structure plan layout (**Appendix A**) provides for the inclusion of thirteen (13) environmental conservation areas and nine (9) local open space (LOS) areas. These proposed conservation and LOS areas have been located where there is the greatest potential to avoid impacts on important biodiversity values (**Appendix B**).

Despite the inclusion of the conservation and LOS areas in the LSP layout, the future implementation of the LSP by individual landowners is still likely to result in residual biodiversity impacts which will need to be considered and potentially addressed by induvial landowners in the future pursuant to the Commonwealth EPBC Act and State BC Act (**Appendix C**).

1.4 Purpose of the Strategic Conservation Management Plan

The purpose of this Strategic Conservation Management Plan (SCMP) is to provide an overarching framework that will support the implementation of the LSP and ensure the long-term preservation of biodiversity values through:

- Specifying and guiding the required impact avoidance and conservation gain outcomes for identified biodiversity values in the LSP area.
- Providing greater certainty regarding conservation outcomes and management requirements for Kal, government departments (state and commonwealth), the local community and future developers of land within the LSP area

A strategic conservation planning approach is considered beneficial for the LSP area as it allows for the holistic consideration of impacts to biodiversity values upfront in the LSP design and implementation, using information about likely future development to avoid and minimise impacts on threatened species and communities. Such an approach facilitates development of an enhanced network of conservation areas, delivering improved biodiversity outcomes while simultaneously creating amenity and accessible open spaces for the local community.

It is noted that this SCMP is a strategic document that provides a mechanism for coordination rather than a plan of management specifying detailed management actions. It is envisaged that such detail would be provided through additional management plans at the implementation stage, as further discussed in **Section 6**.

2 Statutory Context

2.1 Commonwealth Environmental Legislation

2.1.1 *Environment Protection and Biodiversity Conservation Act 1999*

The EPBC Act is the Commonwealth Government's principal environmental legislation and provides for the protection and management of nationally and internationally important flora, fauna, ecological communities and heritage places, defined in the EPBC Act as Matters of National Environmental Significance (MNES).

The relevant MNES to which this SCMP applies are *'nationally threatened species and ecological communities.'* Any action that is likely to have a significant impact on listed threatened species and ecological communities under the EPBC Act must be referred to the Minister and may undergo an environmental assessment and approval process.

However, in this instance the LSP has been prepared by a local government (Kal) and will ultimately be approved by the Western Australian Planning Commission (WAPC) as a planning instrument to guide future development within the LSP area. Kal and the state government do not own the land within the precinct and therefore will not be directly implementing the majority of the LSP (i.e. undertaking the future development of the privately owned lots). On this basis the LSP cannot at this time be considered as an 'action' for the purposes of the EPBC Act[2].

Nonetheless, as the LSP covers 90 landholdings in freehold ownership, it is effectively setting a planning context for a series of consequential future 'actions' as individual proponents seek to develop their properties in accordance with the LSP, once approved. Given the presence of significant biodiversity values across the LSP area, it is likely that future development of up to 44 individual lots currently in freehold ownership could have some level of impacts on MNES, with up to 21 of these having the potential to require referral of actions pursuant to the EPBC Act, although it is also possible that not all of these would be determined to be controlled actions, requiring approval (**Appendix C**). Any EPBC Act referrals would be received by the DAWE on an ad hoc basis as individual developments take place rather than through a single consolidated proposed action.

2.2 Western Australian Environmental Legislation

2.2.1 *Environmental Protection Act*

The EP Act is Western Australia's primary environmental impact assessment legislation and provides for *'the prevention, control and abatement of pollution and environmental harm, for the*

[2] An action is defined broadly in the EPBC Act and includes: a project, a development, an undertaking, an activity or a series of activities, or an alteration of any of these things. A lawful continuation of an existing use is not an action. A decision by a government body to grant an authorisation (for example, a permit or licence) or to provide funding is not an action.

Actions include, but are not limited to: construction, expansion, alteration or demolition of buildings, structures, infrastructure or facilities; storage or transport of hazardous materials; waste disposal; earthworks; impoundment, extraction and diversion of water; research activities; vegetation clearance; military exercises and use of military equipment; and sale or lease of land.

conservation, preservation, protection, enhancement and management of the environment and for matters incidental to or connected with the foregoing'.

Part IV of the EP Act provides for the consideration of planning schemes and proposals that could result in a significant adverse impact on the environment and is administered by EPA Services within the Department of Water and Environmental Regulation (DWER).

As summarised in **Table 1**, Amendment 1285-57 to the Metropolitan Region Scheme (MRS) and Amendment 75 to the City of Kalamunda Local Planning Scheme No. 3 were referred to the EPA in accordance with Section 48A of the EP Act.

Table 1: EP Act environmental assessment history

Date	Amendment details	Purpose	EPA determination
2015	MRS Amendment 1285-57	Rezoned land within the LSP from 'rural' to 'urban'	Scheme not assessed - advice given (no appeals). The EPA advice identified the following environmental factors relevant to the scheme amendment: • Flora and vegetation – specifically the Wavy-leaved smokebush (*Cononspernum undulatum*) • Terrestrial fauna – specifically roosting, foraging and potential breeding habitat for Carnaby's and forest red-tailed black cockatoos and habitat for the Quenda/Southern Brown Bandicoot. The EPA concluded the amendment could be managed to meet the EPA's environmental objectives through preparation of future local planning scheme provisions and structure plans to manage and protect key environmental values. In particular, recommending that the future local scheme text would need to contain *'specific mechanisms and provisions to adequately secure, protect and manage the significant environmental values within the amendment area.'*
2016 (approved 2018)	Kal LPS 3 Amendment 75	Rezoned the wider Forrestfield North District Structure Plan (FNDSP) land to 'urban development'. To coordinate the development of the FNDSP area, the site was divided into two Local Structure Plan precincts: • Forrestfield North TOD precinct (67.49 ha) • Forrestfield North Residential precinct (123.05 ha)	Scheme not assessed - advice given (no appeals). The EPA identified flora and vegetation and terrestrial fauna as the relevant environmental factors, adding an additional note that the amendment area contains vegetation representative of the TEC FCT 20a *Banksia attenuata woodlands over species rich dense shrublands*. To safeguard the protection and management of these significant values the EPA recommended Schedule 11 of LPS 3 be modified to require future structure planning ensures: • *The* protection *of declared rare flora, associated threatened fauna habitat and low representation vegetation complexes in appropriately sized retention areas for conservation purposes. These retention areas shall be informed by Level 2 Flora and Vegetation and Fauna Surveys in accordance with EPA Guidance Statements 51 and 56 (or as revised), and targeted Declared Rare Flora and threatened fauna and associated habitat. The retention area size, location, protection and management mechanisms shall be subject to the OEPA[3] advice prior to the WAPC endorsement of the structure plan.*

[3] It is noted that the former OEPA's roles and responsibilities are now undertaken by DWER.

Date	Amendment details	Purpose	EPA determination
			• *All future subdivision and* development *proposals must be consistent with the retention areas agreed under the above point.*

2.2.2 *Biodiversity Conservation Act 2016*

The *BC Act* and associated *Biodiversity Conservation Regulations 2018* provide protection for biodiversity in Western Australia, particularly threatened species and threatened ecological communities.

Under the BC Act, Ministerial authorisation is required for the taking of threatened flora, taking or disturbing of threatened fauna and modification of threatened ecological communities (TECs). The BC Act also has provisions for applying conditions on these authorisations that mitigate or require environmental offsets to address the net impact to the relevant species or ecological community.

As outlined in Section 2.1.1, the LSP has been prepared by a local government (Kal) as a planning instrument to guide future development by individual proponents within the LSP area. Kal and the state government do not own all the land within the precinct and therefore will not be directly implementing the majority of the LSP (i.e. undertaking the future development of the land). On this basis the LSP does not constitute an action that takes, disturbs or modifies threatened flora/fauna/TECs, but rather sets in place a planning context that facilitates future individual developments. A review of the mapped biodiversity values across the LSP indicates that there are approximately 44 lots currently in freehold ownership which may require subsequent individual Ministerial authorisation requests pursuant to the BC Act to facilitate development (**Appendix C**). These would be received by the DBCA on an ad hoc basis as individual developments take place rather than through a single consolidated action.

2.3 Structure Plan Background

The LSP was prepared by Kal, with advice provided by a Technical Advisory Group comprising key State government agencies with an interest in the progression of the LSP area.

In December 2018, following public advertising of the LSP (and receival of 40 submissions from landowners in the area and government agencies), Kal endorsed the LSP subject to modifications, and forwarded the documentation to Western Australian Planning Commission (WAPC) for assessment.

The DPLH completed its preliminary assessment of the LSP in March 2019. The WAPC then advised Kal that the local government report and LSP did not contain sufficient information for decision-making. The primary outstanding issues identified by DPLH were the mechanisms to manage and protect the regionally and potentially nationally significant vegetation, including areas with environmental values and how these areas will be acquired.

In May 2019 DPLH also received advice from DWER (EPA Services) on the LSP which led to the following deficiencies being identified by the Statutory Planning Committee (SPC) (Meeting no. 76144, 28 May 2019):

- *The proposal is inconsistent with State Planning Policy 2 (SPP 2) and State Planning Policy 2.8 (SPP 2.8) as it is unclear how vegetation with regional importance will be adequately protected and managed;*
- *The proposal is not implementable in its current form as the environmental values protected under State and Federal legislation (BC Act and EPBC Act) have not:*
  - *confirmed retention areas for conservation;*
  - *determined potential offsets required;*
  - *clarified impacts on Matters of National Environmental Significance (MNES), potential funding and management mechanisms for the purchase and maintenance of these areas into the future have not been determined.*
- *The proposal is inconsistent with the statutory provisions of the City of Kalamunda LPS 3, Schedule 11 Part (ii).*

On the basis of the perceived deficiencies identified by the SPC report, in June 2019 the DWER (EPA Services) and the DPLH engaged Emerge Associates Pty Ltd. (trading as Emerge Associates), supported by Taylor Burrell Barnett (TBB), to undertake a review and assist with considerations surrounding the unresolved environmental and planning issues of the LSP. Key tasks undertaken as part of this review included:

- *Identification of the key biodiversity values for retention based on available scientific information.*
- *Investigation into the potential urban design options for protecting the biodiversity values identified.*
- *Identification of the likely offset requirements and how these might be addressed in future referrals pursuant to the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) or individual authorisation requests under the Biodiversity Conservation Act 2016 (BC Act).*
- *Informal consultation with the Department of Biodiversity, Conservation and Attractions (DBCA), the DPLH and the (former) Commonwealth Department of the Environment and Energy (DoEE) (now renamed to Department of Agriculture, Water and the Environment, DAWE) to determine the likely assessment processes and acceptability of the proposed environmental outcome.*
- *Assessment of potential funding and management mechanisms for the acquisition and ongoing maintenance of the proposed environmental conservation and Local Open Space (LOS) areas into the future.*

A summary of the findings and recommendations of this review is provided in **Table 2**. Specifically, this SCMP needs to outline how the key biodiversity values within the LSP area would be adequately protected and managed, and set in place an informal mechanism to acknowledge the state and local government enacted adverted loss and conservation outcomes to ensure that the government's investment in environmental outcomes can be capitalised for future development approvals.

Table 2: Summary of findings and recommendations from draft LSP review (Emerge Associates 2019)

Summary of findings	
1	Key biodiversity values identified within the draft LSP area include *Conospermum undulatum* (Wavy-smoke bush), Banksia Woodlands of the Swan Coastal Plain TEC, TEC FCT 20a and foraging/potential breeding habitat for black cockatoos. These values are supported by vegetation within the draft LSP area which is currently scattered in individual and semi-contiguous patches across the entire LSP area, this vegetation also ranges in its intactness and condition.
2	Avoidance measures adopted in the draft LSP include the designation of thirteen environmental conservation areas and nine LOS areas, spanning across the LSP area. It appears from our review that these have been located where there is the greatest potential to reduce the likely impacts on the key biodiversity values and where the biodiversity values are more consolidated in location to ensure long-term viability.
3	Mitigation measures proposed through the draft LSP include a requirement for all future developments located within 100 m of an environmental conservation area to prepare a Construction Environmental Management Plan (CEMP) that ensures biodiversity values in these areas are protected.
4	Taking into account the avoidance and mitigation measures proposed, it is likely there will still be residual adverse impacts on key biodiversity values that will need to be addressed through the BC Act and EPBC Act. Specifically, based on the LSP design at the time these included the potential loss of up to: • 63 individual *C. undulatum* plants (12% of known plants in draft LSP area) • 6.64 ha of vegetation potentially representative of Banksia Woodlands of the Swan Coastal Plain TEC (42% of mapped TEC extent in the draft LSP area) • 6.64 ha of vegetation potentially representative of TEC FCT 20a (42% of mapped TEC extent in the draft LSP area) • 237 potential habitat trees suitable for black cockatoos (57% of identified potential habitat trees in the draft LSP area) • 9.90 ha of high-quality foraging habitat suitable for black cockatoos (51% of high-quality foraging habitat mapped in the draft LSP area). It is noted that these calculations were based on the assumption that all key biodiversity values *outside* of the conservation and LOS areas are likely to be lost through clearance of vegetation. This may not necessarily be the case, particularly in regards to scattered trees, some of which may be retained through future subdivision processes.
5	An analysis of the likely future BC Act offset requirements across the draft LSP area has indicated that the potential state/local government enacted conservation benefits (i.e. certainty of tenure and future management of the retained biodiversity values within the environmental conservation and LOS areas) are anticipated to satisfy the offset requirements for residual adverse impacts. Informally the DBCA has confirmed a degree of flexibility exists in the BC Act which would allow for consideration of the state/local government enacted conservation benefits during assessment of future individual authorisation requests.
6	In relation to residual impacts on Matters of National Environmental Significance (MNES), calculations utilising the Commonwealth EPBC offsets calculator have indicated that a substantial portion of the potential future individual offset requirements could be achieved through the conservation benefit of actions undertaken by the state/local government (i.e. acquisition and transfer of land to secure conservation tenure and ongoing management/maintenance) that would also allow for future additional activities such as revegetation and enhancement.
Recommendations	
7	To ensure a high level of certainty regarding the proposed state/local government enacted conservation benefits, it is imperative that appropriate funding and management mechanisms are determined for the acquisition and ongoing management and enhancement of the conservation and LOS areas.
8	Vegetation within the conservation areas of the draft LSP is considered of regional (and national) significance which warrants both the reservation of the sites and the use of public funds to secure their acquisition. The Metropolitan Region Improvement Fund (MRIF) is therefore considered the most appropriate funding mechanism for the purpose of acquiring the conservation areas in the draft LSP. The MRIF would become available through an amendment to the Metropolitan Region Scheme (MRS), reserving the environmental conservation areas as 'Parks and Recreation.' Ongoing maintenance costs for these sites would then need to be addressed through whoever the land is vested to.

Recommendations continued.	
9	The most appropriate funding mechanism for the acquisition of the LOS areas is considered to be a Development Contributions Plan (DCP), established and administered by the local government. This funding mechanism would ensure that all landowners within the LSP contribute equitably to the provision of open space via a monetary contribution at the time of subdivision or development.
10	Even acknowledging the state/local government enacted conservation benefits as a potential future offset, there is still likely to be a shortfall in terms of the future EPBC Act offset requirements to address residual impacts. To address this shortfall there are a number of additional offsetting options that future individual referrals may explore, such as translocation or propagation and revegetation, however it is recognised that securing offsite acquisition site offsets for *C. undulatum* and TEC FCT 20a could be problematic.
11	On this basis there is merit in further exploring an informal mechanism to link the overall conservation benefits likely to be achieved by the state/local government and the future individual EPBC Act referrals and offset requirements that will be required within the draft LSP area. We recognise that there is no readily available formal mechanism for linking these, however to resolve this issue, we recommended the state government develop an informal system/framework, similar to the process currently operated by DBCA to coordinate land acquisition to satisfy EPBC Act offset requirements for either black cockatoo or Banksia woodland TEC impacts in WA. This would ensure the effective investment in conservation benefits and would help avoid duplicative offset requirements arising from EPBC Act assessments in the future
12	It is recommended that an informal framework could be supported through a Strategic Conservation Management Plan (SCMP), required through the draft LSP for all of the conservation and LOS areas, and provided to DAWE as part of the process for future individual referrals.
13	It is important to note that legislative frameworks and policies/guidelines are currently in place that support individual proponents to secure their own future offset outcomes (where deemed necessary) for EPBC Act controlled actions. In addition, there are known processes and local knowledge available to facilitate such outcomes should they be required. The ultimate responsibility for securing offsets to support environmental approvals will always rest with the future proponent/developer, however facilitating these conservation benefits ensures that the draft LSP is ultimately implementable given the residual environmental impacts.
14	There is therefore no absolute requirement or obligation for the state/local government to resolve a way for LSP level conservation benefits to be credited in the future to individual referred actions.
15	Nevertheless, should a connection between the conservation benefits proposed to be established through the draft LSP and future individual referrals/authorisations pursuant to the EPBC Act and BC Act be resolved, it would ensure maximum effectiveness of expenditure and avoid duplicative offset/conservation benefits.

Since completion of the draft LSP review in December 2019, the WAPC has reconsidered the LSP pursuant to Section 31 of the *State Administrative Tribunal Act 2004* (SAT Act) and requested modifications which are currently being undertaken by Kal. As a result of the WAPC's decision the SAT appeal initiated by Kal was withdrawn. Once the modifications of the LSP are completed, the WAPC will issue its formal approval. It is noted that our previous advice is also based on a previous version of the LSP and therefore the potential biodiversity loss calculations outlined in this SCMP differ from our previous calculations provided in Item 4 of **Table 2**.

Based on this understanding of context to date the key outcomes that will now be progressed following formal approval of the LSP are:

- The WAPC will initiate an MRS amendment to facilitate reservation of the environmental conservation areas of the LSP as Parks and Recreation.
- Following initiation of the MRS amendment the WAPC will progressively acquire the private land affected by the environmental conservation areas.
- Private properties identified as Local Open Space in the LSP will be progressively acquired by Kal using revenue from the Forrestfield North Development Contribution Plan (DCP).

3 Key Biodiversity Values

The LSP area currently supports rural residential land uses in the form of subdivided smaller rural-residential lots, individual dwellings and associated outbuildings. The area has historically been subdivided to lots averaging 1 ha in size, with the majority of the 90 landholdings privately owned with existing dwellings being occupied by the landowners. It includes an established sealed road network to service existing properties and a number of bridle trails that reflect the historic character and use of the land.

Areas of remnant vegetation and tree canopy are located across these landholdings, particularly within the central and eastern sections abutting Roe Highway. However, given the LSP extends almost entirely across private landholdings in freehold ownership, there are no existing planning or environmental controls in place to ensure the long-term preservation and management of biodiversity values, with the exception of a small reserve referred to as Smokebush Place Reserve located at 39 Smokebush Place, High Wycombe (Lot 50 on D033847) and managed by Kal.

As outlined in Section 1.2, the key biodiversity values identified within the LSP area are:

- *Conospermum undulatum* (Wavy-smoke bush), listed as vulnerable under the EPBC Act and BC Act.
- *Banksia Woodlands of the Swan Coastal Plain Threatened Ecological Community* (TEC), listed as endangered under the EPBC Act.
- Threatened Ecological Community Floristic Community Type 20a (TEC FCT 20a) *Bankia attenuata woodlands over species rich dense shrublands*, identified as endangered in the WA list of TECs. TECs will be afforded statutory protection within Western Australia under the BC Act when declared.
- Foraging/potential breeding habitat for Carnaby's cockatoo (*Calyptorhynchus latirostris*) and forest red-tailed black cockatoo (*Calyptorhynchus banksii naso*), listed as endangered and vulnerable under both the EPBC Act and BC Act respectively.

Further information regarding these biodiversity values is provided in **Sections 3.1** to **3.3** below. A summary of the distribution of these biodiversity values across existing individual land parcels (in freehold and crown ownership) is also provided in **Appendix B**. This information has been sourced from mapping of biodiversity values at a structure plan scale (AECOM 2017b; Strategen 2018) and will likely be subject to future refinement at the individual landholding scale as part of future approvals to progress development, which may ultimately refine/reduce the currently expected extent of the biodiversity values (particularly for TEC FCT 20a and Banksia woodland TEC given the extent of these is based on vegetation condition thresholds).

3.1 *Conospermum undulatum* (Wavy-leaved smokebush)

C. undulatum is a compact shrub endemic to Western Australia. It typically grows to a height of 0.6 to 2.0 metres and blooms between May and October, producing white flowers. The species has a low seed set, low seed viability and appears to have poor seed dispersal as indicated by the frequent clumping of plants in populations (Close 2006). Listed as vulnerable under the EPBC Act and BC Act, the known habitat requirements of the species are sand and sandy clay soils, often over laterite, on

flat or gently sloping sites, although some records are within slightly swampy habitats (DEC 2009). *C. undulatum* has been also been recorded in a number of threatened ecological communities, including TEC SCP 20a.

Habitat critical to the survival of *C. undulatum* is defined as the following ((DEC 2009):

- The area of occupancy of important populations.
- Areas of similar habitat surrounding important populations (i.e. sand and sandy clay soils, often over laterite, on flat or gently sloping sites), as these areas provide potential habitat for natural range extension and/or for allowing pollinators or biota essential to the continued existence of the species to move between populations.
- Additional occurrences of similar habitat that may contain important populations of the species or be suitable sites for future translocations or other recovery actions intended to create important populations.
- The local catchment for the surface and/or groundwater that maintains the habitat of the species.

A total of 525 individual *C. undulatum* plants have been recorded within the LSP area (**Figure 2**), distributed across approximately 19 existing private lots and 2 lots in Crown ownership (**Appendix B**). Current information indicates there are 20 known populations of *C. undulatum* located on the Swan Coastal Plain, comprising approximately 11,453 individuals (DEC 2009). It is noted these populations vary widely in size from 11 individual plants to over 1,500 individual plants (DEC 2009).

3.2 Banksia Woodlands of the Swan Coastal Plain Threatened Ecological Community

The flora and vegetation assessments undertaken to support the *Environmental Assessment and Management Strategy* (Strategen 2018) indicated that a number of vegetation communities within the LSP area are representative of the *Banksia Woodlands of the Swan Coastal Plain TEC*, listed as endangered under the EPBC Act.

This ecological community is a woodland associated with the Swan Coastal Plain (and some adjacent areas) of southwest Western Australia. It typically has a prominent tree layer of *Banksia* sometimes with scattered eucalypts and other tree species present within or above the Banksia canopy. The understorey is species rich and has many wildflowers, including sclerophyllous shrubs, sedges and herbs. The ecological community provides habitat for many native plants and animals that rely on Banksia Woodlands for their homes and food. Remaining patches of the ecological community therefore provide important wildlife corridors and refuges in a mostly fragmented landscape (DoEE 2016).

Four patches of native vegetation within the LSP area have been identified as meeting all key diagnostic features as published in the conservation advice for the TEC (DoEE 2016), specifically location and physical environment, soils and landform, structure, composition and contra-indicators. Patches are defined as a discreet and mostly continuous area of the ecological community. The vegetation within these patches was often co-dominated by a mix of *Banksia attenuata*, *Banksia menziesii*, *Allocasuarina fraseriana* and *Eucalyptus marginata* subsp. *marginata*. The vegetation

within these patches varied from 'good' to 'excellent' condition and many of these patches also support populations of *Conospermum undulatum* (AECOM 2017b).

Based on existing technical reports (AECOM 2017a; AECOM 2017b; Strategen 2018) it is suggested that there is approximately 15.5 ha of native vegetation in four patches within the LSP area that are considered representative of the Banksia Woodlands of the Swan Coastal Plain TEC (**Figure 3**). These patches are distributed across approximately 27 existing lots in private ownership, 2 lots in Crown ownership and existing road reserves (**Appendix B**). However, it is noted that these calculations are currently based on broadscale survey results across the LSP area. More detailed site-specific surveys in the future may determine that at a finer scale some areas of vegetation mapped as Banksia woodland patches do not meet the condition thresholds of the TEC.

3.3 Threatened Ecological Community Floristic Community Type 20a

A Floristic Community Type (FCT) analysis was undertaken by (AECOM 2017a) to determine the significance of native vegetation at the State level within the LSP area. The results of the FCT analysis concluded that all native vegetation patches of Swan Coastal Plain TEC in 'good' or better condition are also considered to represent the State-listed TEC *'Banksia attenuata woodlands over species rich dense shrublands threatened ecological community'* (TEC FCT 20a).

TEC FCT 20a is the richest of any Banksia community found on the Swan Coastal Plain, with an average number of species recorded in 100 m² quadrats established by Gibson et al. (1994) of 67, and some sites having over 80 species. Habitat critical to the survival of this TEC is defined as the area of occupancy of known occurrences, the sandy soils on which the community occurs, the fresh superficial groundwater that likely helps to sustain key dominant trees in the community, and the catchment for this groundwater (DPaW 2016).

Based on existing technical reports (Aecom 2017a; AECOM 2017b; Strategen 2018) it is suggested that there is approximately 15.5 ha of native vegetation in four patches within the LSP area that are considered representative of TEC FCT 20a (**Figure 4**). These patches are distributed across approximately 27 existing lots in private ownership, 2 lots in Crown ownership and existing road reserves (**Appendix B**). However, it is noted that these calculations are currently based on broadscale survey results across the LSP area. More detailed site-specific surveys in the future may determine that at a finer scale some areas of vegetation mapped as FCT 20a patches do not meet the condition thresholds of the TEC.

3.4 Carnaby's cockatoo and forest red-tailed black cockatoo habitat

The seasonal movements of black cockatoos mean they require large areas of habitat for breeding, night roosting and foraging, as well as connectivity between these habitats to assist their movement through the landscape. Black cockatoos breed in large hollow-bearing trees, generally within woodlands or forests. Maintaining the long-term supply of trees of trees of a size to provide suitable nest hollows is particularly important in woodland stands that are known to support cockatoo breeding. While breeding, black cockatoos will generally forage within a 6–12 km radius of their nesting site (DSEWPaC 2012).

The LSP area contains suitable foraging habitat and breeding trees for Carnaby's cockatoo *(Calyptorhynchus latirostris*) and forest red-tailed black cockatoo (*Calyptorhynchus banksii naso)*, listed as endangered and vulnerable under both the EPBC Act and BC Act respectively. A detailed habitat assessment undertaken for the site (AECOM 2017b) concluded that the LSP contains a total of 19.25 ha of suitable foraging habitat (high-quality) for the two black cockatoo species and a total of 411 potential habitat trees, 26 of which collectively contain 42 suitable hollows for potential breeding (**Figure 5**). No evidence of black cockatoo breeding has been identified within these hollows or is known to occur within the site.

It is noted that the 19.25ha of vegetation identified as suitable high-quality foraging habitat for black cockatoos is distributed across approximately 40 private lots and 2 lots in Crown ownership (**Appendix B**) while the 411 potential habitat trees for black cockatoos are scattered across 44 private lots and 3 lots in Crown ownership.

4 Impacts and Mitigation

Vegetation that comprises state listed threatened species or TEC's or commonwealth listed MNES (as have been identified within the LSP area) are significant values for which avoidance should always be the first step in any development planning process. Under both state and commonwealth environmental legislative and policy frameworks, loss of these values is likely to be considered a residual impact that could either be considered unacceptable or require compensatory actions such as offsets to make acceptable.

However, as outlined previously in **Section 3**, the key biodiversity values are supported by vegetation which is currently scattered in individual and semi-contiguous patches across the entire LSP area, and this vegetation also ranges in its intactness and condition.

From a planning and economic perspective, the LSP needs to achieve a level of population density that will support the Forrestfield-Airport link project and generally to achieve public transport investment and patronage outcomes. On this basis, and taking into account the existing fragmented nature of the biodiversity values across the LSP area, it therefore would be difficult to avoid all impacts to key biodiversity values (i.e. TEC FCT 20a and/or *C. undulatum*) within the LSP area while still facilitating the necessary public transport planning objectives.

To this end the design process for the LSP has applied a mitigation hierarchy that seeks to reduce the likely impacts on the key biodiversity values. This strategic mitigation approach is detailed in **Section 4.1** and has been applied for each key biodiversity value in **Sections 4.2 to 4.5**.

4.1 Strategic Mitigation Approach

The proposed strategic mitigation approach is based on a hierarchy of avoidance, mitigation and offsetting (see **Plate 1** below). This approach is consistent with the Commonwealth's *EPBC Offsets Policy* (Commonwealth of Australia 2012), the *WA Offsets Policy* (Government of WA 2011) and the *WA Environmental Offsets Guidelines* (Government of WA 2014), noting that the WA offsets process also includes an additional step of rehabilitation. In this case, rehabilitation is not proposed to be undertaken by the state/local government within the conservation and LOS areas but rather is an additional measure that individual proponents may consider undertaking to address any shortfalls in EPBC Act offset requirements for residual impacts associated with future developments (that are deemed to be 'controlled actions'). On this basis, rehabilitation is further discussed in **Section 6.4.3** and is not included in the overarching strategic mitigation approach.

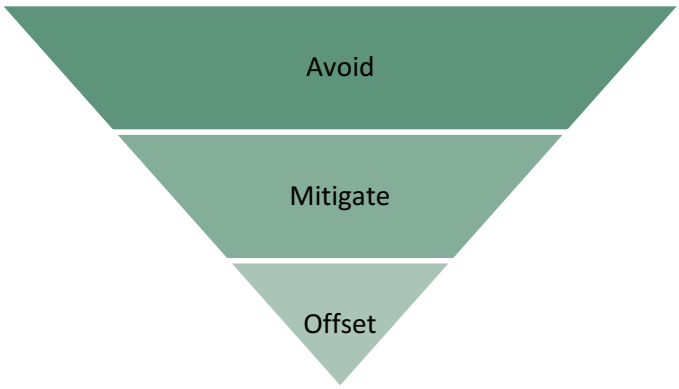

Plate 1: Environmental Impact Mitigation Hierarchy (based on Commonwealth of Australia 2012)

4.1.1 Avoidance

The LSP layout has been designed to avoid and reduce the extent of impacts on known biodiversity values through the designation of thirteen environmental conservation areas and nine local open space (LOS) areas, spanning across the LSP area. These proposed conservation and LOS areas have been located where there is the greatest potential to avoid impacts on key biodiversity values exist, particularly in relation to concentration of *C. undulatum* plants and TEC FCT 20a which are known to be problematic to source offsite land acquisition offsets for.

4.1.2 Mitigation

In addition to avoidance of impacts, the LSP layout has sought to mitigate impacts on the retained biodiversity values through provision of a green linkage/ecological corridor, designed to incorporate areas of active parkland, conservation, significant stands of vegetation and existing Bush Forever areas. Management of this corridor by Kal will ensure that recreational uses within the LOS are complementary to the retention of identified biodiversity values, and provide managed buffers for designated environmental conservation areas from the surrounding urban areas and ensuring the long-term viability of the retained biodiversity values.

The LSP also requires the preparation of construction environmental management plans (CEMPs) to support all future applications for development of landholdings within 100 m of designated environmental conservation areas. The purpose of the CEMPs are to specify how threats and risks to biodiversity values within the environmental conservation areas will be managed both pre-construction and during construction to mitigate impacts. Specific elements to be included in the future CEMPs in relation to each biodiversity value are outlined in **Sections 4.2** to **4.5**.

4.1.3 Offsetting

In accordance with the Commonwealth *EPBC Offsets Policy* (Commonwealth of Australia 2012), the *WA Offsets Policy* (Government of WA 2011), environmental offsets are only applied where the residual impacts are determined to be significant after avoidance and mitigation measures have been pursued.

Acquisition of the conservation and LOS areas designated in the LSP will be enacted by the state/local government and managed in the long term as detailed in **Section 6.4**. Given this will facilitate tenure

change and consolidated long-term management, this would go beyond avoidance and mitigation and provide a conservation benefit over and above this.

Notwithstanding the avoidance and mitigation measures proposed to be enacted by the state/local government, there will be residual adverse impacts on key biodiversity values that are likely to require consideration through the BC Act and EPBC Act. It is therefore reasonable to assume that at some point a measure of environmental counterbalance (i.e. environmental offsets) will be required. However, it is important to note that these residual impacts and counterbalancing environmental offsets will ultimately be considered as part of many individual/separate proponent-driven environmental approval processes in the future. This will also likely mean that not all the residual impacts identified at a strategic level will be subject to formal consideration under these legislative frameworks, given they may not meet the thresholds required under each.

While there is no absolute requirement or legal obligation for the state/local government to progress the consideration of environmental offsets at a structure plan level, from a planning point of view it is important to ensure the proposed LSP is implementable in the future. On this basis a holistic review of the likely residual impacts in relation to the potential conservation benefits that will be achieved across the LSP area is provided in **Section 5**.

4.2 *Conospermum undulatum*

4.2.1 Threatening processes

Table 3 provides a summary of the main threatening processes to *C. undulatum* as identified in the *National Wavy-leaved Smokebush (Conospermum undulatum) Recovery Plan* (DEC 2009).

Table 3: Summary of threatening processes to C. undulatum (DEC 2009)

Threat	Details
Habitat loss and degradation	Most populations are located in degraded natural vegetation remnants. Approximately 23% of known plants are located on subdivided blocks and many other populations are affected by clearing for urban development. Three populations and five subpopulations are known to have become extinct due to land clearance. A further 16% of plants are located on road reserves or near border firebreaks. These plants are threatened by maintenance activities and spraying of verge vegetation with herbicides. Furthermore, a recent study into the associations between flora display and habitat fragmentation with the reproductive success of *C. undulatum* concluded that *'habitat fragmentation appears to be a significant threat to the future persistence of C. undulatum…every stage of sexual reproduction was directly and significantly affected by aspects of habitat fragmentation. Ultimately, urban expansion on the Swan Coastal Plain may result in patches of native vegetation that are unattractive for pollinators, and too small and isolated to ensure long-term population viability and adaptation ability based on reproduction by seeds'* (Delnevo 2019).
Lack of fire	The vegetation remnants in which some populations occur have not been burnt for a long period of time. Existing plants are senescing (coming to the end of their lifespan), causing a decline in reproductive output.
Weeds	Weeds threaten most populations of the Wavy-leaved Smokebush. Weed species compete for resources and weed competition reduces seedling survival.

Threat	Details
Recreational activities	Horse riding, motor biking and four-wheel driving threaten several populations. These activities directly damage plants and also cause soil disturbance that encourages weed invasion.
Rabbit grazing	The species is susceptible to grazing by rabbits (Oryctolagus cuniculus) and, while mature plants have some capacity to resprout, seedlings are particularly vulnerable.

4.2.2 Significant impact threshold

In accordance with the Commonwealth's *MNES Significant Impact Guidelines 1.1* (DotE 2013), an action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

- lead to a long-term decrease in the size of an important population of a species
- reduce the area of occupancy of an important population
- fragment an existing important population into two or more populations
- adversely affect habitat critical to the survival of a species
- disrupt the breeding cycle of an important population
- modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline
- result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat
- introduce disease that may cause the species to decline, or
- interfere substantially with the recovery of the species.

4.2.3 Likely future impacts

Calculations of the anticipated extent of avoidance and direct impacts on individual *C. undulatum* plants from implementation of the LSP are provided in **Table 4**. It is noted that these calculations differ slightly from previous findings provided in early strategic advice (outlined in **Section 2.3**), as the LSP layout has since been modified, further minimising likely impacts on key biodiversity values.

These calculations are based on the following:

- Mapping of the extent of individual *C. undulatum* plants across the LSP area has been sourced from the *Forrestfield North Residential Precinct, Environmental Assessment and Management Strategy* (Strategen 2018). While this mapping is appropriate to support the structure planning scale, it is possible that more detailed site-specific surveys in the future may influence the expected numbers of *C. undulatum* plants at a finer individual lot scale, and therefore the extent of predicted impacts.
- The assumption that all *C. undulatum* plants *within* the conservation areas and LOS will be retained. Should this not be the case, the anticipated impacts on the biodiversity value would be greater.
- Conversely, the assumption that all *C. undulatum* plants *outside* of the conservation and LOS areas will be cleared. This may not necessarily be the case, as individual proponents may consider the retention of additional plants within landholdings to facilitate approval requirements associated with future individual developments.

Table 4: Likely future impacts on C. undulatum from implementation of the LSP

Key biodiversity value	Existing extent of value within LSP area	Anticipated avoidance (retention) proposed in LSP		Anticipated impact (clearance) as proposed in LSP
		Conservation	LOS	
Conospermum undulatum (Wavy smoke bush)	525 plants	454 plants (87%)	23 plants (4%)	48 plants (9%)

4.2.4 Mitigation objectives

- Avoid impacts to 477 mapped individual *C. undulatum* plants through the establishment of environmental conservation and LOS areas, spanning across the LSP area.
- Mitigate impacts on *C. undulatum* plants through the provision of an ecological corridor providing a linkage between known locations of habitat supporting *C. undulatum* plants. This linkage will also act as a buffer for the retained *C. undulatum* plants from the proposed surrounding urban environment to ensure their long-term viability.
- Ensure that CEMPs are required to be prepared to support all future applications for development of landholdings within 100 m of environmental conservation areas, specifying how threats and risks to *C. undulatum* within the environmental conservation areas will be managed both pre-construction and during construction.

4.2.5 Mitigation strategy

4.2.5.1 Avoid

Impacts to approximately 91% of the known individual *C. undulatum* plants located within the LSP area will be avoided through the designation of the environmental conservation and LOS areas.

4.2.5.2 Mitigate

The LSP layout has sought to mitigate impacts on retained *C. undulatum* plants through provision of a green linkage/ecological corridor extending north to south through the LSP between the Bush Forever sites. Management of this corridor by Kal will ensure that recreational uses within the LOS are complementary to the retention of *C. undulatum* plants and supporting habitat, effectively buffering the designated environmental conservation areas from the surrounding urban areas and ensuring the long-term viability of the retained biodiversity values.

The LSP contains a requirement for all future developments located within 100 m of an environmental conservation area to prepare a Construction Environmental Management Plan (CEMP) that ensures the known *C. undulatum* plants and supporting habitat in these areas are protected. Specific construction threats relevant to *C. undulatum* that are to be addressed in the CEMPs include:

- Restricted use of herbicides for weed control pre-construction and during construction to prevent overspray/runoff into conservation areas that may result in habitat loss/degradation.
- Temporary fencing around construction sites (in addition to fencing that will already be established around the conservation areas) to prevent accidental damage to *C. undulatum* plants within the conservation areas.

- Ensuring any fill imported to a site is provided from a clean source and free of weeds and contaminants to minimise potential for spread into conservation areas. In addition to ensuring stockpiled materials are not within close proximity to shared boundaries with conservation areas.
- Ensuring pest animals, particularly rabbits, are managed on an as required basis, using methods such as trapping, baiting and fumigation subject to advice from a licenced pest management technician.

4.2.5.3 Residual impacts

Taking into account the avoidance and minimisation measures proposed, it is likely there will still be residual adverse impacts on *C. undulatum* values that will need to be addressed through the BC Act and EPBC Act. Specifically, these include the potential loss of up to 48 individual *C. undulatum* plants (9% of known plants within the LSP area).

4.3 Banksia Woodlands of the Swan Coastal Plain Threatened Ecological Community

4.3.1 Threatening processes

Table 5 provides a summary of the main threatening processes to Banksia Woodlands of the SCP TEC, as identified in the *EPBC Act Approved Conservation Advice for the Banksia Woodlands of the Swan Coastal Plain Threatened Ecological Community* (DoEE 2016).

Table 5: Summary of threatening processes to Banksia Woodlands of the SCP TEC (DoEE 2016)

Threat	Details
Clearing and fragmentation	This includes: • clearing for urban developments, especially in the Perth metropolitan region but also in the urban centres of Bunbury and Busselton • associated urban degradation/disturbance such as rubbish dumping, uncontrolled vehicle access, wildflower and seed harvesting • clearing for agriculture and horticulture (mainly in the past) • mining for basic raw materials (e.g. road/building materials), mineral sands and silica sands, that involve vegetation clearing and hydrological impacts. Clearing reduces the extent of the ecological community and exacerbates patch isolation, reducing connectivity between remnants. Connectivity between remnants of the ecological community and other native vegetation is an important determinant of habitat quality at the landscape scale for native flora and fauna as well as for overall condition and persistence of the ecological community.
Dieback diseases	'Dieback' here generally refers to the effects of a plant disease caused by the water mould *Phytophthora cinnamomi* and other Phytophthora species, although it can be related to a number of plant pathogens. The consequences of infection range from localised infection affecting one or more individual plants, to a dramatic modification of the structure and composition of the native plant communities; a significant reduction in primary productivity; and, for dependent flora and fauna, habitat loss and degradation. For Banksia Woodlands, impacts are typically towards the severe extreme of this range.
Invasive species	There are many herb and grass weeds in Banksia Woodlands as this system is particularly vulnerable to new weeds due to their proximity to major population centres. Common invasive fauna include the European rabbit (*Oryctolagus cuniculus*), red fox (*Vulpes vulpes*), black rat (*Rattus rattus*), house mouse (*Mus musculus*), long-billed corella

Threat	Details
	(*Cacatua tenuirostris*), little corella (*Cacatua sanguinea gymnopis*), rainbow lorikeets (*Trichoglossus haematodus*), laughing kookaburra (*Dacelo novaeguineae*) and the introduced honey bee (*Apis mellifera*). Introduced fauna species affect biodiversity values through habitat modification, predation, grazing and competition.
Fire regime change	Higher frequency fire regimes and fire management practices that result in burning during the growing season (late autumn to late spring) and during the seeding season (for most native species in Banksia Woodlands this is from November to December) result in the following changes to Banksia Woodlands: • Structural change, e.g. reduction in canopy cover, loss of native resprouting shrub cover • A shift from native species to introduced species, notably increased weed abundance and diversity • Decrease in native plant cover, richness and diversity • Changes to the ecological function of Banksia Woodlands • Feedback loops that promote weed species at the expense of native plants, for example the perennial veldgrass is highly flammable and infestations promote further fires. Higher fire frequencies, in turn, reduces the cover and regeneration capacity of many native plants.
Hydrological degradation	One of the most significant threats to wetland and woodland ecosystems in the Swan Coastal Plain is the reduction of groundwater levels as a result of an increase in groundwater abstraction (including production bores), patterns in water regulation and decreased rainfall and subsequent recharge to the groundwater system
Climate change	Long-term climate variability is affecting the southwest of Western Australia, which is experiencing a trend of increasing temperatures and declining rainfall. Declining recharge/rainfall rates as a result of climate change is correspondingly further increasing groundwater decline influenced by extraction.

4.3.2 Significant impact threshold

In accordance with the Commonwealth's *MNES Significant Impact Guidelines 1.1* (DotE 2013) an action is likely to have a significant impact on an ecological community if there is a real chance or possibility that it will:

- reduce the extent of an ecological community
- fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines
- adversely affect habitat critical to the survival of an ecological community
- modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns
- cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting
- cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to: – assisting invasive species, that are harmful to the listed ecological community, to become established, or – causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community, or
- interfere with the recovery of an ecological community.

4.3.3 Likely future impacts

Calculations of the anticipated extent of avoidance and direct impacts on Banksia Woodlands of the SCP TEC from implementation of the LSP are provided in **Table 6**. It is noted that these calculations differ slightly from previous findings provided in early strategic advice (outlined in **Section 2.3**), as the LSP layout has since been modified, further minimising likely impacts on key biodiversity values.

These calculations are based on the following:

- Mapping data has been utilised from the *Forrestfield North Residential Precinct, Environmental Assessment and Management Strategy* (Strategen 2018). It is noted this data is based on broadscale survey results across the LSP area. More detailed site-specific surveys in the future may determine that at a finer scale some areas of vegetation mapped as patches do not meet the condition thresholds of the TEC.
- All vegetation representative of the TEC *within* the conservation areas and LOS is assumed to be retained. Should this not be the case, the anticipated impacts on the Banksia Woodlands of the SCP TEC may be greater.
- Conversely, all vegetation representative of the TEC *outside* of the conservation and LOS areas is assumed to be cleared. This may not necessarily be the case, as individual proponents may consider the retention of additional vegetation within landholdings to reduce approval requirements associated with future individual developments.

Table 6: Likely future impacts on Banksia Woodlands of the Swan Coastal Plain Threatened Ecological Community from implementation of the LSP

Key biodiversity value	Existing extent of value within LSP area	Anticipated avoidance (retention) proposed in LSP		Anticipated impact (clearance) as proposed in LSP
		Conservation	LOS	
Banksia Woodlands of the SCP TEC	15.5 ha	6.49 ha (42%)	2.86 ha (18%)	6.15 ha (40%)

4.3.4 Mitigation objectives

- Avoid impacts to 9.35 ha of mapped Banksia Woodlands of the SCP TEC occurrences through the establishment of environmental conservation and LOS areas, spanning across the LSP area.
- Mitigate impacts on Banksia Woodlands of the SCP TEC through the provision of an ecological corridor providing a linkage between known locations of vegetation representative of the TEC. This linkage will also act as a buffer for the retained TEC patches from the proposed surrounding urban environment to ensure their long-term viability.
- Ensure that CEMPs are required to be prepared to support all future applications for development of landholdings within 100 m of environmental conservation areas, specifying how threats and risks to Banksia Woodlands of the SCP TEC within the environmental conservation areas will be managed both pre-construction and during construction.

4.3.5 Mitigation strategy

4.3.5.1 Avoid

Impacts to approximately 60% of the mapped Banksia Woodlands of the SCP TEC occurrences within the LSP area will be avoided through the designation of the environmental conservation and LOS areas.

4.3.5.2 Mitigate

The LSP layout has sought to mitigate impacts on retained vegetation representative of the Banksia Woodlands of the SCP TEC through provision of a green linkage/ecological corridor extending north to south through the LSP between the Bush Forever sites. Management of this corridor by Kal will ensure that recreational uses within the LOS are complementary to the retention of the TEC patches, effectively buffering the designated environmental conservation areas from the surrounding urban areas and ensuring the long-term viability of the retained vegetation.

The LSP also contains a requirement for all future developments located within 100 m of an environmental conservation area to prepare a Construction Environmental Management Plan (CEMP) that ensures the Banksia Woodlands of the SCP TEC values in these areas are protected. Specific construction threats relevant to the Banksia Woodlands of the SCP TEC that are to be addressed in the CEMPs include:

- Restricted use of herbicides for weed control pre-construction and during construction to prevent overspray/runoff into conservation areas that may result in degradation of TEC patches.
- Temporary fencing around construction sites (in addition to fencing that will already be established around the conservation areas) to prevent accidental damage to TEC patches within the conservation areas.
- Ensuring that all machinery and vehicles are free of plant material and soil prior to mobilisation to site to prevent introduction of dieback pathogens.
- Ensuring any fill imported to a site is provided from a clean source and free of weeds and contaminants to minimise potential for spread of invasive species into conservation areas.
- Confirming clearing activities will not occur if fire danger is Extreme or Catastrophic.

4.3.5.3 Residual impacts

Taking into account the avoidance and minimisation measures proposed, it is likely there will still be residual adverse impacts on Banksia Woodlands of the SCP TEC values that will need to be addressed through the EPBC Act. Specifically, these include the potential loss of up to 6.15 ha (40% of mapped Banksia Woodlands of the SCP TEC occurrences within the LSP area).

4.4 Threatened Ecological Community Floristic Community Type 20a

4.4.1 Threatening processes

Table 7 provides a summary of the main threatening processes to TEC FCT 20a, as identified in the *Interim Recovery Plan No. 359: Banksia attenuata woodlands over species rich dense shrublands* (DPaW 2016).

Table 7: Summary of threatening processes to TEC FCT 20a (DPaW 2016)

Threat	Details
Clearing	Clearing for urban developments in the Perth metropolitan region and associated urban degradation/disturbance such as rubbish dumping represents a key threat to TEC FCT 20a. For occurrences of TEC FCT 20a outside of Bush Forever sites particularly, there is no real security of tenure and a series of areas are proposed for development.
Disease	Dieback disease caused by *Phytophthora* species has the potential to impact the community, although it is not known if these particular *Banksia attenuata* woodlands are very susceptible to the disease. Elevated dry sands, are not particularly conducive to dieback, and the disease may not spread rapidly despite the number of highly susceptible species in the overstorey.
Altered fire regimes	Disturbances within remnants often lead to an increase in weed invasion, particularly where remnants are small. Therefore, fire frequency should be minimised unless studies indicate that fire is not occurring frequently enough. In addition, the risk of fire is increased by the presence of grassy weeds in the understorey, as they are likely to be more flammable than the original native species in the herb layer. The increased number of fires may well be impacting the community in terms of structure, composition and level of weed invasion.
Disturbance due to recreational use or maintenance activities	Many occurrences of TEC FCT 20a are in areas utilised heavily for public recreation where visitation is high and the impact from recreational users from trampling, rubbish and track creation is increased. Some of these areas have also become unofficial rubbish tips, which, apart from being visually unappealing, also introduces weeds and seeds into the bushland and increases the fire hazard.
Weed invasion	Weed invasion is a major factor influencing local extinctions of Banksia spp. Current weed levels in most occurrences are still quite low, with the exception of some localized areas within occurrences that have been subject to heavy disturbance historically (DPaW 2016).
Hydrological change	*Banksia attenuata* woodlands are one of a number of groundwater dependent ecosystems in southwestern Western Australia that are threatened by groundwater abstraction, and in addition to this threat, is an ongoing decline in regional water tables due to a drying climate (DPaW 2016). These groundwater dependent communities are generally adapted to natural fluctuating groundwater levels; however, a sudden drawdown may exceed their adaptive capacity. Coupled with long-term climatic drying, groundwater drawdown may cause the rate of groundwater decline to exceed potential root reach or growth rate, or physiological tolerance (DPaW 2016).
Quarrying	The yellow sands commonly associated with TEC FCT 20a are a focus for quarrying of basic raw materials (e.g. road/building materials), involving vegetation clearing and hydrological impacts.
Grazing	Rabbits have invaded a number of occurrences of TEC FCT 20a, causing damage to vegetation root structure through warren construction. Rabbits are likely to cause alteration to species composition by selective grazing of edible species and introducing nutrients that promote weed growth. An overabundance of kangaroos, particularly in peri-urban areas, is also contributing to further grazing pressure on occurrences of TEC FCT 20a.

4.4.2 Significant impact threshold

As outlined in the *Interim Recovery Plan No. 359: Banksia attenuata woodlands over species rich dense shrublands* (DPaW 2016), activities that may have a significant impact on the TEC FCT 20a include land clearing, too frequent burning, or significantly altering drainage in the immediate vicinity of the community. Proponents should demonstrate that on-ground works will not have a significant impact on the community, or on the habitat that is defined as being critical for its survival.

4.4.3 Likely future impacts

Calculations of the anticipated extent of avoidance and direct impacts on TEC FCT 20a from implementation of the LSP are provided in **Table 8**. It is noted that these calculations differ slightly from previous findings provided in early strategic advice (outlined in **Section 2.3**), as the LSP layout has since been modified, further minimising likely impacts on key biodiversity values.

These calculations are based on the following:

- Mapping data has been utilised from the *Forrestfield North Residential Precinct, Environmental Assessment and Management Strategy* (Strategen 2018). It is noted this data is based on broadscale survey results across the LSP area. More detailed site-specific surveys in the future may determine that at a finer scale some areas of vegetation mapped as patches do not meet the condition thresholds of the TEC.
- The assumption that all vegetation representative of the TEC *within* the conservation areas and LOS will be retained. Should this not be the case, the anticipated impacts on TEC FCT 20a may be greater.
- Conversely, the assumption that all vegetation representative of the TEC *outside* of the conservation and LOS areas will be cleared. This may not necessarily be the case, as individual proponents may consider the retention of additional vegetation within landholdings to reduce approval requirements associated with future individual developments.

Table 8: Likely future impacts on TEC FCT 20a from implementation of the LSP

Key biodiversity value	Existing extent of value within LSP area	Anticipated avoidance (retention) proposed in LSP		Anticipated impact (clearance) as proposed in LSP
		Conservation	LOS	
TEC (FCT20a) / Banksia Woodlands of the SCP TEC	15.5 ha	6.49 ha (42%)	2.86 ha (18%)	6.15 ha (40%)

4.4.4 Mitigation objectives

- Avoid impacts to 9.35 ha of mapped TEC FCT 20a occurrences through the establishment of environmental conservation and LOS areas, spanning across the LSP area.
- Mitigate impacts on TEC FCT 20a through the provision of an ecological corridor providing a linkage between known locations of vegetation representative of the TEC. This linkage will also act as a buffer for the retained TEC patches from the proposed surrounding urban environment to ensure their long-term viability.
- Ensure that CEMPs are required to be prepared to support all future applications for development of landholdings within 100 m of environmental conservation areas, specifying

how threats and risks to TEC FCT 20a within the environmental conservation areas will be managed both pre-construction and during construction.

4.4.5 Mitigation strategy

4.4.5.1 Avoid

Impacts to approximately 60% of the mapped TEC FCT 20a occurrences within the LSP area will be avoided through the creation of the environmental conservation and LOS areas.

4.4.5.2 Mitigate

The LSP layout provides for the establishment of a green linkage/ecological corridor extending north to south through the LSP between the Bush Forever sites. Management of this corridor by Kal will ensure that recreational uses within the LOS are complementary to the retention of the TEC patches, effectively buffering the designated environmental conservation areas from the surrounding urban areas and ensuring the long-term viability of the retained vegetation.

The LSP contains a requirement for all future developments located within 100 m of an environmental conservation area to prepare a Construction Environmental Management Plan (CEMP) that ensure that the TEC FCT 20a values in these areas are protected. Specific construction threats relevant to the TEC FCT 20a that are to be addressed in the CEMPs include:

- Restricted use of herbicides for weed control pre-construction and during construction to prevent overspray/runoff into conservation areas that may result in degradation of TEC patches.
- Temporary fencing around construction sites (in addition to fencing that will already be established around the conservation areas) to prevent accidental damage to TEC patches within the conservation areas.
- Ensuring that all machinery and vehicles are free of plant material and soil prior to mobilisation to site to prevent introduction of dieback pathogens.
- Ensuring any fill imported to a site is provided from a clean source and free of weeds and contaminants to minimise potential for spread of invasive species into conservation areas.
- Confirming clearing activities will not occur if fire danger is Extreme or Catastrophic.
- Ensuring pest animals, particularly rabbits, are managed on an as required basis, using methods such as trapping, baiting and fumigation subject to advice from a licenced pest management technician.

4.4.5.3 Residual impacts

Taking into account the avoidance and minimisation measures proposed, it is likely there will still be residual adverse impacts on TEC FCT 20a values that will need to be addressed through the BC Act. Specifically, these include the potential loss of up to 6.15 ha (40% of mapped TEC FCT 20a occurrences within the LSP area).

4.5 Carnaby's cockatoo and forest red-tailed black cockatoo habitat

4.5.1 Threatening processes

Table 9 provides a summary of the main threatening processes to Carnaby's cockatoo and forest red-tailed black cockatoo habitat, as identified in the following plans:

- *Carnaby's Cockatoo (Calyptorphynchus latirostris) Recovery Plan* (DPaW 2013)
- *Forest black cockatoo (Baudin's cockatoo Calyptorphynchus baudinii and forest red-tailed black cockatoo Calyptorphynchus banksii naso) Recovery Plan* (DEC 2008).

Table 9: Summary of threatening processes to black cockatoo habitat (DPaW 2013; DEC 2008)

Threat	Details
Loss of breeding habitat	The breeding habitat of black cockatoos is made up of the eucalypt woodlands that provide breeding hollows, together with feeding areas and watering sites within foraging distance of breeding sites. The loss of functioning breeding habitat as a whole is due to threats that impact on one or all of these components. Hollow-bearing trees suitable for nesting are now largely restricted to remnant patches of woodland and individual trees within cleared sites (e.g. paddock trees) (Saunders and Ingram 1998). Competition for nest hollows with other species also reduces the number of nest hollows available to black cockatoos. Species that compete for nest hollows include the native and introduced corellas (*Cacatua* species), galahs (*Cacatua roseicapilla*), Australian shelducks (*Tadorna tadornoides*), Australian wood ducks (*Chenonetta jubata*) and feral European honey bees (*Apis mellifera*).
Loss of foraging and night roosting habitat	A further significant threat is the clearing, fragmentation and degradation of foraging and night roosting habitat for black cockatoos, in particular the clearing of feeding habitat on the Swan Coastal Plain associated with industrial, urban and residential development.
Tree health	Premature decline syndromes have been recorded for many important food and roosting tree species throughout Western Australia. In particular *Phytophthora cinnamomi* (or 'dieback') occurs when there is a combination of susceptible plant species, the presence of the pathogen and vulnerability due to environmental conditions (DPaW 2013).
Mining and extraction activities	Specifically, the clearing of native vegetation (and associated black cockatoo habitat) for mining and extraction activities in the south-west.
Climate change	Successful regeneration of the eucalypt species utilised by black cockatoos for breeding requires specific regeneration events, including fire and subsequent rainfall, as well as an adequate rainfall regime after germination. These events may be reduced under future climate change scenarios to the species detriment.

4.5.2 Significant impact threshold

In accordance with the Commonwealth's *EPBC Act referral guidelines for three threatened black cockatoo species* (DSEWPaC 2012), an action has a high risk of significant impacts on threatened black cockatoo species if there is a real chance or possibility that it will result in:

- clearing of any known nesting tree
- clearing or degradation of any part of a vegetation community known to contain breeding habitat
- clearing of more than 1 ha of quality foraging habitat
- clearing or degradation (including pruning the top canopy) of a known night roosting site, or

- creation of a gap of greater than 4 km between patches of black cockatoo habitat (breeding, foraging or roosting).

4.5.3 Likely future impacts

Calculations of the anticipated extent of avoidance and direct impacts on potential black cockatoo breeding and foraging habitat from implementation of the LSP are provided in **Table 10**. It is noted that these calculations differ slightly from previous findings provided in early strategic advice (outlined in **Section 2.3**), as the LSP layout has since been modified, further minimising likely impacts on key biodiversity values.

These calculations are based on the following:

- Mapping data has been utilised from the *Forrestfield North Residential Precinct, Environmental Assessment and Management Strategy* (Strategen 2018). This mapping is based on broadscale survey results across the LSP area and may be subject to refinement through future site-specific surveys at the individual landholding scale.
- It is assumed that all potential black cockatoo foraging and breeding habitat located *within* the conservation areas and LOS will be retained. Should this not be the case, the anticipated impacts on the key biodiversity values would be greater.
- Equally, it is assumed that all potential black cockatoo foraging and breeding habitat located *outside* of the conservation and LOS areas will be removed. This may not necessarily be the case, particularly in regards to scattered trees, some of which may be retained through future road reserves or individual development design.

Table 10: Likely future impacts on black cockatoo habitat from implementation of the LSP

Key biodiversity value	Existing extent of value within LSP area	Anticipated avoidance (retention) proposed in LSP		Anticipated impact (clearance) as proposed in LSP
		Conservation	LOS	
Potential black cockatoo habitat trees without suitable hollows	385 trees	61 trees (16%)	99 trees (26%)	225 trees (58%)
Potential black cockatoo habitat trees with suitable hollows	26 trees	3 trees (12%)	14 trees (54%)	9 trees (34%)
Black cockatoo foraging habitat (high quality[4])	19.25 ha	6.96 ha (36%)	2.91 ha (15%)	9.38 ha (49%)

4.5.4 Mitigation objectives

- Avoid impacts to 177 potential black cockatoo habitat trees (17 of which contain suitable hollows for breeding) and 9.87 ha of foraging habitat through the establishment of environmental conservation and LOS areas, spanning across the LSP area.
- Mitigate impacts on black cockatoo breeding and foraging habitat through the provision of an ecological corridor providing a linkage between known locations of black cockatoo habitat. This linkage will also act as a buffer for the retained habitat from the proposed surrounding urban environment to ensure long-term ecological viability.

[4] High quality foraging habitat is defined in the AECOM (2017b) assessment as being based on suitable foraging species, Jarrah woodlands, presence of water availability within 2km and support of trees with potential to be used for breeding.

- Ensure that CEMPs are required to be prepared to support all future applications for development of landholdings within 100 m of environmental conservation areas, specifying how threats and risks to black cockatoo's and their supporting habitat within the environmental conservation areas will be managed both pre-construction and during construction.

4.5.5 Mitigation strategy

4.5.5.1 Avoid

Impacts to approximately 42% of the potential black cockatoo habitat trees without hollows, 66% of the habitat trees with suitable hollows, and 51% of the black cockatoo foraging habitat within the LSP area will be avoided through the creation of the environmental conservation and LOS areas.

4.5.5.2 Mitigate

The LSP design seeks to mitigate impacts on retained black cockatoo habitat through the provision of a green linkage/ecological corridor extending north to south through the LSP between the Bush Forever sites. Kal will manage this corridor to ensure that recreational uses and landscaping within the LOS are complementary to the retention of the black cockatoo habitat. The corridor will act as a buffer for the environmental conservation areas from the surrounding urban areas, maintaining long-term viability of the habitat and assisting movement of black cockatoos between the retained habitat across the LSP area.

The LSP contains a requirement for all future developments located within 100 m of an environmental conservation area to prepare a Construction Environmental Management Plan (CEMP) to ensure that key biodiversity values, such as black cockatoo habitat, in these areas are protected. Specific construction threats relevant to the black cockatoo habitat that are to be addressed in the CEMPs include:

- Restricted use of herbicides for weed control pre-construction and during construction to prevent overspray/runoff into conservation areas that may result in degradation of habitat.
- Temporary fencing around construction sites (in addition to fencing that will already be established around the conservation areas) to prevent accidental damage or clearing of BC habitat within the conservation areas.
- Ensuring that all machinery and vehicles are free of plant material and soil prior to mobilisation to site to prevent introduction of dieback pathogens.
- Ensuring that any black cockatoos encountered onsite are not disturbed or interfered with, and domestic animals are not permitted onsite during construction.
- Limiting clearing of vegetation to outside the Carnaby's cockatoo breeding season (late July to late October) where possible. When clearing during the breeding season cannot be avoided, a pre-clearance survey should be undertaken to inspect hollows for nesting black cockatoos.
- If injured or sick native black cockatoos are encountered, the Department of Biodiversity, Conservation and Attractions (DBCA) *Wildcare Helpline* is to be called immediately on (08) 9474 9055, and Kal informed.

4.5.5.3 Residual impacts

Taking into account the avoidance and minimisation measures proposed, it is likely there will still be residual adverse impacts on black cockatoo breeding and foraging habitat that will need to be addressed through the BC Act and EPBC Act. Specifically, these include the potential loss of up to 234 habitat trees (9 of which contain suitable hollows) and 9.38 ha of foraging habitat (noting that this is assuming all biodiversity values outside of the conservation and LOS areas will be cleared, which may not necessarily be the case in relation to scattered trees).

5 Proposed State/Local Government Enacted Strategic 'Offset'

5.1 Summary of Likely Residual Impacts

As outlined in **Section 4**, it is likely there will still be residual adverse impacts on biodiversity values remaining on private properties within the LSP that may need to be considered under future individually referred actions pursuant to the EPBC Act and/or the BC Act (**Figure 6**). Specifically, these include the loss of up to:

- 48 individual *C. undulatum* plants (9% of known plants in the LSP area)
- 6.15 ha of vegetation potentially representative of Banksia Woodlands of the SCP TEC (40% of mapped TEC extent in the LSP area)
- 6.15 ha of vegetation potentially representative of TEC FCT 20a (40% of mapped TEC extent in the LSP area)
- 234 potential habitat trees suitable for black cockatoos (57% of identified potential habitat trees in the LSP area)
- 9.38 ha of high-quality black cockatoo foraging and potential breeding habitat (49% of high-quality foraging habitat mapped in the LSP area).

These calculations assume that all key biodiversity values *outside* of the conservation and LOS areas are likely to be lost through clearance of vegetation. This may not necessarily be the case, particularly in regards to scattered trees, some of which may be retained through future subdivision processes, and other values where a proponent may make the decision to pursue additional avoidance in response to environmental approval requirements.

In addition, it is important to note that not all impacts associated with future individually referred actions pursuant to the EPBC Act are likely to be considered significant. Under the existing legislative framework, impacts will need to be considered on a case-by-case basis by each separate proponent, and therefore some quantum of the total cumulative impact identified above may not be considered through EPBC Act referrals, and further not all referred actions would necessarily be considered 'controlled actions' requiring assessment and approval.

5.2 Proposed Strategic Conservation Benefit

At the time the LSP was being finalised, the intent for avoidance and mitigation of impacts was relatively clear, however there were five options identified in terms of how the key environmental values would be accommodated by the LSP and beyond, in the context of all of the LSP area being zoned Urban under the MRS and Urban Development zone in the local scheme. These were:

- Option A - Parks and Recreation reservation through an amendment to the MRS
- Option B - Local government acquires environmentally significant areas through a DCP and manages the land as a single environmental conservation reserve
- Option C - Land to remain in the Urban Development zone and environmental values protected by State and Federal legislation – land in private ownership with residential use to continue

- Option D - Areas of environmental significance to be rezoned Environmental Conservation – land in private ownership with residential use to continue
- Option E - Land to remain in the Urban Development zone with provisions in the structure plan to manage environmental values – land in private ownership with residential use to continue.

Options C, D and E all involved ongoing private ownership of the avoided impact areas, with residential use to continue. Options C and E would have also involved the land continuing to remain in the Urban Development zone in the long term, and Option D would have involved the same in the short to medium term until a Conservation Zone was put in place, and there was uncertainty regarding the pathway and likelihood of ultimately achieving this outcome. Options C, D and E would have facilitated the avoidance and mitigation of impacts arising from residential development as proposed by the LSP. However none of these options would have mitigated the risk of the entire loss of environmental values in the long term nor the risk of incremental ongoing decline in the quality of environmental values in the long term, or enabled the consolidation and ongoing management of these areas to enable an incremental improvement in the long term. Given the degree of land ownership fragmentation (i.e. the small size and number of individual land parcels with different owners) this was not only a significant risk, but also posed a significant barrier to the appropriate ongoing future management of these areas.

The proposed strategic mitigation approach is based on a combination of Options A and B and will result in long-term conservation benefits in addition to impact avoidance and mitigation across the LSP area through the resolution of tenure of the environmental conservation and LOS areas, as well as Kal assuming responsibility for ongoing management and maintenance of these areas. Management by Kal will not only prevent further loss of existing key biodiversity values, but ultimately enhance these biodiversity values through the implementation of a coordinated maintenance regime, currently absent due to the location of the values within private ownership. This extends beyond just the avoidance and mitigation of impacts, as avoidance and mitigation (without further averted losses or conservation gains) could have been achieved through leaving the land in private ownership, or designated as open space with no consideration of ongoing conservation management.

The state/local government enacted conservation benefits are not 'environmental offsets' under the EPBC Act per se, but rather they should be considered informally at this stage as allowing for a significant long-term conservation benefit which would counterbalance the worst case future residual cumulative impacts. It is only when the individual referred action residual impacts are being considered through future referrals pursuant to the EPBC Act that the formal requirement for environmental offsets may be raised.

Nevertheless, to gain an understanding of how the proposed state/local government enacted conservation benefits might be considered in relation to being a counterbalance for the worst case future cumulative residual impacts, the following section contains a holistic appraisal of the theoretical offset requirements and conservation benefits across the LSP area.

It is important to note that legislative frameworks and policies/guidelines are currently in place that require individual proponents to secure their own future offset outcomes (where deemed necessary) for EPBC Act controlled actions. In addition, there are known processes and local knowledge available to facilitate such outcomes should they be required. The ultimate responsibility for securing

offsets to support environmental approvals will always rest with the proponent, however facilitating these conservation benefits ensures that the LSP is ultimately implementable given the residual environmental impacts, and that some consideration would be given to this by future decision makers during assessments pursuant to the EPBC Act and BC Act.

Key assumptions that the proposed state/local government enacted conservation benefits are based on are:

- The WAPC will facilitate the rezoning and subsequent acquisition of the environmental conservation areas through an amendment to the MRS.
- Kal will implement a DCP for the LSP area that enables the acquisition of the LOS areas.
- Removal of all existing infrastructure, dwellings and structures within the environmental conservation and LOS areas will be undertaken by the state/local government as per the Management Agreement executed by Kal and the WAPC. Specifically, WAPC will be responsible for this in environmental conservations areas, and Kal responsible for this in LOS areas.
- Kal will assume responsibility for long term management and maintenance of all environmental conservation and LOS areas within the LSP through a Management Agreement executed by Kal and the WAPC.

5.3 EPBC Act Requirements

To provide a transparent framework for applying environmental offsets through EPBC Act assessment and approvals, DAWE have developed an EPBC Act offset calculator which calculates the percentage coverage that each offset equates to, based on the offset type and attributes, and the residual impact from the project.

In relation to the residual cumulative impacts on Commonwealth listed MNES within the LSP area, calculations have been run using this EPBC offset calculator to determine how the proposed state/local government enacted conservation benefits might be considered a strategic 'offset' for MNES values in the LSP area. Values used in the offset calculations to determine the likely offset requirements are detailed in **Table 11,** with descriptions and the basis of the parameters outlined below. It is noted that these calculations are based on a number of assumptions regarding future development of the LSP area (detailed in **Section 5.2**) and would be subject to refinement at the individual project scale through referral of future individual actions.

Descriptions of parameters used in **Table 11**:

- **Area of impact** – The area of habitat/community impacted
- **Quality of impacted area** - The quality score for area of habitat/community being impacted – a measure of how well a particular site supports a particular threatened species or ecological community and contributes to its ongoing viability
- **Time over which loss is averted** - This describes the timeframe over which changes in the level of risk to the proposed mitigation site can be considered and quantified
- **Time until ecological benefit** - This describes the estimated time (in years) that it will take for the main benefit of the quality (habitat/community) improvement of the proposed offset to be realised

- **Start quality** - The quality score for the area of habitat/community proposed as an offset – a measure of how well a particular site supports a particular threatened species or ecological community and contributes to its ongoing viability
- **Future quality without offset** - The predicted future quality score (habitat/community) of the proposed offset without the offset
- **Future quality with offset** - The predicted future quality score (habitat/community) of the proposed offset with the offset
- **Risk of loss (%) without offset** - This describes the chance that the habitat/community on the proposed offset will be completely lost (i.e. no longer hold any value for the protected matter of concern) over the foreseeable future without an offset
- **Risk of loss (%) with offset** - This describes the chance that the habitat/community on the proposed offset will be completely lost (i.e. no longer hold any value for the protected matter of concern) over the foreseeable future with an offset.
- **Confidence in result** - The level of certainty about the successful achievement of the proposed change in quality (habitat/community) or value (features/individuals)

Table 11: Values utilised for calculating anticipated offset requirements for residual impacts on MNES across the LSP area

Parameter		Input	Assumptions
Conospermum undulatum			
Impact	**Description**	Individual plants being removed	Individual plants being cleared/destroyed as part of residential development activities across the LSP area.
	Quantum of impact	48 individual plants	Removal of all individual identified *C. undulatum* plants outside of conservation and LOS areas.
	Information sources	AECOM 2017b, Strategen 2018	The surveys undertaken to support the LSP, which is the most current available information and is deemed to be adequate for the purposes of this calculation.
Offset	**Proposed offset**	Retention of 477 individual plants	Retention of all individual *C. undulatum* plants located inside conservation and LOS areas. This outcome would be ensured through the preparation of detailed conservation area and LOS management plans as detailed in **Section 6**.
	Time horizon	20 years	While the establishment of protection measures would occur as a priority once LSP approved by WAPC, it is expected that the actual implementation would occur over a number of years. 20 years is a conservative estimate in this regard, as it is possible that implementation of the tenure and conservation management activities could occur sooner than this.
	Start value	477 plants	Number of individual *C. undulatum* plants currently located inside designated conservation and LOS areas and that would be retained.
	Future value without offset	429 plants	Allowance for loss of approximately 10% of plants through ongoing incremental loss associated with existing rural residential land uses in the LSP area. This would occur as direct losses through the destruction of plants, or as indirect losses through habitat degradation and secondary impacts resulting in the mortality of individual plants. Given the number of individual property owners across the

Parameter		Input	Assumptions
			conservation areas, 10% is considered to be a reasonable loss assumption.
	Future quality with offset	477 plants	Ensuring that all least the same number of plants are retained in the long term as compared with the initial retention and protection of all individual plants located within conservation and LOS areas. This is conservative as it is expected that if appropriate management is undertaken, there is likely to be not only the retention of the existing plants, but further recruitment of *C. undulatum* but this additional recruitment has not been factored into the calculations.
	Confidence in result	90%	High level of confidence in success of securing and then managing conservation estate given the mechanisms proposed.
Banksia Woodlands of the Swan Coastal Plain Threatened Ecological Community			
Impact	**Description**	Clearance of 6.15 ha of TEC	Bansksia woodland TEC cleared/destroyed as part of residential development activities across the LSP area.
	Area	6.15 ha	Removal of all mapped TEC extent outside of the conservation and LOS area.
	Quality (scale 0-10)	7	The majority of the TEC patches are identified as being in 'good' to 'excellent' condition (AECOM 2017a). The type of Banksia woodland is quite poorly represented which would increase its contextual value. Notwithstanding this, the area of Banksia woodland has been aggregated, and does not occur as a single consolidated patch which would reduce the overall quality scale rating. Therefore 7 is seen as an appropriate rating.
	Information source	AECOM 2017a, Strategen 2018	The surveys undertaken to support the LSP, which is the most current available information and is deemed to be adequate for the purposes of this calculation.
Offset	**Proposed offset**	Retention of 9.35 ha of TEC	Retention of all mapped TEC extent located inside conservation and LOS areas. This outcome would be ensured through the preparation of detailed conservation area and LOS management plans as detailed in **Section 6**.
	Time over which loss is averted	20 years	Placement in secure conservation tenure in perpetuity, with ongoing management by Kal. The maximum allowable value is 20 years.
	Time until ecological benefit	20 years	Establishment of protection measures as a matter of priority once LSP approved by WAPC, but implementation to occur over a number of years. 20 years is a conservative estimate in this regard, as it is possible that implementation of the tenure and conservation management activities could occur sooner than this.
	Start area	9.35 ha	Extent of TEC currently mapped as being located inside conservation and LOS areas.
	Start quality (scale 0-10)	7	The majority of the TEC patches are identified as being in 'good' to 'excellent' condition (AECOM 2017a). The type of Banksia woodland is quite poorly represented which would increase its contextual value. Notwithstanding this, the area of Banksia woodland has been aggregated, and do not occur

Parameter		Input	Assumptions
			as a single consolidated patch which would reduce the overall quality scale rating. Therefore 7 is seen as an appropriate rating.
	Risk of loss without offset	45%	The expected risk of complete loss without offset for large consolidated, single owner offsite offset sites is generally accepted to be between 10% to 15% Given the proposed offset area is currently in multiple ownership, is in the metropolitan area, zoned Urban Development, and is currently used for residential uses the risk of loss should be significantly higher than usually expected for offsite offset sites in rural locations. In addition, given that the complete loss of Banksia woodland within the site would only require further fragmentation and decline in condition (to less than 'Good' condition), it is very plausible that without the offset (i.e. change in tenure and ongoing management) that in 20 years the vegetation would not be representative of Banksia woodland any more. Total loss does not require full clearing of the vegetation.
	Future quality without offset (scale 0-10)	5	Accounting for the high likelihood of ongoing incremental clearing and fragmentation of TEC patches associated with existing rural residential land uses in the LSP area, as well as increased degradation of TEC patches through weed infestation and potential dieback spread, it is expected that a decline in 2 future quality scale ratings (i.e. from 7 to 5) is reasonable and entirely plausible given the unique situation and high level of ongoing threat given the fragmented land ownership.
	Risk of loss with offset	5%	With the offset, there is still some risk of complete loss, but this is significantly lower than without. Loss could occur through broader events such as wildfire, climate change or change in Government intentions to rezone the conservation areas or for local government to development the land. There are agreements and mechanisms in place to respond to the latter, but there is some minor ongoing risk of wildfire and climate change related loss.
	Future quality with offset (scale 0-10)	8	Given the placement of land in secure tenure with ongoing management, the currently fragmented areas can be managed as a consolidated conservation area. This will enable effective management but also facilitate passive recruitment in areas previously maintained as cleared such as individual property firebreaks.
	Confidence in result	90%	High level of confidence in success of securing and then managing conservation estate given the mechanisms proposed.
Black cockatoo habitat			
Impact	**Description**	Clearance of 9.38ha of BC potential breeding & foraging habitat	BC habitat cleared/destroyed as part of residential development activities across the LSP area.
	Area	9.38 ha	Assuming all BC habitat outside of conservation and LOS areas is removed.
	Quality (scale 0-10)	7	Foraging habitat quality has been identified as high quality, based on presence of suitable foraging species, Jarrah

Parameter		Input	Assumptions
			woodlands, presence of water availability within 2km and support of trees with potential to be used for breeding (AECOM 2017b). Contextually, however, there is no known breeding or roosting activity in close proximity to the site.
	Information source	AECOM 2017b, Strategen 2018	The surveys undertaken to support the LSP, which is the most current available information and is deemed to be adequate for the purposes of this calculation.
Offset	**Proposed offset**	Retention of 9.87 ha of BC foraging habitat	Assuming retention of all mapped BC habitat located inside conservation and LOS areas. This outcome would be ensured through the preparation of detailed conservation area and LOS management plans as detailed in **Section 6**.
	Time over which loss is averted	20 years	Assuming placement in secure conservation tenure in perpetuity with ongoing management by Kal. The maximum allowable value is 20 years.
	Time until ecological benefit	20 years	Establishment of protection measures as a matter of priority once LSP approved by WAPC, but implementation to occur over a number of years. 20 years is a conservative value in this regard, as it is possible that implementation of the tenure and conservation management activities could occur sooner than this.
	Start area	9.87 ha	Assuming retention of all mapped BC habitat located inside conservation and LOS areas.
	Start quality (scale 0-10)	7	Foraging habitat quality has been identified as high quality, based on presence of suitable foraging species, Jarrah woodlands, presence of water availability within 2km and support of trees with potential to be used for breeding (AECOM 2017b). Contextually there is no known breeding or roosting activity in close proximity to the site.
	Risk of loss without offset	30%	risk of complete loss without offset for large consolidated, single owner offsite offset sites is generally accepted to be between 10% to 15% Given the offset area is currently in fragmented multiple ownership, is in the metropolitan area, zoned Urban Development, and is currently used for residential uses the risk of loss should be higher than usually expected for offsite offset sites in rural locations. Therefore 30% has been assumed on the basis that the risk of complete loss should be considered double that of single ownership offsite offset sites over 20 years. Total loss would result though incremental degradation combined with the intention in the future to develop the area (given its zoning), or incremental impacts to the extent that the value is entirely lost regardless of land use change/development.
	Future quality without offset (scale 0-10)	6	Accounting for the high likelihood of ongoing incremental clearing and fragmentation of BC habitat associated with existing rural residential land uses in the LSP area, as well as increased degradation of habitat and loss of foraging species through weed infestation and potential dieback spread, it is expected that a decline in 1 future quality scale rating (i.e. from 7 to 6) is reasonable and entirely plausible given the unique situation and high level of ongoing threat.
	Risk of loss with offset	5%	With the offset, there is still some risk of complete loss, but this is significantly lower than with the offset. Complete loss

Parameter		Input	Assumptions
			could occur through broader events such as wildfire, climate change or change in Government intentions to rezone the conservation areas or for local government to development the land. There are agreements and mechanisms in place to respond to the latter, but there is some minor ongoing risk of wildfire and climate change related loss.
	Future quality with offset (scale 0-10)	8	Given the placement of land in secure tenure with ongoing management, the currently fragmented areas can be managed as a consolidated conservation area. This will enable effective management but also passive recruitment in areas previously cleared such as individual property firebreaks. In addition, the removal of a large number of residential dwellings and associated residential/human activities would make the habitat more desirable for undisturbed foraging or nesting/breeding activity.
	Confidence in result	90%	High level of confidence in success of securing and then managing conservation estate given the mechanisms proposed.

Applying the inputs outlined in **Table 11** to the EPBC offset calculator (individually calculated for each MNES), a summary of the anticipated residential impacts on MNES and potential offset requirements is provided in **Table 12**.

Table 12: Anticipated residual impacts on MNES and potential offset requirements across the LSP area

MNES	Residual impact	Potential offsets enacted by state/local government	Offset calculator (approx.)
C. undulatum	Removal of up to 48 individual plants.	Protection of 91% (477 plants) of existing plants in LSP area.	86% of offset requirement
Banksia Woodlands of the SCP	Removal of up to 6.15 ha of vegetation representative of the TEC.	Protection of 60% (9.35 ha) of existing TEC extent in LSP area.	75% of offset requirement
Carnaby's cockatoos and forest red-tailed black cockatoos	Removal of up to 9.38 ha of potential foraging and breeding habitat.	Protection of 51% (9.87 ha) of existing foraging and breeding habitat in LSP area.	CBC = 36% of offset requirement FRTBC = 42% of offset requirement

The results provided in **Table 12** indicate that a substantial portion of the potential future individual offset requirements for each MNES would theoretically be satisfied through the conservation benefit arising from actions undertaken by the state/local government (i.e. acquisition and transfer of land to secure conservation tenure and ongoing management/maintenance) that would also allow for future additional activities such as additional revegetation and enhancement.

It is recognised that there are difficulties and limitation to connecting the proposed environmental conservation benefits (potential offsets) identified in **Table 12** to future individually referred actions under the EBPC Act. A formal mechanism does not exist for linking these overall conservation benefits achieved by the state/local government to future individual EPBC Act referrals and offset requirements within the LSP area. By presenting them in this SCMP it is intended that any future

EPBC Act referrals and any subsequent assessments would take this strategic information into consideration.

5.4 BC Act Requirements

An assessment of the proposed strategic conservation benefits against the WA Offsets Policy (Government of WA 2011) is provided in **Table 13**. This assessment demonstrates that the proposed conservation benefits to be facilitated through the LSP implementation are consistent with the state government's principles for the use of environmental offsets.

While the DBCA are unable to provide formal endorsement that may pre-empt future decisions under the BC Act, the DBCA have informally indicated that the proposed extent of retention of key biodiversity values through the LSP is generally considered suitable. Informal confirmation was also provided that a degree of flexibility exists in the BC Act which would allow for consideration of any state/local government enacted conservation benefits during assessment of future individual authorisation requests. This is particularly important as the conservation benefits, when considered holistically across the LSP, are likely to satisfy the offset requirements for the residual adverse impacts on biodiversity values relevant to the BC Act.

Table 13: Assessment against the state government's principles for the use of environmental offsets

Environmental offset principle	Comment
1. Environmental offsets will only be considered after avoidance and mitigation options have been pursued.	**Consistent with principle** • The LSP has applied a strategic mitigation approach based on a hierarchy of avoidance, mitigation and offsetting that seeks to reduce the likely impacts on the key biodiversity values. The following measures will be enacted by the state/local government through the implementation of the LSP: • *Avoidance* – the LSP designates 13 environmental conservation areas and 9 LOS areas, spanning across the LSP area and located where there is the greatest potential to avoid impacts on key biodiversity values. • *Mitigation* – the LSP layout has sought to mitigate impacts on the retained biodiversity values through provision of a green linkage/ecological corridor, designed to incorporate areas of active parkland, conservation, significant stands of vegetation and existing Bush Forever areas. Management of this corridor by Kal will ensure that recreational uses within the LOS are complementary to the retention of identified biodiversity values, effectively buffering the designated environmental conservation areas from the surrounding urban environment and ensuring the long-term viability of the retained biodiversity values. The LSP also requires the preparation of CEMPs to support all future applications for development of landholdings within 100 m of designated environmental conservation areas that specify how threats and risks to biodiversity values within the environmental conservation areas will be managed both pre-construction and during construction.
2. Environmental offsets are not appropriate for all projects	**Consistent with principle** • The proposed strategic conservation benefit is considered appropriate for the LSP area as it provides an opportunity to increase the overall environmental conservation benefit by facilitating development of an enhanced network of conservation/LOS areas in secure tenure with ongoing management by a single public entity (Kal).
3. Environmental offsets will be cost-effective, as well as relevant and proportionate to the significance of the	**Consistent with principle** • There are significant costs associated with achieving the proposed state/local government enacted conservation benefits.

Environmental offset principle	Comment
environmental value being impacted.	• The alternative, however, is that individual proponents are left to pursue their own offset requirements. Given the level of difficulty associated with offsetting the specific biodiversity values identified on this site (notably *C. undulatum* and TEC FCT 20a), the costs of the holistic conservation benefits, weighed up against the costs and time required to individually source offsets could be similar or more. Furthermore, it is likely to be extremely difficult to individually source appropriate offsets for these key biodiversity values outside of the LSP area. • On this basis the proposed state/local government enacted strategic conservation benefit provides a more cost-effective approach to resolve the significance of the key biodiversity values being impacted.
4. Environmental offsets will be based on sound environmental information and knowledge.	**Consistent with principle** • A wide range of technical assessments have been undertaken across the LSP area, as well as consultation with relevant state agencies, to ensure that decisions are informed by sound environmental information and knowledge that is credible and capable of external review and independent scrutiny.
5. Environmental offsets will be applied within a framework of adaptive management.	**Consistent with principle** • Kal will be assuming responsibility for all conservation and LOS areas throughout the LSP. On this basis Kal will establish a framework of adaptive management for the retention and enhancement of the biodiversity values through preparation and implementation of detailed management plans.
6. Environmental offsets will be focused on longer term strategic outcomes.	**Consistent with principle** • The proposed state/local government enacted conservation benefits are considered a preferable longer-term strategic outcome to the alternative approach of requiring individual proponents to secure their own offset requirements in the future in an ad hoc manner as developments take place. • Such an individual approach would be likely to result in more fragmented offset outcomes with little strategic focus on the longer-term outcome. • In comparison the proposed state/local government enacted conservation benefits provide for an enduring, enforceable and longer-term strategic outcome.

6 Implementation

6.1 Acquisition of Land

6.1.1 Conservation Areas

The LSP identifies approximately 10 ha of land within 13 areas for environmental conservation purposes. These thirteen environmental conservation areas contain vegetation of state and national significance (**Table 14**), warranting both the reservation of the sites and the use of public funds to secure their acquisition.

The sites will therefore be progressively acquired by the WAPC, using the Metropolitan Region Improvement Fund (MRIF) which becomes available through an amendment to the MRS, reserving the sites as 'Parks and Recreation.' It is noted that this level of statutory intervention by the WAPC is not typical, and is only provided in this instance to support timely development of the Forrestfield North Residential Precinct as a METRONET related project.

Table 14: Identified key biodiversity values to be retained in environmental conservation areas

Key biodiversity values	Existing extent identified in LSP area	Extent proposed to be retained in conservation areas
Conospermum undulatum (Wavy smoke bush)	525 plants	454 plants (86%)
TEC (FCT20a) / Banksia Woodlands of the SCP TEC	15.5 ha	6.49 ha (42%)
Potential habitat trees for black cockatoos	411 trees (26 with hollows)	64 trees (16%) (3 with hollows, 12%)
High quality foraging habitat for black cockatoos	19.25 ha	6.69 ha (35%)

6.1.2 Local Open Space

The LSP identifies nine areas of Local Open Space. These areas contain less biodiversity values (specifically *C. undulatum* plants), however still have important vegetation that requires protection (**Table 15**).

To protect these values Kal will progressively acquire the LOS areas through a DCP, established and administered by Kal. This funding mechanism will ensure that all landowners within the LSP contribute equitably to the provision of open space via a monetary contribution at the time of subdivision or development.

Table 15: Identified key biodiversity values to be retained in LOS areas

Key biodiversity values	Existing extent identified in LSP area	Extent proposed to be retained in LOS areas
Conospermum undulatum (Wavy smoke bush)	525 plants	23 plants (4%)
TEC (FCT20a) / Banksia Woodlands of the SCP TEC	15.5 ha	2.86 ha (18%)
Potential habitat trees for black cockatoos	411 trees (26 with hollows)	113 trees (27%) (14 with hollows, 54%)
High quality foraging habitat for black cockatoos	19.25 ha	2.91 ha (15%)

6.2 Vesting and Ongoing Management and Maintenance

Following acquisition, removal of infrastructure, dwellings and structures within the environmental conservation and LOS areas will be gradually undertaken by the state/local government as per the Management Agreement executed by Kal and the WAPC.

To ensure that the biodiversity values are properly protected and enhanced over time, Kal will assume responsibility for long term management and maintenance of all environmental conservation and LOS areas in the LSP under a Management Agreement executed by Kal and the WAPC. This Management Agreement is currently being prepared and will be finalised with the LSP approval.

Management of these areas by Kal will not only prevent further loss of existing key biodiversity values, but ultimately enhance these biodiversity values through the implementation of a coordinated maintenance regime, currently absent due to the location of the values within private ownership. Furthermore, having a single entity coordinating management across all the environmental conservation and LOS areas within the LSP will ensure the appropriate integration of passive open spaces with conservation areas, whilst protecting the key biodiversity values of the areas.

To ensure these conservation benefits are achieved, Kal will prepare two separate management plans as follows:

6.2.1 Forrestfield North Environmental Conservation Area Management Plan

This management plan will detail specific management activities and ongoing monitoring actions to be undertaken within each of the environmental conservation areas of the LSP, with the purpose of maintaining and enhancing the existing retained biodiversity values. The management plan will be prepared by Kal on advice from DBCA and finalised prior to Kal assuming responsibility for ongoing management and maintenance of the environmental conservation areas under a Management Agreement executed by Kal and WAPC on [to be inserted]. The Agreement provides for the making and execution of the Environmental Conservation Area Management Plan.

Primary maintenance/management activities that will be addressed in the detailed Environmental Conservation Area Management Plan are outlined in **Table 16**.

Table 16: Actions to be addressed in the Forrestfield North Environmental Conservation Area Management Plan

Factors	Details
Access control	Public access to the conservation areas will be restricted to minimise negative impacts to key biodiversity values such as accidental trampling or degradation of habitat. Fencing will be required around all conservation areas. Signage may be erected to identify environmental conservation areas, which could involve educational material regarding the environmental value of the vegetation.
Weed control	Weed control will be required to reduce and limit weed cover within and adjacent to all environmental conservation areas to minimise weed invasion in the retained vegetation and reduce edge effects from adjacent private properties/LOS.
Rubbish removal	All infrastructure, dwellings and structures will be progressively removed by the state/local government from the environmental conservation areas. However, it is likely that there will still be remaining rubbish that will require removal from within these areas, as well as ongoing removal of litter or illegal dumping that may occur.
Pathogen risk reduction and hygiene control	A variety of pathogens have potential to occur in the LSP area but their current status is unknown. In particular, *Phytophthora cinnamomi* (commonly known as dieback), has potential to occur and plants species that are known to be susceptible to dieback are present. A dieback survey will be undertaken for all environmental conservation areas. If dieback is found to be present, the extent of spread will be determined and the area delineated for containment. Precautionary hygiene measures are recommended to be undertaken to minimise the potential for introduction and/or spread of pathogens and/or weeds during maintenance/management works. Examples of precautionary measures are as follows: • Vehicles, tools, equipment and machinery used in maintenance/management activities by or on behalf of Kal must be inspected to ensure that they are free of mud, soil and plant material prior to entering environmental conservation areas. • Personnel undertaking maintenance/management works within or adjacent to conservation or LOS areas must inspect footwear to ensure that they are free of mud, soil and plant material prior to entering environmental conservation areas. • If required, imported fill or mulch material is to be certified free of dieback before use in environmental conservation areas.
Pest animal management	Pest animals, particularly rabbits, will be managed on an as required basis, using methods such as trapping, baiting and fumigation subject to advice from a licenced pest management technician.
Fire management	Firebreaks, tracks and access points will be maintained around all environmental conservation areas.
Monitoring and maintenance	A detailed breakdown of ongoing monitoring and maintenance requirements will be provided for each of the factors listed above, including type of monitoring, frequency and timing.

6.2.2 Forrestfield North Local Open Space Management Plan

This management plan will detail specific management activities and ongoing monitoring actions to be undertaken within each of the LOS areas of the LSP, in order to maintain and enhance the existing retained biodiversity values (i.e. through access management, weed control etc.). The management plan will be prepared by Kal on advice from DBCA and finalised to support the DCP, prior to Kal assuming responsibility for ongoing management and maintenance of the LOS areas under a Management Agreement executed by Kal and WAPC on [to be inserted]. The Agreement provides for the making and execution of the Local Open Space Management Plan.

Rehabilitation and revegetation of degraded and completely degraded areas will be addressed in the LOS Management Plan and be considered as part of broader LOS design having regard to Liveable Neighbourhoods requirements for active open space. Individual proponents may consider undertaking revegetation actions to further improve biodiversity values within the LOS areas as part of future individual EPBC Act approvals, to be determined in consultation with Kal. This is further addressed in **Section 6.3.3**.

Primary maintenance/management activities that will be addressed in the detailed LOS Management Plan are outlined in **Table 17.**

Table 17: Actions to be addressed in the Forrestfield North Local Open Space Management Plan

Activities to be address	Detail
Access control	Vegetation to be retained within LOS areas will be clearly delineated and protected from harm through restricted public access in specific locations as determined by Kal through a landscaping plan. Directed access through limestone or other semi-sealed pathways and effective use of dense revegetation may assist in the LOS areas. Signage may be erected to identify management areas, which could involve educational material regarding the environmental value of the vegetation.
Weed control	Weed control will be required to reduce and limit weed cover within all LOS areas, but particularly in and around vegetation being retained the conservation areas to minimise weed invasion that may result in degradation of biodiversity values.
Rubbish removal	All infrastructure, dwellings and structures will be progressively removed by the state/local government from the LOS areas. However, it is likely that there will still be remaining rubbish that will require removal from within these areas, as well as ongoing removal of litter or illegal dumping that may occur.
Landscaping requirements	Detailed landscaping plan(s) will be prepared for all LOS areas indicating: • Locations of key biodiversity values being retained • Extent of manicured planting proposed, including details of species to be used • Street tree locations and species proposed • Turf areas • Street swales and rain gardens The landscaping plan(s) will include details on nutrient and irrigation management to ensure that proposed landscaping works will not adversely impact on retained biodiversity values within the LOS areas.
Complementary uses within LOS areas	A detailed breakdown of the type of recreation activities that are permitted to occur within each LOS area will be provided, ensuring that uses adjacent to conservation areas or retained biodiversity values in LOS are complementary. The designation of appropriate complementary uses will be driven by the landscaping plan(s).
Pathogen risk reduction and hygiene control	A variety of pathogens have potential to occur in the LSP area but their current status is unknown. In particular, *Phytophthora cinnamomi* (commonly known as dieback), has potential to occur and plants species that are known to be susceptible to dieback are present. A dieback survey will be undertaken for all LOS areas. If dieback is found to be present, the extent of spread will be determined and the area delineated for containment. Precautionary hygiene measures are recommended to be undertaken to minimise the potential for introduction and/or spread of pathogens and/or weeds during maintenance/management works. Examples of precautionary measures are as follows: • Vehicles, tools, equipment and machinery used in maintenance/management activities by or on behalf of Kal must be inspected to ensure that they are free of mud, soil and plant material prior to entering LOS areas.

Activities to be address	Detail
	• Personnel undertaking maintenance/management works within or adjacent to conservation or LOS areas must inspect footwear to ensure that they are free of mud, soil and plant material prior to entering LOS areas. If required, imported fill or mulch material is to be certified free of dieback before use in environmental conservation areas.
Pest animal management	Pest animals, particularly rabbits, will need to be managed on an as required basis, using methods such as trapping, baiting and fumigation subject to advice from a licenced pest management technician.
Monitoring and maintenance	A detailed breakdown of ongoing monitoring and maintenance requirements will be provided for each of the factors listed above, including type of monitoring, frequency and timing.

6.3 Additional Future Obligations and Requirements of Individual Proponents

Although a substantial portion of the potential future offset requirements can be achieved through the state/local government enacted conservation benefits, there will still be a potential shortfall in terms of the EPBC offset requirements for residual impacts. To address such a shortfall there are a number of additional measures that future individual proponents may wish to pursue, which are outline further below.

6.3.1 Avoidance

Individual proponents may consider retaining additional plants/vegetation within landholdings as localised open space to better facilitate environmental approvals associated with future individual developments.

6.3.2 Mitigation

In accordance with the LSP all proponents of future developments located within 100 m of an environmental conservation area will be required to prepare a Construction Environmental Management Plan (CEMP) that ensures biodiversity values in these areas are protected. The CEMPs are to incorporate environmental elements pre-construction and during construction, including management of potential threats and risks associated with construction activities adjacent to the environmental conservation areas such as dieback, fauna and habitat management. Specific requirements relevant to each key biodiversity value are outlined in **Section 4**.

6.3.3 Offsetting

In consultation with Kal, individual proponents may consider undertaking actions to further improve biodiversity values within the conservation and/or LOS areas of the LSP. Such actions may include:

- Translocation or propagation (from seeds or cuttings) of individual *C. undulatum* plants into the established conservation areas. Results from propagation studies undertaken with *C. undulatum* plants at the Perth airport provide confidence that propagation from seed or cuttings of semi-hardwood material can be successful in Western Australia (Close D.C 2006).
- Revegetation of degraded areas within the conservation/LOS areas (including within the existing Bush Forever areas such as Lot 82 Brae Road) to improve the status and viability of

vegetation representative of the TEC and habitat supportive of *C. undulatum.* Ongoing weed control and vegetation management will be required to limit the influence of weeds and other native species on revegetation areas. Supplementary watering may also improve survival of existing *C. undulatum* plants during summer months (Emerge 2018).

- Acquisition and protection of off-site offsets containing suitable black cockatoo foraging and/or potential breeding habitat.
- Planting of potential habitat trees for black cockatoos within established conservation areas or off-site offset sites.

Figure 7 provides an indicative overview of conservation and LOS areas within the LSP which may be suitable for future revegetation/restoration works to address potential shortfalls in terms of offset requirements for residential impacts on MNES. These locations have been identified through a brief site walkover by an Emerge Associates in February 2020, and will require further detailed investigation to confirm site suitability and specific revegetation requirements with Kal should any future proponents select to pursue this option.

As demonstrated in **Section 5.4**, the proposed state/local government enacted conservation benefits are likely to satisfy future offset requirements for impacts on biodiversity values relevant to the BC Act. This does not preclude the need for future licences and authorities to be secured by individual proponents in the future, however discussions with the DBCA have indicated that regard could be given to broader conservation benefits achieved for the LSP area, which would likely negate the need for additional potentially duplicative offset requirements to be sought.

6.4 Summary of Implementation Approach

In summary, the WAPC and Kal have agreed to implement the following strategic conservation management approach (**Table 18**).

Table 18: Forrestfield North Strategic Conservation Management Approach, Implementation Summary

Action		Description	Target Date
1	Forrestfield North Residential Precinct LSP	This SCMP forms part of the LSP which was approved by the WAPC on [to be inserted]. Under the LSP, Kal can only approve development that is for a purpose generally in accordance with the LSP. This will protect the areas identified in the LSP as Environmental Conservation and Local Open Space from urban development.	July 2020
2	Management Agreement	To ensure that the key biodiversity values are properly protected and enhanced over time, Kal will assume responsibility for ongoing management and maintenance of the Environmental Conservation and Local Open Space areas under a Management Agreement ('the Agreement') executed by Kal and WAPC on [to be inserted]. The Agreement provides for the making and execution of Management Plans referred to in Action 3 below.	July 2020
3	Management Plans	Separate Management Plans for the Environmental Conservation and Local Open Space areas will be prepared by Kal to the satisfaction of the WAPC on advice from DBCA. Actions to be addressed in the Management Plans are outlined in **Section 6.2**.	Dec 2020

Action		Description	Target Date
4	Metropolitan Region Scheme (MRS) Amendment	The WAPC to initiate an amendment to the MRS to reserve the Environmental Conservation areas as Park and Recreation. This provides the highest level of protection from incompatible development under the state planning system.	July 2020
5	Acquisition of Environmental Conservation Areas	Following initiation of the MRS amendment, the WAPC will progressively acquire the private land affected by the Environmental Conservation areas. Once acquired, the land will be managed and enhanced by Kal under the terms of the Management Agreement and Management Plan.	Progressively from July 2020
6	Acquisition of Local Open Space	Private properties identified as Local Open Space will be progressively acquired by Kal using revenue from the Forrestfield North Development Contribution Plan (DCP). Once acquired, the land will be managed and enhanced by Kal under the terms of the Management Agreement and Management Plan.	Progressively as funds accumulate in the DCP
7	Demolition and Enhancement	Once the affected private land is acquired, buildings and structures will be removed as required in preparation for enhancement under the relevant Management Plan.	Ongoing
8	Cell Density Plans	The LSP requires the preparation of Cell Density Plans for 10 identified development cells prior to subdivision or development. The Cell Density Plans must demonstrate, to the satisfaction of Kal on advice from DBCA, how residual biodiversity impacts have been mitigated through appropriate tree retention and/or creation of small parks or public spaces.	Prior to subdivision or development
9	Subdivision and/or development	Any applications for subdivision or development that trigger an action under the EPBC Act will be referred to the DAWE with residual impacts to be considered individually.	Prior to subdivision or development
10	Construction Environmental Management Plans	The LSP requires all proponents of future developments located within 100m of an Environmental Conservation area to prepare a construction environmental management plan (CEMP) to ensures biodiversity values in these areas are protected. The CEMP's are to incorporate environmental elements pre-construction and during construction, including management of potential threats and risks associated with construction activities adjacent to the Environmental Conservation areas such as dieback, fauna and habitat management.	Prior to Development
11	Proponent environmental offsets	As an option of last resort unlikely to be required, the securing of environmental offsets may be required. If and where required, individual proponents will address residual impacts through the provision of environmental offsets.	Prior to Development

7 Conclusion

Key biodiversity values historically identified within the LSP area include:

- *Conospermum undulatum* (Wavy-smoke bush)
- *Banksia Woodlands of the Swan Coastal Plain Threatened Ecological Community* (TEC)
- TEC FCT 20a *Bankia attenuata woodlands over species rich dense shrublands*
- Foraging/potential breeding habitat for Carnaby's cockatoo (*Calyptorhynchus latirostris*) and forest red-tailed black cockatoo (*Calyptorhynchus banksii naso*).

These biodiversity values are supported by vegetation which is currently scattered in individual and semi contiguous patches across the entire LSP area that ranges in intactness and condition. As the LSP extends almost entirely across private landholdings in freehold ownership, there is no existing planning or environmental framework in place to ensure the long-term preservation and management of these biodiversity values. The exception being a small reserve referred to as Smokebush Place Reserve located at 39 Smokebush Place, High Wycombe (Lot 50 on D033847) which is managed by Kal.

Future implementation of the LSP is likely to result in residual biodiversity impacts which will need to be addressed pursuant to the EPBC Act and BC Act.

Strategic Mitigation Approach

The LSP has applied a strategic mitigation approach based on a hierarchy of avoidance, mitigation and offsetting that seeks to reduce the likely impacts on the key biodiversity values. The following measures will be enacted by the state/local government through the implementation of the LSP:

Avoidance – the LSP designates thirteen environmental conservation areas and nine local open space (LOS) areas, spanning across the LSP area and located where there is the greatest potential to avoid impacts on key biodiversity values. The future acquisition and management of these areas is part of a broader conservation gain enacted by the state/local government (see below).

Mitigation – in addition to avoidance of impacts, the LSP layout has sought to mitigate impacts on the retained biodiversity values through provision of a green linkage/ecological corridor, designed to incorporate areas of active parkland, conservation, significant stands of vegetation and existing Bush Forever areas. Management of this corridor by Kal will ensure that recreational uses within the LOS are complementary to the retention of identified biodiversity values, effectively buffering the designated environmental conservation areas from the surrounding urban areas and ensuring the long-term viability of the retained biodiversity values. The LSP also requires the preparation of construction environmental management plans (CEMPs) to support all future applications for development of landholdings within 100 m of designated environmental conservation areas. The purpose of the CEMPs are to specify how threats and risks to biodiversity values within the environmental conservation areas will be managed both pre-construction and during construction to mitigate impacts.

Offsetting - taking into account the avoidance and mitigation measures proposed to be enacted by the state/local government, there will still be residual adverse impacts on key biodiversity values that will need to be offset. However, the confounding factor is that these residual impacts and

counterbalancing environmental offsets will ultimately be considered as part of multiple individual/separate proponent-driven environmental approval processes, rather than as one single consolidated action. To address this challenge, while balancing the competing objectives of environmental protection and urban intensification, the WAPC and Kal have agreed to implement the strategic conservation management approach outlined in **Table 18**.

This level of intervention is not typical and is only provided in this instance to support the delivery of a contemporary urban response to the Forrestfield-Airport Link project, a State and Commonwealth funded METRONET initiative.

The strategic conservation approach will result in long-term conservation gains across the LSP area. Specifically, through the confirmed tenure of the environmental conservation and LOS areas, as well as Kal assuming responsibility for long term management and maintenance of these areas. Management by Kal will not only prevent further loss of existing key biodiversity values, but ultimately enhance these biodiversity values through the implementation of a coordinated maintenance regime, currently absent due to the location of the values within private ownership.

A formal mechanism does not exist for linking these overall conservation benefits achieved by the state/local government to future individual EPBC Act referrals and offset requirements within the LSP area. However, an analysis of the likely future EPBC Act offset requirements across the LSP area (utilising the EPBC offsets calculator) has indicated that a substantial portion of the potential future individual offset requirements for each MNES could be achieved through the state/local government enacted conservation gains.

In the absence of a formal mechanism, it is requested that the committed actions under this SCMP are taken into account if and when any future actions in the LSP area are referred for consideration under the Commonwealth EPBC Act and State BC Act.

8 References

8.1 General references

The references listed below have been considered as part of preparing this document.

AECOM 2017a, *Forrestfield North Detail Flora and Vegetation Assessment: Floristic Community Type Analysis*, 60527304, Rev C.

AECOM 2017b, *Forrestfield North Level 2 Flora and Fauna Survey*, 60527304, Rev 0.

Close D.C, M. G., Krauss S.L., Rokich D.P., Stritzke J., and Dixon K.W., 2006, *Conservation biology of the rare species Conospermum undulatum and Macarthuria keigheryi in an urban bushland remnant*, Australian Journal of Botany, 54: 585-593.

Close, D. C., Messina, G., Krauss, S. L., Rokich, D. P., Stritzke, J. and Dixon, K. W. 2006, *Conservation biology of the rare species Conospermum undulatum and Macarthuria keigheryi in an urban bushland remnant*, Australian Journal of Botany, 54: 583-593.

Commonwealth of Australia 2012, *Environment Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy*, Canberra, Australia.

Department of Environment and Conservation (DEC) 2008, *Forest black cockatoo (Baudin's cockatoo Calyptorphynchus baudinii and forest red-tailed black cockatoo Calyptorphynchus banksii naso) Recovery Plan*

Department of Environment and Conservation (DEC) 2009, *National Wavy-leaved Smokebush (Conospermum undulatum) Recovery Plan*, Kensington WA.

Delnevo, N., van Etten, E.J., Byrne, M. and Stock, W.D., 2019, *Floral display and habitat fragmentation: Effects on the reproductive success of the threatened mass-flowering Conospermum undulatum (Proteaceae)*, Ecology and Evolution. 2019;00:1–10.(2019,00): 1-10.

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Department of Parks and Wildlife (DPaW) 2013, *Carnaby's Cockatoo (Calyptorphynchus latirostris) Recovery Plan*.

Department of Parks and Wildlife (DPaW) 2016, *Interim Recovery Plan 2016-2021 No. 359: Banksia attenuata woodlands over species rich dense shrublands*.

E. Department of Sustainability, Water, Population and Communities, (DSEWPaC) 2012, *EPBC Act referral guidelines for three threatened black cockatoo species: Carnaby's cockatoo (endangered) Calyptorhynchus latirostris, Baudin's cockatoo (vulnerable) Calyptorhynchus baudinii, Forest red-tailed black cockatoo (vulnerable) Calyptorhynchus banksii naso*.

Emerge Associates (Emerge) 2018, *Annual Monitoring Report: Pioneer Park Offset Site - Conospermum undulatum*. EP17-049(05)--009, Version B.

Government of Western Australia (Government of WA) 2011, *WA Environmental Offsets Policy*.

Strategen Environmental (Strategen) 2018, *Forrestfield North Residential Precinct, Environmental Assessment and Management Strategy*. Rev 0.

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Figures

Figure 1: Location Plan

Figure 2: Cononspermum undulatum (Wavy-leaved Smokebush)

Figure 3: Banksia Woodslands of the Swan Coastal Plain Threatened Ecological Community

Figure 4: Threatened Ecological Community Floristic Community Type 20a

Figure 5: Potential Black Cockatoo Foraging and Breeding Habitat

Figure 6: Key Biodiversity Values Remaining on Private Landholdings

Figure 7: Indicative locations potentially suitable for future revegetation/restoration works

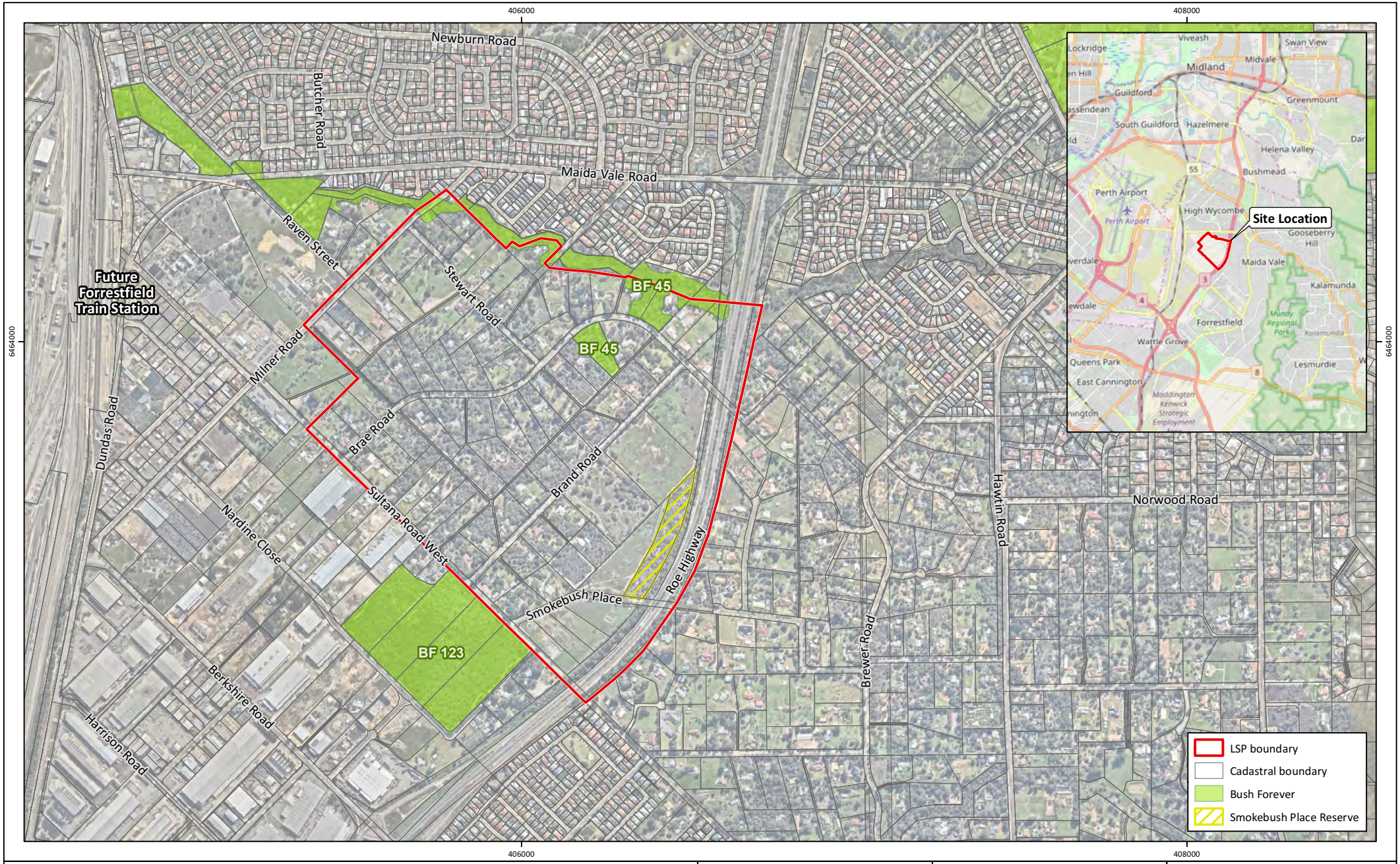

Figure 1: Location Plan

Project:	Strategic Conservation Management Plan Forrestfield North Residential Precinct
Client:	Department of Planning, Lands and Heritage (DPLH)

Plan Number:
EP19-071(08)--F19

Drawn:	AFF
Date:	3/03/2020
Checked:	JMM
Approved:	CKK
Date:	9/03/2020

N

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GDA 1994 MGA Zone 50

emerge ASSOCIATES

While Emerge Associates makes every attempt to ensure the accuracy and completeness of data, Emerge accepts no responsibility for externally sourced data used

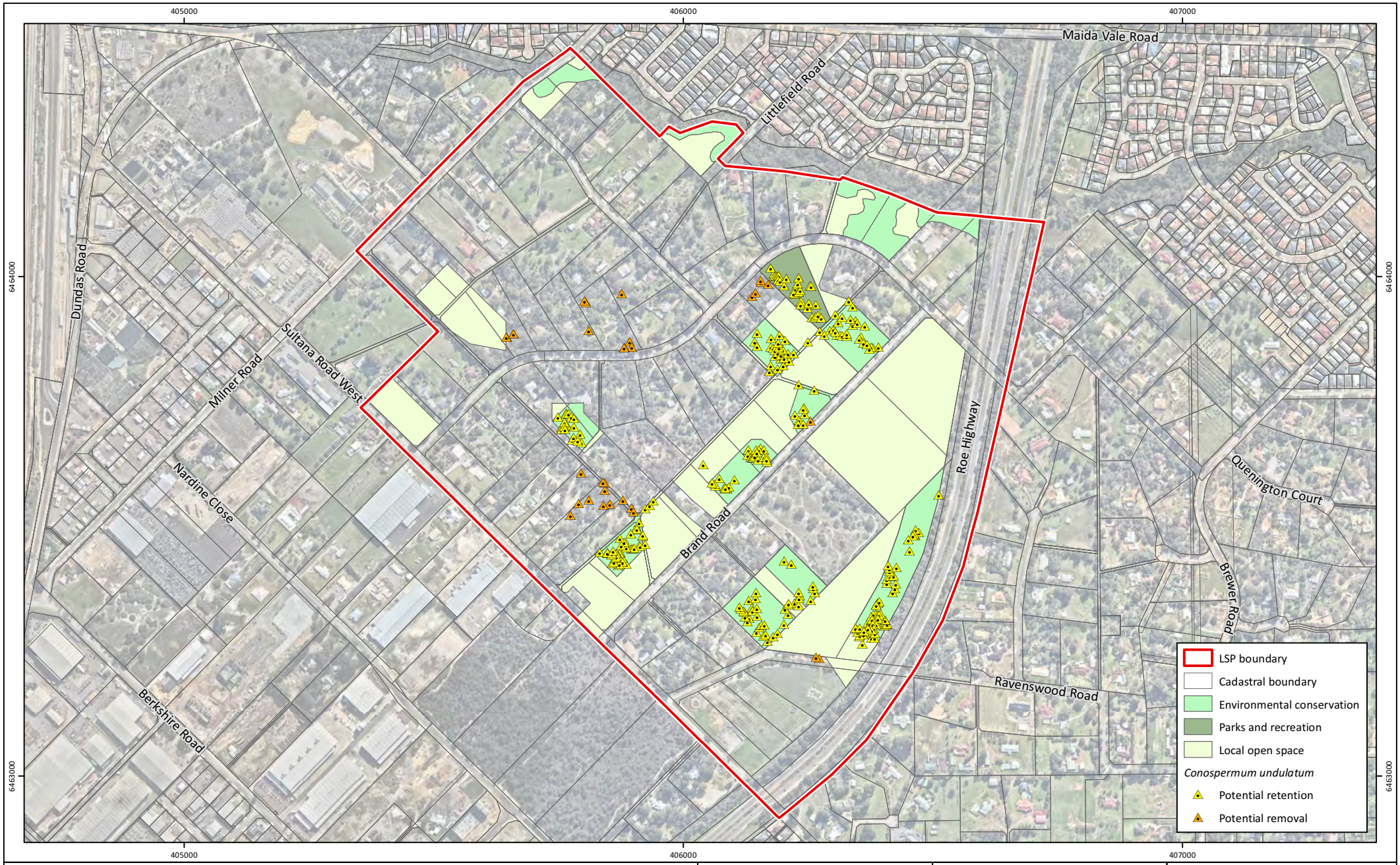

Figure 2: ***Conospermum undulatum*** **(Wavy-leaved Smokebush)**

Project: Strategic Conservation Management Plan
Forrestfield North Residential Precinct
Client: Department of Planning, Lands and Heritage (DPLH)

Plan Number:
EP19-071(08)--F20a
Drawn: AFF
Date: 23/04/2020
Checked: JMM
Approved: JDH
Date: 23/04/2020

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Scale: 1:10,000@A4
GDA 1994 MGA Zone 50

emerge ASSOCIATES

While Emerge Associates makes every attempt to ensure the accuracy and completeness of data, Emerge accepts no responsibility for externally sourced data used

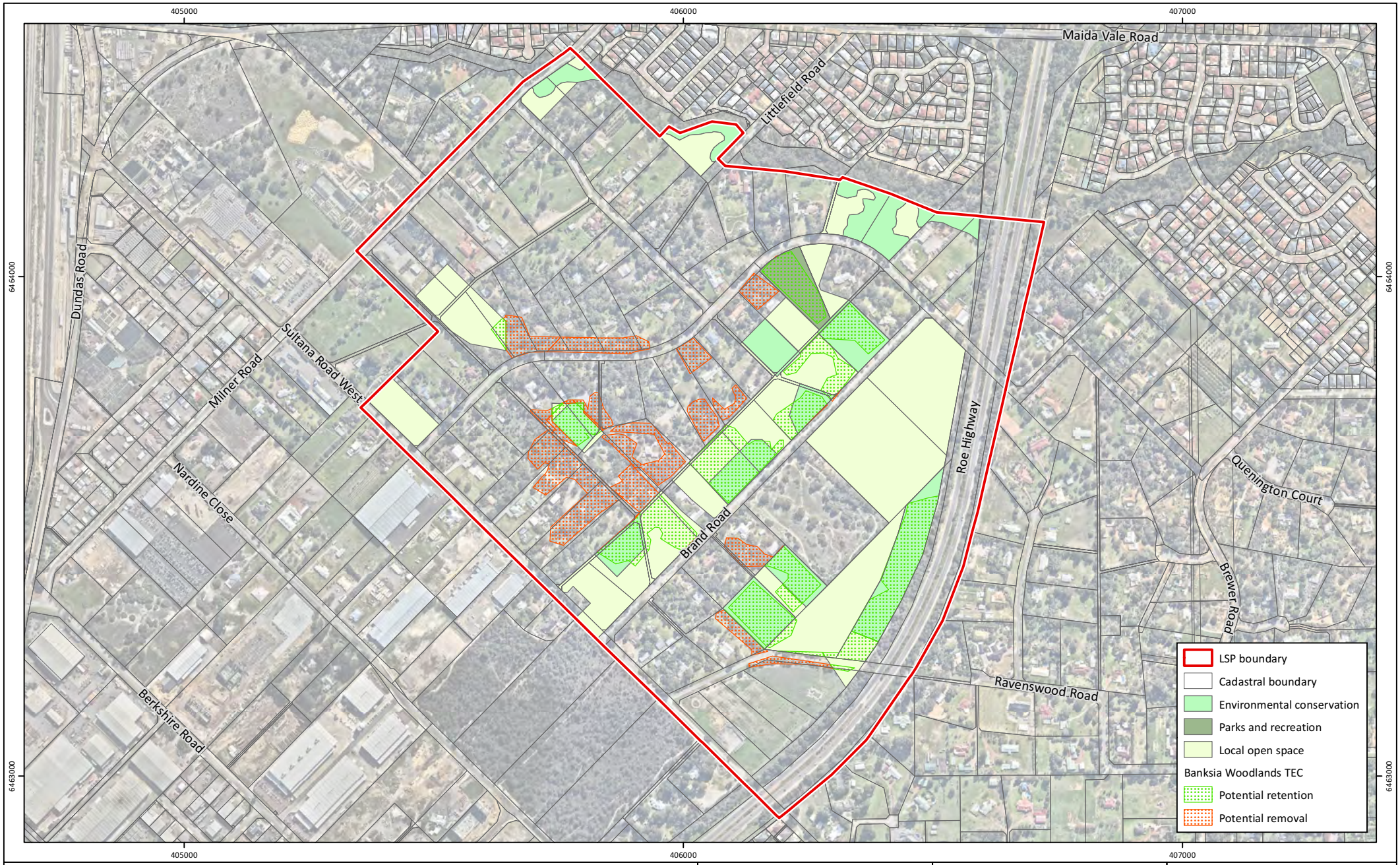

Figure 3: Banksia Woodlands of the Swan Coastal Plain Threatened Ecological Community

Project: Strategic Conservation Management Plan
Forrestfield North Residential Precinct
Client: Department of Planning, Lands and Heritage (DPLH)

Plan Number:
EP19-071(08)--F21a

Drawn:	AFF
Date:	23/04/2020
Checked:	JMM
Approved:	JDH
Date:	23/04/2020

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GDA 1994 MGA Zone 50

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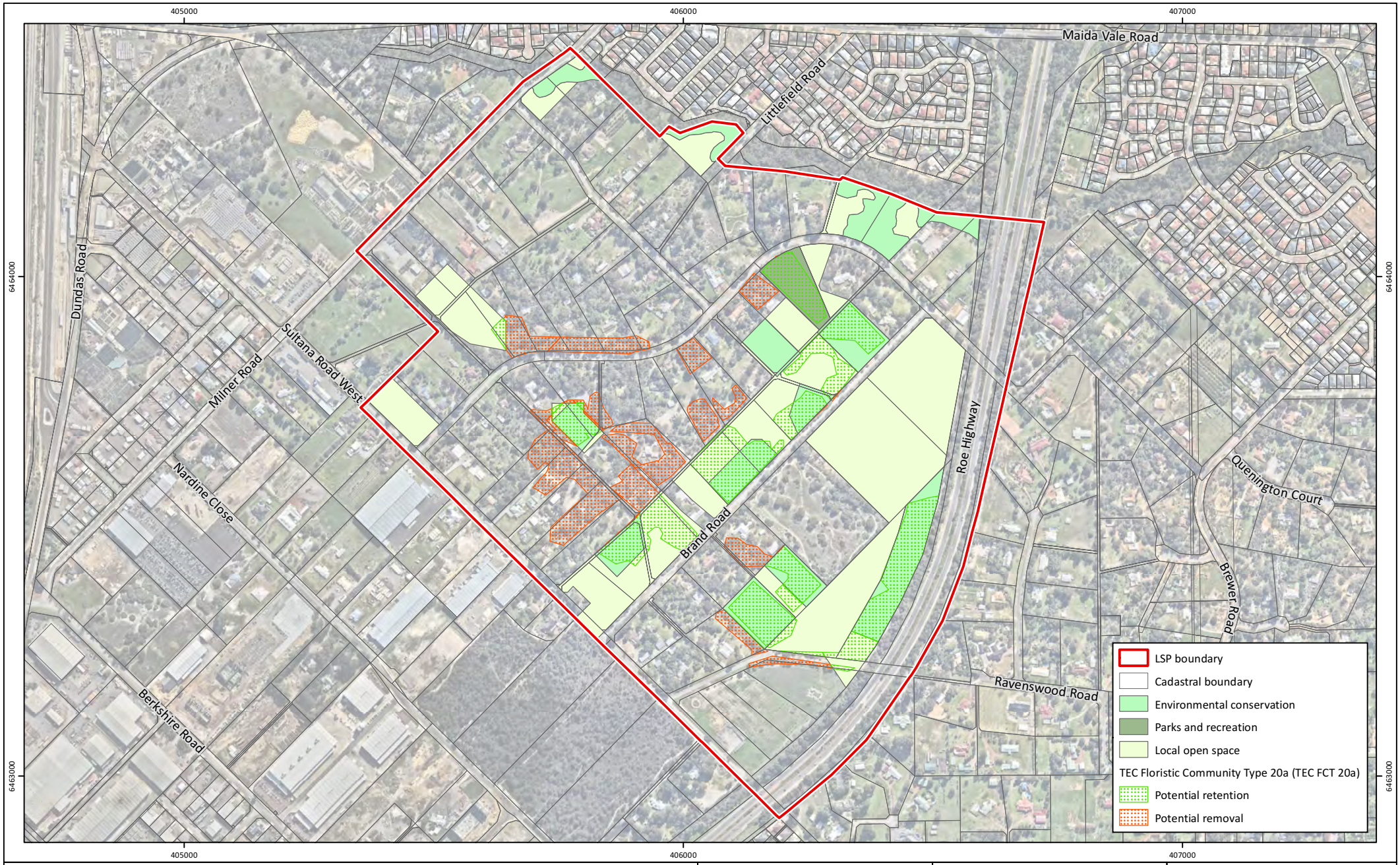

Figure 4: Threatened Ecological Community Floristic Community Type 20a (TEC FCT 20a)

Project:	Strategic Conservation Management Plan Forrestfield North Residential Precinct
Client:	Department of Planning, Lands and Heritage (DPLH)

Plan Number:
EP19-071(08)--F24a

Drawn:	AFF
Date:	23/04/2020
Checked:	JMM
Approved:	JDH
Date:	23/04/2020

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Scale: 1:10,000@A4

GDA 1994 MGA Zone 50

emerge ASSOCIATES

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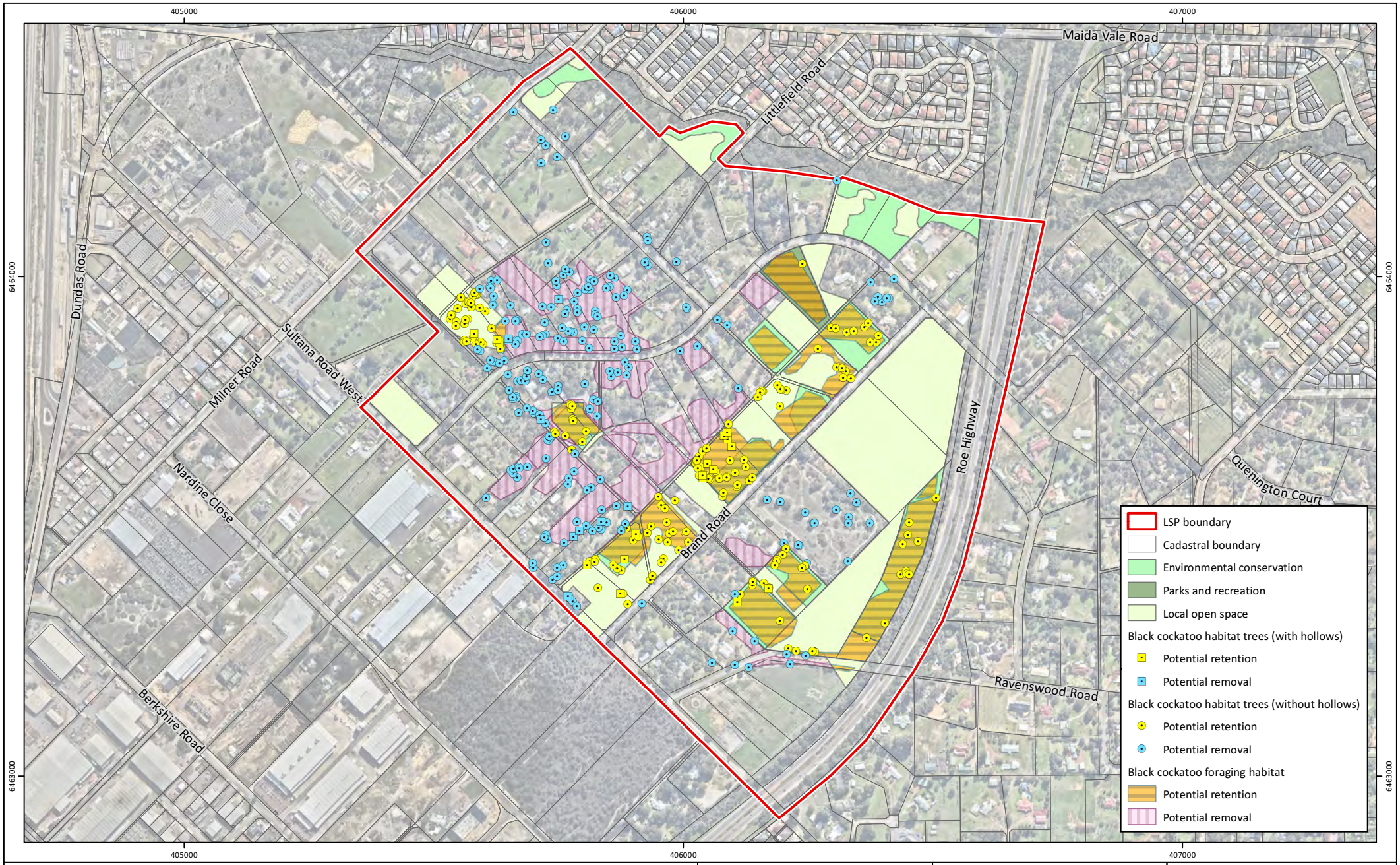

Figure 5: Potential Black Cockatoo Foraging and Breeding Habitat

Project: Strategic Conservation Management Plan
Forrestfield North Residential Precinct
Client: Department of Planning, Lands and Heritage (DPLH)

Plan Number:
EP19-071(08)--F22a

Drawn:	AFF
Date:	23/04/2020
Checked:	JMM
Approved:	JDH
Date:	23/04/2020

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Scale: 1:10,000@A4
GDA 1994 MGA Zone 50

emerge ASSOCIATES

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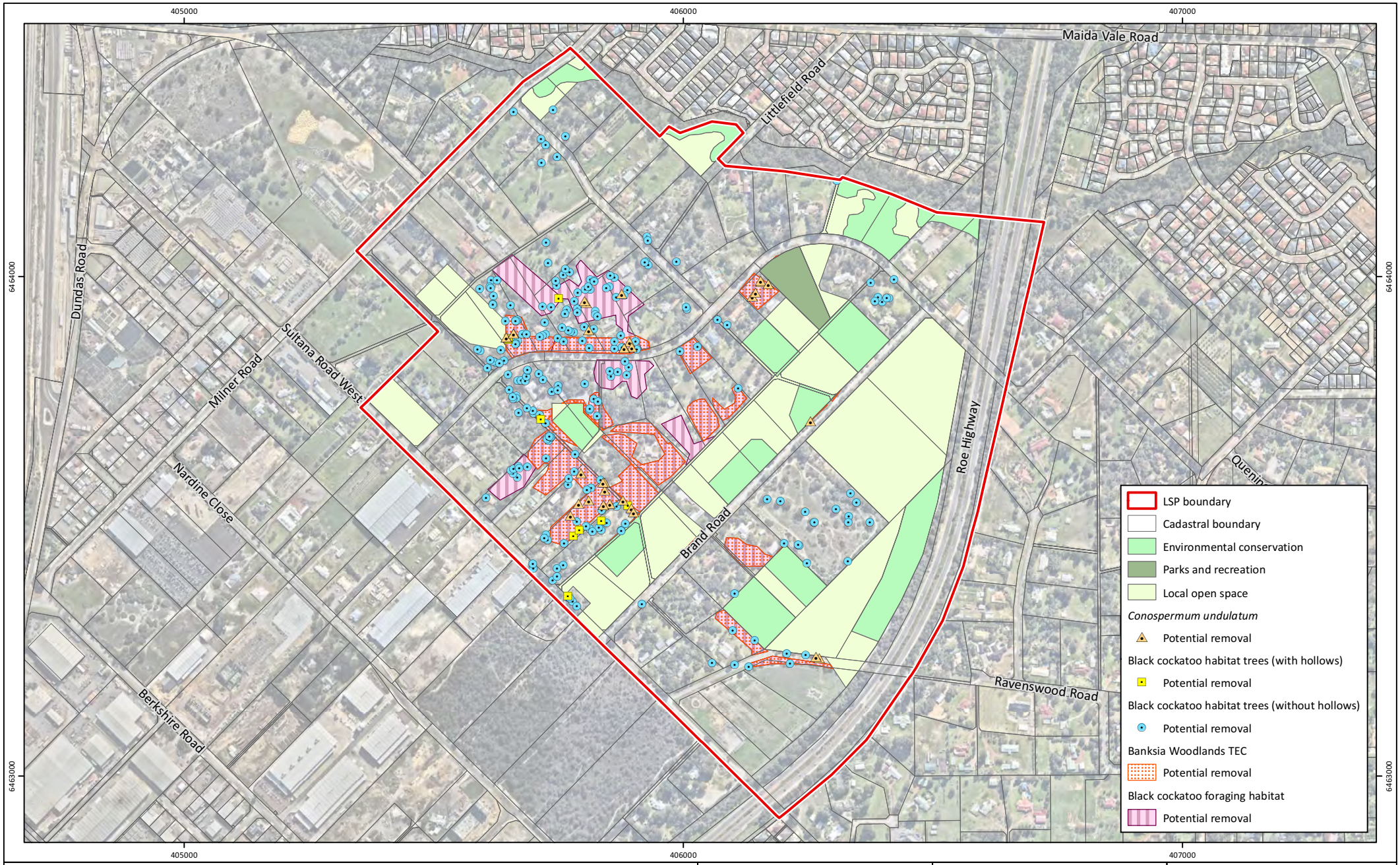

Figure 6: **Key Biodiversity Values Remaining on Private Landholdings**

Project: Strategic Conservation Management Plan
Forrestfield North Residential Precinct
Client: Department of Planning, Lands and Heritage (DPLH)

Plan Number:
EP19-071(08)--F23a

Drawn:	AFF
Date:	23/04/2020
Checked:	JMM
Approved:	JDH
Date:	23/04/2020

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Metres
Scale: 1:10,000@A4
GDA 1994 MGA Zone 50

emerge ASSOCIATES

While Emerge Associates makes every attempt to ensure the accuracy and completeness of data, Emerge accepts no responsibility for externally sourced data used

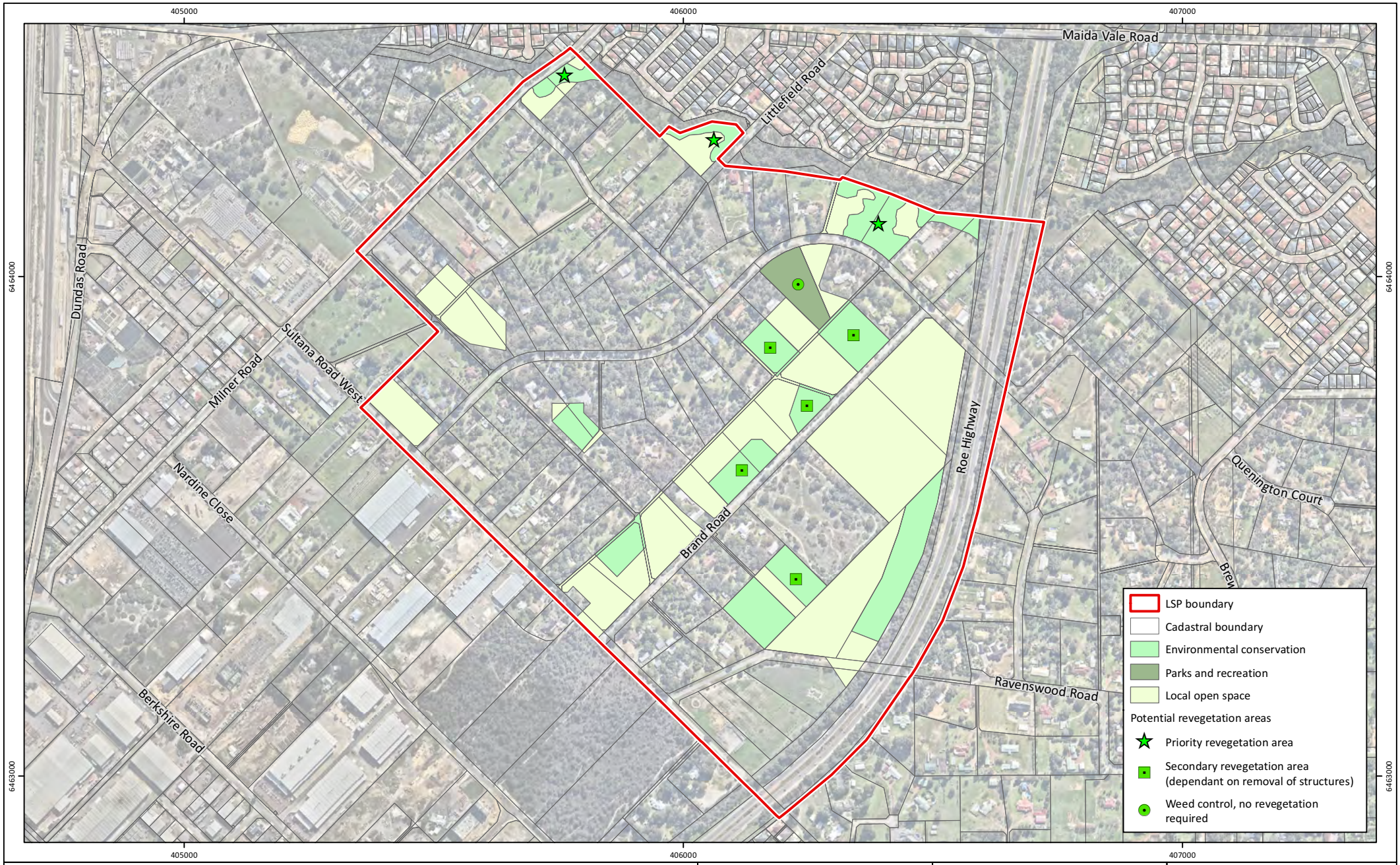

Figure 7: Indicative Locations Potentially Suitable For Future Revegetation/Restoration Works

Project: Strategic Conservation Management Plan
Forrestfield North Residential Precinct
Client: Department of Planning, Lands and Heritage (DPLH)

Plan Number:
EP19-071(08)--F25a
Drawn: AFF
Date: 23/04/2020
Checked: JMM
Approved: JDH
Date: 23/04/2020

N

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Metres
Scale: 1:10,000@A4
GDA 1994 MGA Zone 50

emerge ASSOCIATES

While Emerge Associates makes every attempt to ensure the accuracy and completeness of data, Emerge accepts no responsibility for externally sourced data used

Appendix A

Forrestfield North Residential Precinct Structure Plan

LEGEND

Structure Plan Boundary

Region Scheme Reserves

Parks and Recreation

Primary Regional Road

Notice of Delegation

Bush Forever

Land Use and Residential Density

Environmental Conservation

Local Open Space

PS — Public Purposes - Primary School

Residential Medium Density (R40 - R60)

Residential Medium / High Density (R60 - R80)

Residential High Density (R80 - R100)

Other Categories

District Integrator A (Existing / Proposed)

District Integrator A (Potential Future)

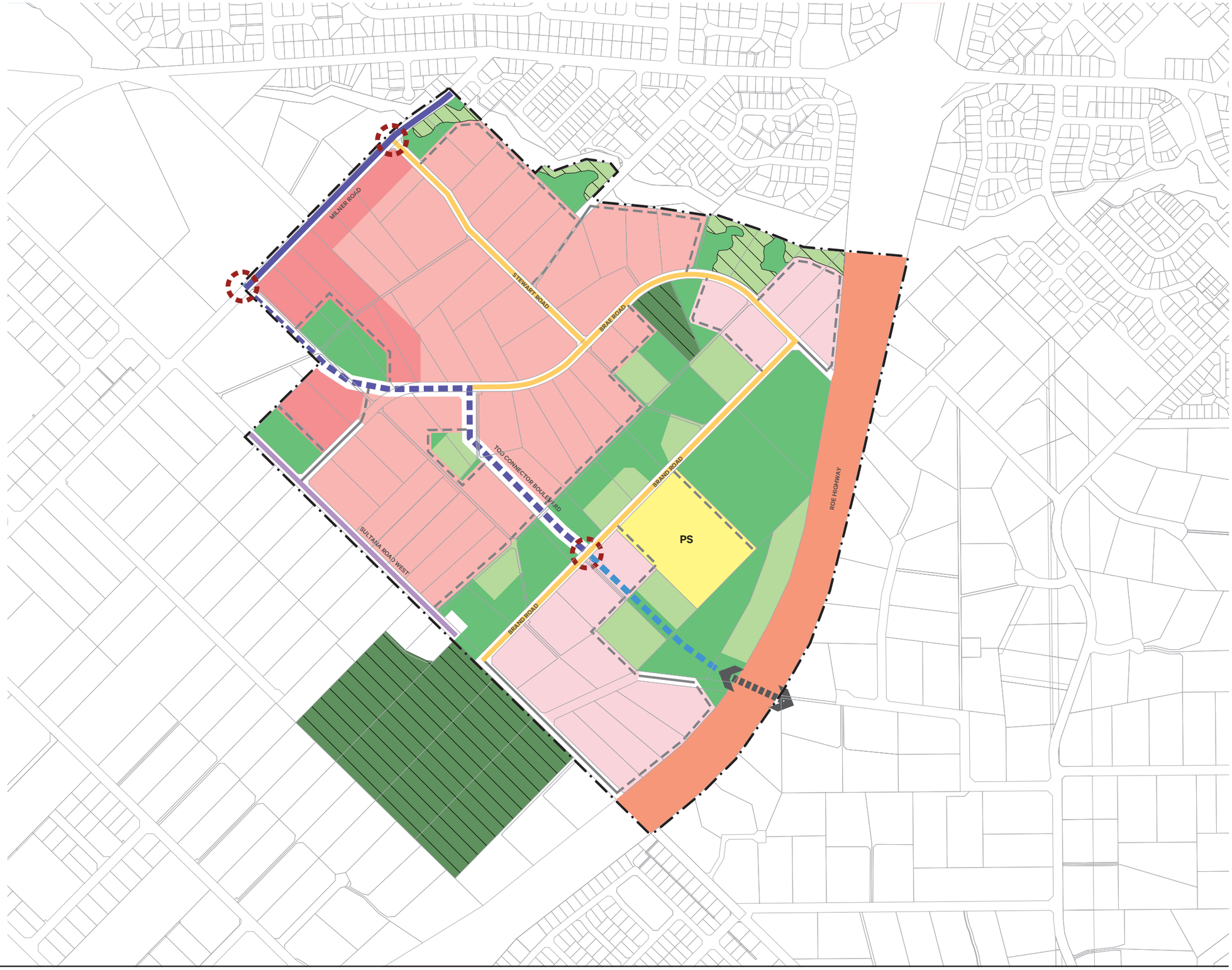
District Integrator B (Existing / Proposed)

Neighbourhood Connector (Existing / Proposed)

Local Street (Existing / Proposed)

Proposed Roundabout

Potential Future Fly-Over Roe Highway



Plan 1: Structure Plan

Forrestfield North Residential Precinct

DRAFT

Date: 26 Feb 2020 Scale: 1:8000@ A3 1:4000 @ A1 File: **17-527 ST-1 A** Staff: MC GW Checked: MC

0 80 160m

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Appendix B

Anticipated Retention of Key Biodiversity Values within Individual Lots of the LSP Area

Document Reference: EP19-071(08)—007B JMM

APPENDIX B – ANTICIPATED RETENTION OF KEY BIODIVERSITY VALUES WITHIN INDIVIDUAL LOTS OF THE LSP AREA

The following calculations of key biodiversity values anticipated to be retained within individual lots (designated as environmental conservation or local open space areas) in the LSP are based on the following:

1. Mapping data has been utilised from the *Forrestfield North Residential Precinct, Environmental Assessment and Management Strategy* (Strategen 2018). While this mapping is appropriate to support the structure planning scale, it is possible there may be future refinement required at the individual landholding scale which may ultimately reduce the expected areas of the biodiversity values, and therefore the extent of predicted retention.
2. The assumption that all key biodiversity values *within* the conservation areas and LOS will be retained. Should this not be the case, the anticipated impacts on the key biodiversity values would be greater.
3. Conversely, the assumption that all key biodiversity values *outside* of the conservation and LOS areas will be cleared. This may not necessarily be the case, particularly in regards to scattered trees, some of which may be retained through future road reserves or individual development design.

Table 1: Anticipated retention of key biodiversity values within individual lots identified as environmental conservation and local open space areas in the LSP

Lot ref.	Tenure	*C. undulatum* (no. plants)	Banksia woodlands TEC (ha)	TEC FCT 20a (ha)	BC foraging habitat (ha)	BC habitat trees without hollows	BC habitat trees with hollows
D016644 2	Freehold	0	0.00	0.00	0.00	0	0
D024292 13	Freehold	0	0.00	0.00	0.00	0	0
D024292 14	Freehold	0	0.00	0.00	0.00	0	0
D024292 15	Freehold	0	0.00	0.00	0.00	0	0
D024292 18	Freehold	0	0.17	0.17	0.17	5	0
D033847 50	Freehold	114	1.97	1.97	2.05	12	0
D057011 13	Freehold	0	0.00	0.00	0.00	0	0
D060278 69	Freehold	0	0.00	0.00	0.00	0	0
D060278 70	Freehold	0	0.00	0.00	0.00	0	0
D060280 81	Freehold	0	0.00	0.00	0.00	0	0
D060280 82	Freehold	0	0.00	0.00	0.00	0	0
D069590 5	Freehold	0	0.00	0.00	0.00	0	0
D071830 8	Freehold	44	0.86	0.86	0.86	4	1
D071830 9	Freehold	25	0.64	0.64	0.64	11	1
D075676 200	Freehold	0	0.00	0.00	0.00	0	0
D075676 201	Freehold	0	0.00	0.00	0.00	0	0

Lot ref.	Tenure	*C. undulatum* (no. plants)	Banksia woodlands TEC (ha)	TEC FCT 20a (ha)	BC foraging habitat (ha)	BC habitat trees without hollows	BC habitat trees with hollows
P013417 25	Freehold	0	0.00	0.00	0.00	0	0
P013417 26	Freehold	34	0.60	0.60	0.60	9	0
P013417 27	Freehold	0	0.49	0.49	0.49	6	0
P013417 28	Freehold	12	0.51	0.51	0.51	7	0
P013417 29	Freehold	34	0.42	0.42	0.42	1	1
P013417 30	Freehold	18	0.96	0.96	0.96	27	6
P013417 31	Freehold	0	0.05	0.05	0.06	2	1
P013417 32	Freehold	0	0.62	0.62	0.62	17	0
P013417 33	Freehold	55	0.44	0.44	0.44	8	2
P013417 34	Freehold	0	0.00	0.00	0.00	3	1
P013417 39	Freehold	0	0.00	0.00	0.00	0	0
P013417 41	Freehold	0	0.00	0.00	0.00	0	0
P013417 10209	Crown	17	0.20	0.20	0.25	9	1
P013418 76	Freehold	40	0.00	0.00	0.39	0	0
P013418 77	Freehold	0	0.00	0.00	0.00	0	0
P013418 78	Freehold	38	0.80	0.80	0.80	1	0
P013418 79	Freehold	0	0.00	0.00	0.00	0	0
P013418 10274	Crown	1	0.00	0.00	0.00	0	0
P013419 67	Freehold	45	0.34	0.34	0.34	4	0
P013419 68	Freehold	0	0.16	0.16	0.16	3	0
P013419 83	Freehold	0	0.00	0.00	0.00	0	0
P013419 88	Freehold	0	0.00	0.00	0.00	0	0
P013419 10208	Crown	0	0.00	0.00	0.00	0	0
P013420 46	Freehold	0	0.00	0.00	0.00	0	0
P013420 61	Freehold	0	0.08	0.08	0.08	6	0
P013420 62	Freehold	0	0.02	0.02	0.02	25	3
P013420 89	Freehold	0	0.00	0.00	0.00	0	0
P013420 90	Freehold	0	0.00	0.00	0.00	0	0
P013420 92	Freehold	0	0.00	0.00	0.00	0	0
P040528 100	Freehold	0	0.02	0.02	0.01	0	0
TOTAL RETENTION		**477**	**9.35**	**9.35**	**9.87**	**160**	**17**

Appendix C

Anticipated Impacts on Key Biodiversity Values within Individual Lots of the LSP Area

Document Reference: EP19-071(08)—007B JMM

APPENDIX C – ANTICIPATED IMPACTS ON KEY BIODIVERSITY VALUES WITHIN INDIVIDUAL LOTS OF THE LSP AREA

The following calculations of key biodiversity values anticipated to be impacted/removed within individual lots in the LSP are based on the following:

1. Mapping data has been utilised from the *Forrestfield North Residential Precinct, Environmental Assessment and Management Strategy* (Strategen 2018). While this mapping is appropriate to support the structure planning scale, it is possible there may be future refinement required at the individual landholding scale which may ultimately reduce the expected areas of the biodiversity values, and therefore the extent of predicted retention.
2. The assumption that all key biodiversity values *within* the conservation areas and LOS will be retained. Should this not be the case, the anticipated impacts on the key biodiversity values would be greater.
3. Conversely, the assumption that all key biodiversity values *outside* of the conservation and LOS areas will be cleared. This may not necessarily be the case, particularly in regards to scattered trees, some of which may be retained through future road reserves or individual development design.

Table 1: Key biodiversity values anticipated to be removed within individual lots of the LSP area

Lot ref.		Tenure	*C. undulatum* (no. plants)	Banksia woodlands TEC (ha)	TEC FCT 20a (ha)	BC foraging habitat (ha)	BC habitat trees without hollows	BC habitat trees with hollows
D024292	18	Freehold	0	0.00	0.00	0.00	0	0
D033847	50	Freehold	6	0.00	0.00	0.00	1	0
D060278	69	Freehold	2	0.54	0.54	0.55	0	0
D060278	70	Freehold	0	0.72	0.72	0.75	0	0
D069590	6	Freehold	0	0.00	0.00	0.00	1	0
D069590	5	Freehold	0	0.25	0.25	0.25	2	0
D071830	7	Freehold	0	0.00	0.00	0.00	1	0
D071830	8	Freehold	0	0.01	0.01	0.01	0	0
D071830	9	Freehold	0	0.02	0.02	0.02	2	0
D071830	10	Freehold	0	0.3	0.3	0.3	0	0
D024292	15	Freehold	0	0.00	0.00	0.00	16	0
P013417	34	Freehold	0	0.00	0.00	0.00	3	1
P013417	35	Freehold	0	0.00	0.00	0.00	13	1
P013417	36	Freehold	9	0.66	0.66	0.66	7	2
P013417	37	Freehold	6	0.19	0.19	0.19	4	0
P013417	38	Freehold	0	0.4	0.4	0.4	1	0
P013417	39	Freehold	0	0.31	0.31	0.69	14	0

Lot ref.	Tenure	*C. undulatum* (no. plants)	Banksia woodlands TEC (ha)	TEC FCT 20a (ha)	BC foraging habitat (ha)	BC habitat trees without hollows	BC habitat trees with hollows
P013417 65	Freehold	0	0.00	0.00	0.01	0	0
P013417 66	Freehold	0	0.02	0.02	0.02	3	0
P013417 10209	Crown	4	0.12	0.12	0.12	8	1
P013418 74	Freehold	0	0.4	0.4	0.4	3	0
P013418 77	Freehold	5	0.28	0.28	0.28	0	0
P013418 76	Freehold	0	0.00	0.00	0.00	1	0
P013418 10274	Crown	0	0.00	0.00	0.00	1	0
P013419 56	Freehold	1	0.00	0.00	0.28	9	0
P013417 25	Freehold	0	0.00	0.00	0.00	6	0
P013419 57	Freehold	0	0.04	0.04	0.07	2	0
P013419 58	Freehold	9	0.2	0.2	0.77	13	0
P013419 59	Freehold	1	0.19	0.19	0.53	17	1
P013419 60	Freehold	0	0.19	0.19	0.54	5	0
P013419 67	Freehold	0	0.15	0.15	0.15	13	1
P013419 68	Freehold	0	0.16	0.16	0.19	8	0
P013419 71	Freehold	0	0.06	0.06	0.48	6	0
P013419 72	Freehold	0	0.00	0.00	0.39	0	0
P013419 73	Freehold	0	0.33	0.33	0.35	0	0
P013420 54	Freehold	0	0.00	0.00	0.18	2	0
P013420 55	Freehold	0	0.00	0.00	0.21	8	0
P013420 61	Freehold	5	0.33	0.33	0.33	22	2
P013420 62	Freehold	0	0.01	0.01	0.01	12	0
P013419 87	Freehold	0	0.00	0.00	0.00	1	0
P013419 88	Freehold	0	0.00	0.00	0.00	2	0
P013419 83	Freehold	0	0.00	0.00	0.00	1	0
P013420 52	Freehold	0	0.00	0.00	0.00	3	0
P013420 51	Freehold	0	0.00	0.00	0.00	2	0
P013420 92	Freehold	0	0.00	0.00	0.00	2	0
P013420 10205	Crown	0	0.00	0.00	0.01	0	0
P040528 100	Freehold	0	0.04	0.04	0.04	1	0
ROAD RESERVE		0	0.23	0.23	0.2	9	0
TOTAL IMPACT		**48**	**6.15**	**6.15**	**9.38**	**225**	**9**

Appendix 6

Management Agreement Between the WAPC and City of Kalamunda

2020

CITY OF KALAMUNDA

and

WESTERN AUSTRALIAN PLANNING COMMISSION

Forrestfield North Residential Precinct Management Agreement for the implementation of the Strategic Conservation Management Plan

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State Solicitor's Office
David Malcolm Justice Centre
28 Barrack Street
Perth WA 6000
Telephone : (08) 9264 1888
Ref: 2912-19

Management Agreement

This Agreement is dated this day of 2020.

Between

CITY OF KALAMUNDA of 2 Railway Road Kalamunda in the State of Western Australia (the **City**)

AND

THE WESTERN AUSTRALIAN PLANNING COMMISSION of 140 William Street Perth in the State of Western Australia (the **Commission**)

Recitals

A Forrestfield North comprises an area of approximately 264.1 hectares bounded generally by Poison Gully to the north, Roe Highway to the east, Berkshire Road to the south, and the Forrestfield Freight Yard and Mainline Freight Rail to the west and includes the area the subject of the future passenger railway station forming part of the Forrestfield Airport Link.

B In 2015 the Commission initiated Amendment 1285/57 to the Metropolitan Region Scheme (**MRS**) to broadly rezone Forrestfield North from rural to urban.

C Concurrently the City initiated the Forrestfield North District Structure Plan (finally approved August 2018) to provide strategic guidance for the Forrestfield North Area, and set the framework for subsequent local structure plans.

D In 2018 the City's Amendment 75 to Kalamunda Local Planning Scheme 3 zoned the land within the Forrestfield North District Structure Plan area to Urban Development, and initiated two Local Structure Plan Precincts:

- Forrestfield North TOD precinct
- Forrestfield North Residential precinct

E In 2018 the City commenced preparation of the Forrestfield North Residential precinct Local Structure Plan (the **LSP**).

F The Commission and the City have agreed to jointly manage the environmentally significant land and have adopted the Forrestfield North Residential Precinct Local Structure Plan Strategic Conservation Management Plan (**Management Plan**) attached hereto as Annexure 1.

G Final approval of the LSP by the Commission and the related initiation by the Commission of the relevant amendment to the MRS to implement the LSP as it relates to the protection of the Environmental Conservation Areas are subject to the prerequisite that the parties are ready to implement the Management Plan.

H This Management Agreement **(Agreement)** sets out the obligations of the Commission and the City with respect to the implementation of the Management Plan.

Operative provisions

1 Definitions and interpretation

1.1 Definitions

In this Agreement, unless the contrary intention appears:

BC Act means the *Biodiversity Conservation Act 2016* (WA).

CEMP means a Construction Environmental Management Plan to make provision for protection of fauna and habitat management including management of risks such as the spread of dieback and other threats associated with construction activities.

Agreement means this Agreement.

DAWE means and includes the Minister from time to time responsible for the administration of the EPBC Act, and the Commonwealth Department of Agriculture, Water and the Environment or any renamed or reconstituted department assisting the responsible Minister.

DBCA means and includes the Minister from time to time responsible for the administration of the BC Act and the Western Australian Department of Biodiversity Conservation and Attractions or any renamed or reconstituted department assisting the responsible Minister.

Environmental Conservation Areas means the land classified as "Environmental Conservation" by the LSP.

Environmental Offsets means a strategy to mitigate unavoidable impacts on wetland and native vegetation arising from the type of development facilitated by the LSP, consistently with the *WA Environmental Offsets Policy* (September 2011) and *WA Environmental Offsets Guidelines* (August 2014) and includes the *Offsets assessment guide* prepared for the purposes of the EPBC Act.

EP Act means the *Environmental Protection Act 1986* (WA).

EPBC Act means the *Environment Protection and Biodiversity Conservation Act 1999* (Cth).

Local Open Space means classified as "Local Open Space" by the LSP.

LPS 3 means the City of Kalamunda Local Planning Scheme No. 3.

LSP means the Forrestfield North Residential Precinct Local Structure Plan.

Management Approach Implementation Summary means the Parties' agreed strategic conservation management approach, being Table 18: Forrestfield North Strategic Conversation Management Approach, Implementation Summary of the Management Agreement.

Management Plan means the Strategic Conservation Management Plan forming part of the LSP which is attached here to as Annexure 1.

MRS means the Metropolitan Region Scheme.

Party means the City or the Commission according to the context and Parties means both the City and the Commission;

PD Act means the *Planning and Development Act 2005* (WA).

Strategic Action means an action identified as such in the Management Approach Implementation Summary.

Target Date means, in respect of a Strategic Action, the target date for the achievement or completion of that Strategic Action as set out in the Management Approach Implementation Summary, as may be extended or varied by the Parties from time to time.

1.2 Interpretation

In this Agreement unless the contrary intention appears:

(a) words importing one gender include all other genders;

(b) words in the singular number include the plural and vice versa;

(c) where the words "including" or "includes" are used, they are to be taken to be followed, where the context allows, by the words "but not limited to";

(d) clause headings are inserted for ease of reference only and shall be disregarded in the interpretation or construction of this Agreement;

(e) any agreement or obligation entered into or undertaken by more than one person shall bind those persons jointly and each of them separately;

(f) reference to a clause means a clause of this Agreement;

(g) reference to an Act includes the amendments to the Act for the time being in force and also any Act passed in substitution for it and all subsidiary or subordinate legislation for the time being in force under it;

(h) a reference to a party to this Agreement includes that party's successors and permitted assigns;

(i) the word "person" includes a firm, company, partnership, joint venture, association, corporation or other body corporate; and

(j) reference to 'the State' includes each agent, agency, emanation, instrumentality and officer of the State of Western Australia.

2 Management Plan

(1) The parties agree to take all reasonable steps and actions to implement the Management Plan by undertaking and completing the Strategic Actions including (without limitation) undertaking the actions set out in clauses 3, 4 and 5 of this Agreement in a timely manner by the relevant Target Dates.

(2) The Parties agree to meet on a regular basis, to consider the progress of the Strategic Actions, and any other matters generally relevant to the implementation of the Management Agreement.

3 WAPC commitments

(1) The Commission agrees to take all reasonable steps and actions to progressively acquire the Environmental Conservation Areas.

(2) The Parties acknowledge and agree that the Environmental Conservation Areas are to be protected and reserved under the MRS as 'Parks and Recreation'.

(3) The Commission agrees to initiate an amendment to the MRS to reserve the Environmental Conservation Areas for 'Parks and Recreation' by the relevant Target Date.

(4) Once the MRS amendment referred to in clause 3(3) has been initiated, the Commission agrees to use its best endeavours to enter into negotiations with the owners of land within the Environmental Conservation Areas for the purchase of that land.

4 City commitments

(1) The City agrees to take all reasonable steps and actions necessary to progressively acquire the land identified as Local Open Space in the LSP (**LOS Areas**) through a Development Contribution Plan in accordance with LPS 3, established and administered by the City by the relevant Target Date.

(2) Upon:

(a) the Environmental Conservation Areas and the LOS Areas being acquired and reserved to the Crown; and

(b) care, control and management of the Environmental Conservation Areas and LOS Areas being placed with the City,

the City agrees to assume responsibility for the management and maintenance of all Environmental Conservation Areas and LOS Areas.

(3) In accordance with sections 6.2.1 and 6.2.2 of the Management Plan, the City agrees to prepare and implement:

(a) a management plan for the management and enhancement of Environmental Conservation Areas by the City (**Environmental Conservation Areas Management Plan**), with such plan to be prepared on advice from DBCA to the reasonable satisfaction of the Commission and to address the following maintenance and management activities:

- Access control;
- Weed control;
- Rubbish removal;
- Pathogen risk reduction and hygiene control;
- Pest animal management;
- Fire management;
- Rehabilitation and revegetation; and

- Monitoring and maintenance.

(b) a management plan for the management and enhancement of LOS Areas by the City (**LOS Management Plan**), with such plan to be prepared on advice from DBCA to the reasonable satisfaction of the Commission and to address the following maintenance and management activities:

- Access control;
- Weed control;
- Rubbish removal;
- Landscaping requirements;
- Complementary uses within LOS Areas;
- Pathogen risk reduction and hygiene control;
- Pest animal management;
- Rehabilitation and revegetation; and
- Monitoring and maintenance.

(4) The City agrees to use its reasonable endeavours to prepare (or procure to be prepared) the Environmental Conservation Management Plan and LOS Management Plan by the relevant Target Dates.

(5) The City agrees to implement the Environmental Conservation Management Plan and LOS Management Plan, including removal of structures from the Environmental Conservation Areas and LOS Areas and rehabilitation of those areas in accordance with the Management Plan to the reasonable satisfaction of the City.

(6) The City will be responsible for the costs of removal of all existing infrastructure, dwellings and structures within the LOS Areas, and subject to clause 4(7), for all other costs of implementing the Environment Conservation Management Plan and LOS Management Plan.

(7) The Commission will be responsible for the costs of removal of all existing infrastructure, dwellings and structures within the Environmental Conservation Areas.

5 Parties' mutual commitments

Following the adoption of the LSP, the parties shall in considering any applications for development or subdivision approval as the case requires:

(a) have due regard to the requirement in the LSP that applicants for development or subdivision approval prepare Cell Density Plans for those areas identified in the LSP to the satisfaction of the Commission and/or the City, such Cell Density Plans to include provision for mitigation of environmental impacts attributable to the proposed development or subdivision;

(b) refer those applications which are required to be assessed under the EPBC Act to DAWE on the basis that residual impacts of such proposals will be individually assessed;

(c) where developments are located within 100 metres of an Environmental Conservation Area, have due regard to the requirement in the LSP that a CEMP be prepared by applicants for development or subdivision approval; and

(d) consider, as an option of last resort, the provision of Environmental Offsets to address residual impacts.

6 No Fetter

The Commission acknowledges and agrees:

(a) that the City is a local government established by the *Local Government Act 1995 (WA);*

(b) in its capacity as a local government, the City will be obliged to comply with statutory obligations imposed by law; and

(c) no provision of this Agreement may unlawfully restrict or otherwise fetter the discretion of the City in the lawful exercise of any of its functions and powers as a local government (as distinct from a commercial participant in the terms and conditions of this Agreement),

provided that this clause will not serve to relieve the City from responsibility for performance of its obligations arising pursuant to this Agreement, except to the extent necessary to avoid any unlawful restriction or fetter of the City's discretion.

7 Governing Law and Jurisdiction

For all purposes this Agreement shall be governed by and construed in accordance with the laws of the State of Western Australia and, where applicable, the laws of the Commonwealth of Australia, for the time being in force, and the parties agree to submit to the exclusive jurisdiction of the courts of Western Australia for the purposes of enforcement of this Agreement.

8 Costs

The parties must pay their own legal and other costs in connection with the preparation and signing of this Agreement.

Executed as an Agreement.

Signed for and on behalf of the **WESTERN AUSTRALIAN PLANNING COMMISSION**

DAVID JOHN CADBY
(print full name)
an officer of the Commission duly authorised by the Commission pursuant to Section 24 of the Planning and Development Act 2005 for that purpose, in the presence of:

(Signature)

Witness Signature

EILEEN FINN
Witness Full Name

21/7/2020
Date

Officer Western Australian Planning Commission

Executed for and on behalf of the **CITY OF KALAMUNDA** pursuant to section 9.49A of the Local Government Act 1995:

Signature

Peter Varelis
Director Development Services
Full Name & Position

Witness Signature

Kaitlan Schilling
Executive Assistant to Director Development Services
Witness Full Name & Position

20/7/2020.
Date

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