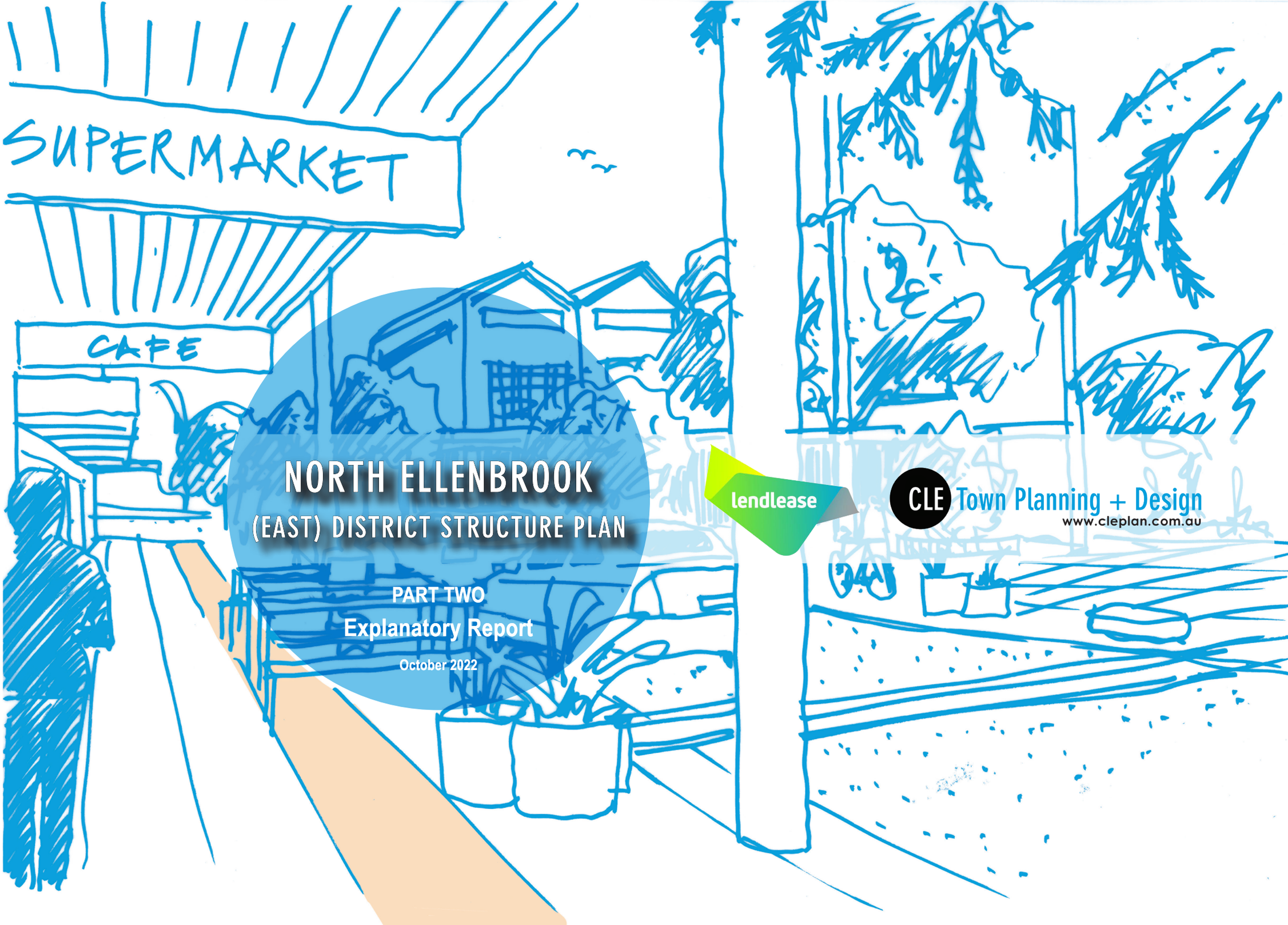

NORTH ELLENBROOK

(EAST) DISTRICT STRUCTURE PLAN

PART TWO

Explanatory Report

October 2022

lendlease

CLE Town Planning + Design

www.cleplan.com.au

Title:	North Ellenbrook (East) District Structure Plan Part Two - Explanatory Report
Prepared for:	Lendlease
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Prepared by:	CLE Town Planning + Design
Project team:	Emerge Associates - Environmental Assessment Report Emerge Associates - Bushfire Management Plan GHD - Traffic Impact Assessment Cossill & Webley - Engineering and Servicing Report Macroplan - Economic, Retail and Employment Strategy RPS - District Water Management Strategy Lendlease - Community Facilities Strategy Herring Storer - Road Traffic, Freight Rail and Environmental Noise Assessment Research4 - Perth North-East Land Market Analysis

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1.0 INTRODUCTION AND PURPOSE


Source: Lendlease

1.0 | INTRODUCTION AND PURPOSE

This Part Two: Explanatory Report provides the background and supporting information that has informed preparation of the District Structure Plan Map and Part One: Implementation Section. It describes the influencing factors that have shaped the District Structure Plan (DSP) design and provides the rationale behind the matters to be addressed and implemented at subsequent planning stages. The Part Two summarises the suite of technical appendices that support the DSP, discussing the key findings and outlining the DSP response.

The Part Two report is structured as follows:

- **Section 2** describes the land that comprises the DSP;
- **Section 3** summarises the key elements of the existing planning framework relevant to the DSP, demonstrating consistency between the proposed DSP and strategic planning for the sub-region;
- **Section 4** discusses the DSP area's characteristics in terms of physical and cultural features that require consideration;
- **Section 5** comprehensively discusses and explains the various elements of the DSP and how any site constraints will be appropriately managed at subsequent stages of planning;
- **Section 6** describes the infrastructure items that are expected to require shared funding through future Development Contribution Plans.

2.0 LAND DESCRIPTION

2.0 | LAND DESCRIPTION

The DSP area encompasses all the land east of Tonkin Highway identified as 'Urban Investigation' under the *North-East Sub-regional Planning Framework* (the Frameworks). The following sections provide a detailed description of the DSP area and its surrounds.

2.1 Location

The DSP area is located approximately 26km north-east of the Perth CBD and 5km north of the Ellenbrook Secondary Centre (refer Figure 1 – Location Plan). It directly abuts Tonkin Highway to the west, Ellenbrook to the south, Railway Parade to the east and rural land to the north. The existing rural land to the north is strategically identified as 'Industrial Expansion' under the Frameworks.

The DSPs location directly abutting Tonkin Highway provides an opportunity for direct and efficient access to the regional road network via a future planned interchange. Its location directly abutting the established suburb of Ellenbrook to the south makes it a logical and sequential extension of the urban front.

Further, the DSP is located approximately 5.5 km north of the planned location for the Ellenbrook Rail Station which will provide future residents with convenient access to future passenger rail services.

2.2 Area and Land Use

The DSP is approximately 499 ha in area. The majority of the site has been historically cleared of native vegetation with some limited areas of native vegetation remaining, primarily in the north-west of the DSP within and surrounding Bush Forever Site 13.

A site plan identifying the DSP area and it's surrounds is Figure 2 – 'Site Plan and Orthophoto'.

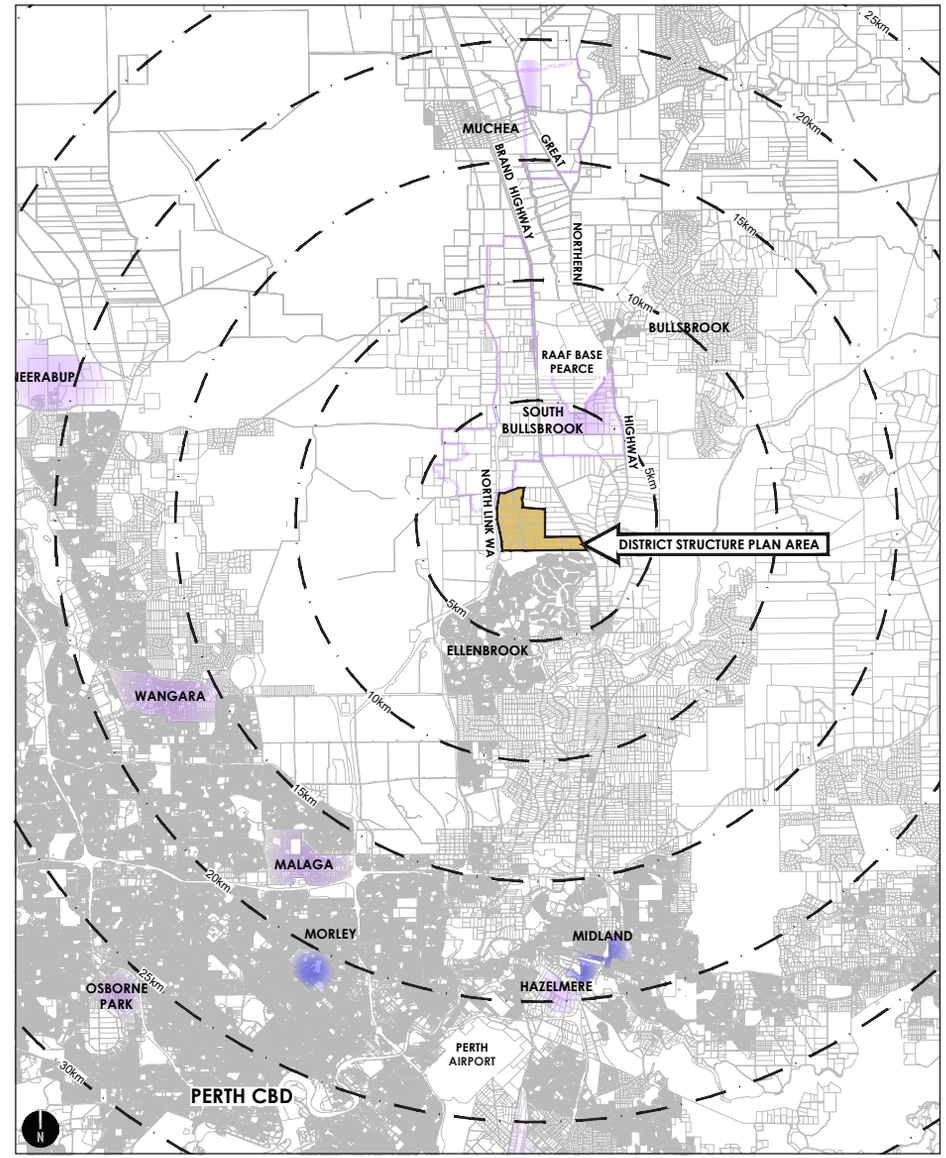


Figure 1: Location Plan

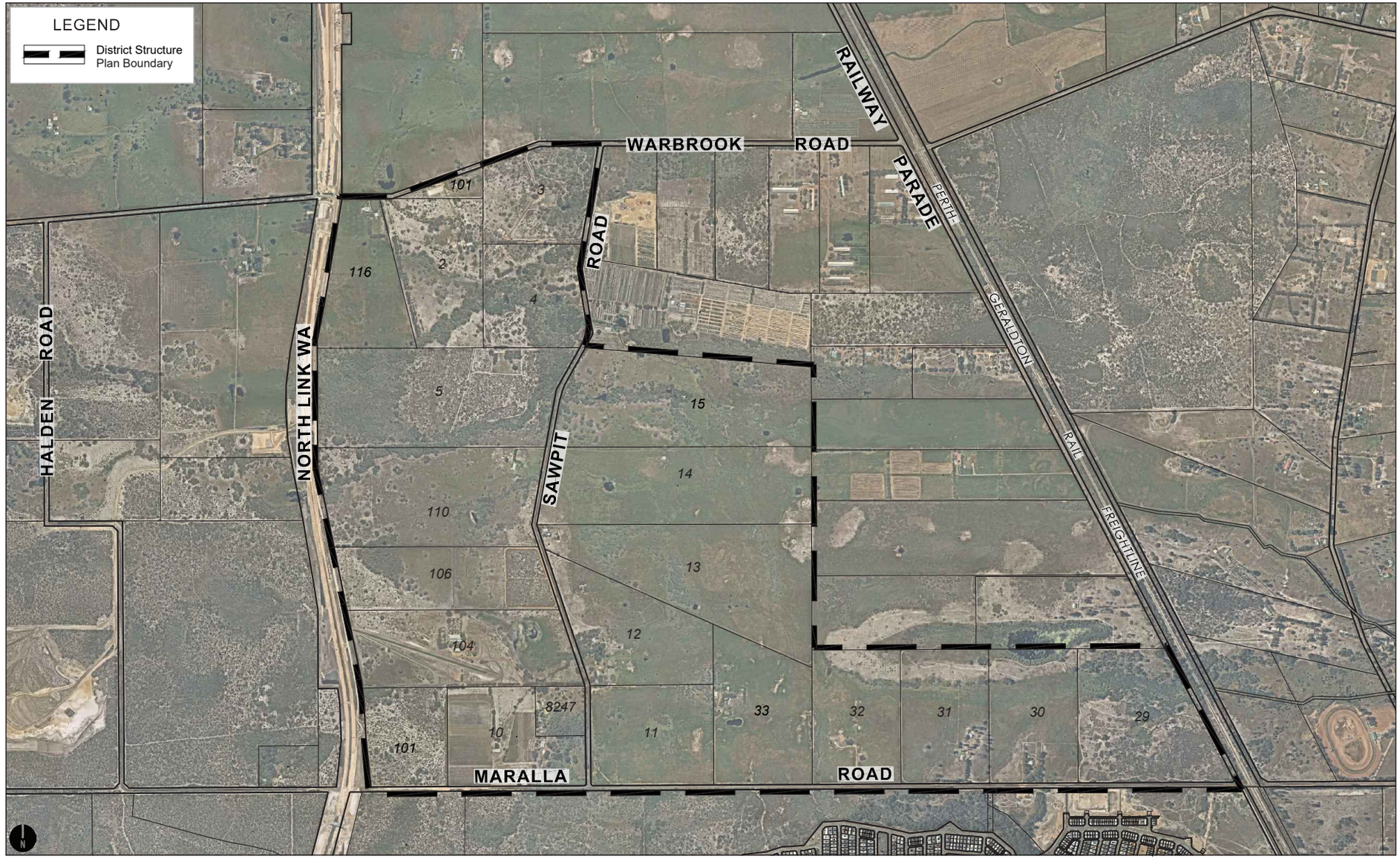


Figure 2: Site Plan and Orthophoto

Source: Nearmap

2.0 | LAND DESCRIPTION

The land is primarily used for a range of rural and rural-residential land uses, including small-scale hobby farms, horse agistment and pasture for limited cattle grazing. Lot 10 in the south-west corner of the DSP, abutting Maralla Road has historically been used as a turf farm.

Land uses external to the site that have been considered in the preparation of the DSP are discussed in further detail under sections 4.6.2 and 4.7.3 of this report. There are no existing land uses within the DSP area that affect the ability for the land to be developed for urban purposes.

2.3 Legal Description and Ownership

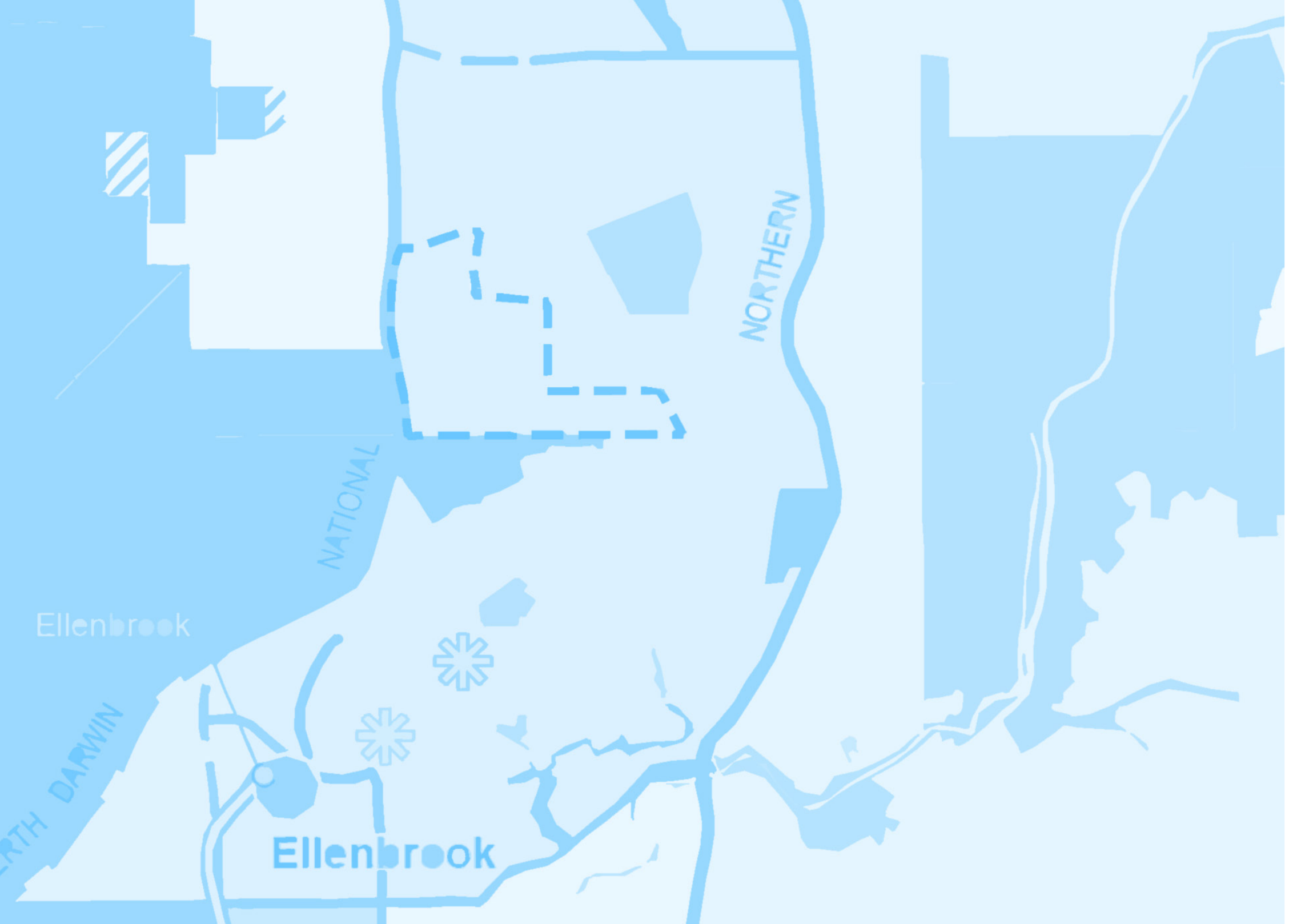
The DSP comprises 22 individual lots. The ownership structure of the DSP is outlined at Table 1.

Of the 22 lots identified at Table 1, Lendlease have control over 10 lots through contractual arrangements with individual landowners.

The DSP is also prepared in collaboration with the owners of lots 29 and 30 Maralla Road. Collectively, input and direction from the majority of affected landowners has guided the preparation of the DSP, representing a high degree of collaboration for the project.

Table 1: Land Ownership

Lot Number	Owner	Land Area (ha)	Plan	Volume / Folio
2	Ross, George Dickson & Ross, Kelly Amanda Shirley	20.685	P007880	108/50A
3	Adtech FRP Pty Ltd	16.188	P007880	1737/258
4	K Corp Holdings Pty Ltd	16.692	P007880	1446/368
5	Yozzi, Antonio	39.161	P007880	80/16A
10	Robinson, Linda Helen & Robinson, Terry William	18.393	P007880	246/39A
11	Maralla Holdings Pty Ltd	20.133	P007880	1597/569
12	Edwards, Bruce Derek & Edwards, Jacqueline Ann	22.106	P007880	1597/571
13	Subbel, Anne Margaret & Sibbel, Franciscus	36.913	P007880	1597/568
14	Maralla Holdings Pty Ltd	33.915	P007880	1597/567
15	WA Land Holdings Pty Ltd	36.393	P007880	1275/443
29	Ellenbrook Developments Ltd	26.909	P008094	2059/401
30	Crossbrook Pty Ltd & Northern Corridor Holdings Pty Ltd	19.433	P008094	246/52A
31	Thompson, Beverley Anne & Thompson, John William	19.450	P008094	246/54A
32	Maralla Holdings Pty Ltd	19.435	P008094	246/56A
33	Maralla Holdings Pty Ltd	22.387	P008094	246/57A
101 (N)	Noone, Paul Andrew & Noone, Wendy Miranda	2.367	D083664	1980/778
101 (S)	K Corp Holdings Pty Ltd	16.512	P404845	2862/284
104	Taylor, Lois Patricia	27.423	P404846	2862/285
106	Clauson, Derek George & Taylor, Lois Patricia	21.551	P404847	2862/287
110	Sawpit Road Pty Ltd	34.759	P404848	2862/288
116	West, John Underwood & West, Lesley Irene	16.821	DP404849	2862/299
8247	Mulder, Dorothy Elizabeth	4.047	P255074	1601/676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3.0 PLANNING FRAMEWORK

3.0 | PLANNING FRAMEWORK

3.1 Regional and Sub-Regional Planning

3.1.1 Perth and Peel @3.5 million and the North East Sub-regional Planning Framework

The *North-East Sub-regional Planning Framework* (March 2018) provides the strategic direction for managing growth and development within Perth's north-east corridor. The Frameworks and associated mapping spatially identify consolidated urban areas to accommodate population growth as well as locations for strategic employment land for approximately 30 years (up to 2050). An excerpt of the Frameworks map identifying the 'North Ellenbrook Urban Investigation Area' within the relevant context is included as Figure 3 – 'Frameworks Map'.

Under the Frameworks, 'Urban Investigation' areas are identified as those requiring detailed planning prior to the Western Australian Planning Commission (WAPC) considering rezoning requests under the Metropolitan Region Scheme (MRS) and before development can occur. Consistent with 'Table 7: Implementation actions' of the Frameworks, this DSP represents the 'detailed planning' process to be undertaken prior to lodgement of an MRS amendment request.

In addition to the standard information and documentation that would be prepared in association with a DSP, 'Table 2: Urban Investigation areas – key considerations' of the Frameworks outlines the specific matters that are required to be addressed as part of the detailed investigation and planning for North Ellenbrook. Table 2 lists the key considerations for the North Ellenbrook Urban Investigation area followed by a brief response and reference to the section of the DSP where each key consideration is addressed in detail.

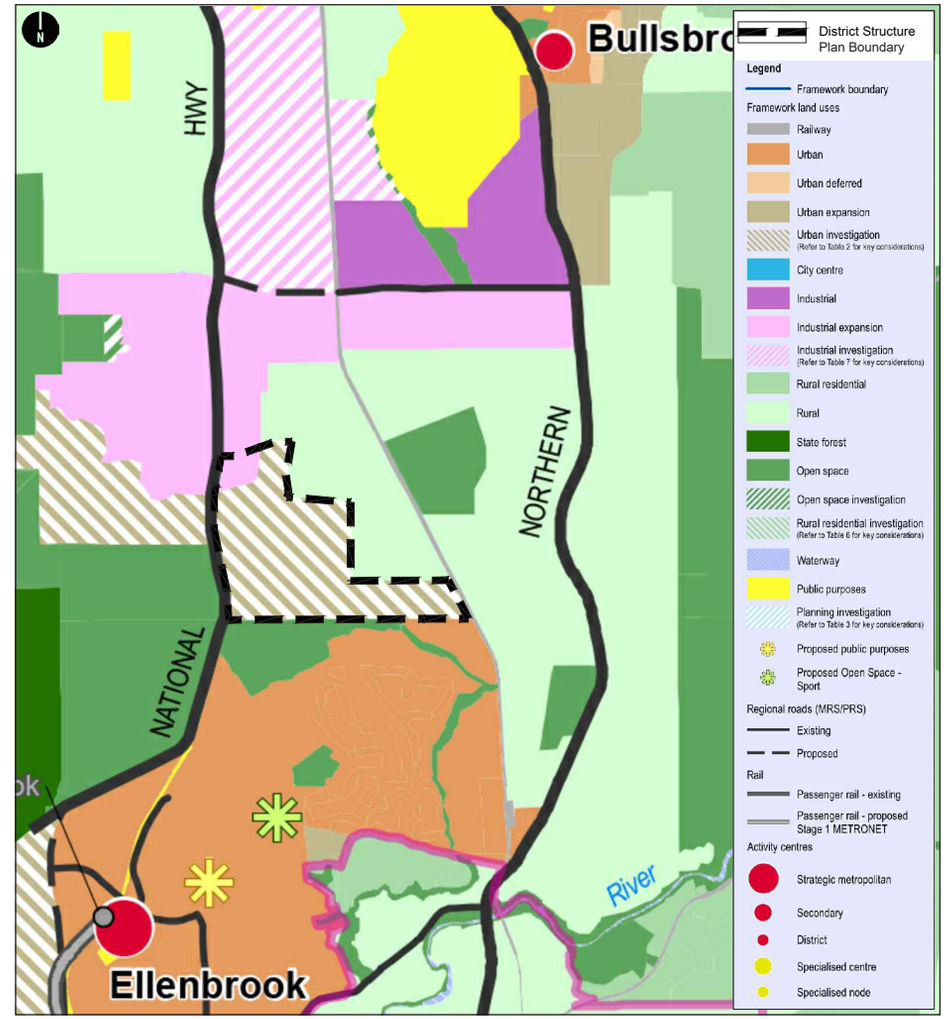


Figure 3: Frameworks Map
Source: Sub Regional Frameworks Plan (2018)

Table 2– North Ellenbrook Urban Investigation Area: Key Considerations

Key Consideration	Comment	Relevant Section of DSP Report
Protection of Bush Forever areas and conservation category wetlands	Bush Forever Site 13 is located within the DSP area. The DSP provides for the future protection and retention of the bush forever site and broader vegetation area within a Parks and Recreation Reserve under the MRS. All mapped conservation category wetlands are identified for retention within future local reserves.	5.5
Protection of high value Carnaby's Black Cockatoo habitat and vegetation with 10-30% remaining in Perth and Peel regions	The majority of the site has been historically cleared of native vegetation and associated terrestrial fauna habitat. No evidence confirming that Carnaby's Black Cockatoo roost or breed within the site was observed as part of the site investigations. Notwithstanding, the DSP seeks to protect areas identified as suitable foraging, roosting and breeding habitat for Carnaby's black cockatoo and forest red-tailed black cockatoo.	5.5
Protection of threatened ecological communities and flora populations	The majority of the site has been historically cleared of native vegetation. In relation to areas that have not been cleared and identified as threatened ecological communities, the DSP proposes the following: • Protection of the identified population of threatened flora species *Grevillea curviloba* within a local reserve; and • Protection of vegetation potentially representative of the state-listed TEC FCT 15 'Forests and woodlands of deep seasonal wetlands of the Swan Coastal Plain' within a local reserve.	5.5
Offsite impacts on Western Swamp Tortoise habitat (EPP)	The DSP area does not interact with the Twin Swamps Nature Reserve in terms of groundwater or surface water. Existing surface water from the DSP area does discharge into the Ellen Brook Nature Reserve via the Ellen Brook however, predevelopment flow quantity and quality will be maintained or improved to avoid impacting the habitat.	5.6
Best practice drainage and nutrient management	Stormwater and groundwater management strategies, as outlined in the District Water Management Strategy that accompanies this DSP, have been prepared as per best practice drainage and nutrient management, guided by the following documents: • *Better Urban Water Management* (WAPC 2008) • *Water Resource Considerations when Controlling Groundwater Levels* (DoW 2013) • *Decision process for stormwater management in Western Australia* (DWER 2017)	5.6
Impacts, risks and management of Gnangara groundwater resources (existing Priority 3 Source Protection Area)	The site is not within a public drinking water source area. It is located 2 km downstream of existing Priority 1 and Priority 3 areas and will not impact the Gnangara groundwater resource.	5.6
Pearce Airbase operations (Department of Defence)	The DSP area is not impacted by noise contours as demonstrated by the most recent Australian Noise Exposure Forecast (ANEF) Map for RAAF Base Pearce as published by the Department of Defence. The DSP does not propose land uses that could result in building heights affecting flight paths and does not propose land uses that could increase the risk of bird strike.	4.6
Transition/interface with regional open space areas	Bush Forever Site 300 and the association Parks and Recreation Reserve are located south of the DSP on the opposite side of Maralla Road. The Maralla Road road reserve will serve as an appropriate interface for managing potential impacts on the MRS reserve to the south.	3.1
Bushfire risk	The majority of the bushfire risk within the site will be removed as part of future development. Areas of vegetation that are proposed to remain but will pose a bushfire threat, will be appropriately managed through the strategic location and provision of public road reserves and managed public open space areas adjacent to these hazards.	4.4
Access to the regional road network	The DSP provides for an interchange with Northlink WA that will service both the eastern and western Urban Investigation areas. This will provide efficient and direct access to the regional road network.	5.3
Basic raw materials – sequential land allowing for extraction of sand resources	Neither the current nor draft mapping under *State Planning Policy 2.4 – Basic Raw Materials* identify basic raw materials within the DSP.	3.0

Part 4.2 of the Frameworks 'Staging and Sequencing' identifies the North Ellenbrook Urban Investigation area as 'Medium-long term' (2022+) (refer Figure 4 – Urban Staging). As outlined under the Frameworks, *"the timeframes depicted on the urban staging plan set out the anticipated timing for commencement of development, aligned with planned service provision and should not be construed as preventing further detailed planning from occurring in the interim."* This DSP represents part of the 'detailed planning' that is required to occur prior to development commencing. In considering the time required to progress the other stages of detailed planning for North Ellenbrook in addition to the DSP (i.e. MRS Amendments, local scheme amendments, local structure plans and subdivision), the project timing for commencing development in circa 2026 aligns with the Frameworks urban staging of 2022+.

The Frameworks acknowledge that timing for the delivery of land will be guided by a range of factors including demand for urban land, landowner intentions, the capacity of servicing agencies and local government planning within the sub-region. It also acknowledges the need for an adequate supply of land to be continuously available. A continuous supply of land is important to ensure that housing affordability is not adversely impacted in the future as a result of the demand for housing exceeding supply.

Consideration of land supply requires a multi-faceted approach and should not be limited to a simple mathematical exercise based on total areas of zoned land and average consumption rates. Separate to the physical amount of land available for development but equally as important, is consideration of the timing, ability and willingness for the land to be developed within a timeframe that can match demand. The location of the future urban areas must also be considered, acknowledging that certain locations are better placed to accommodate residential development due to their proximity to established residential areas and the associated access to infrastructure, services and amenities.

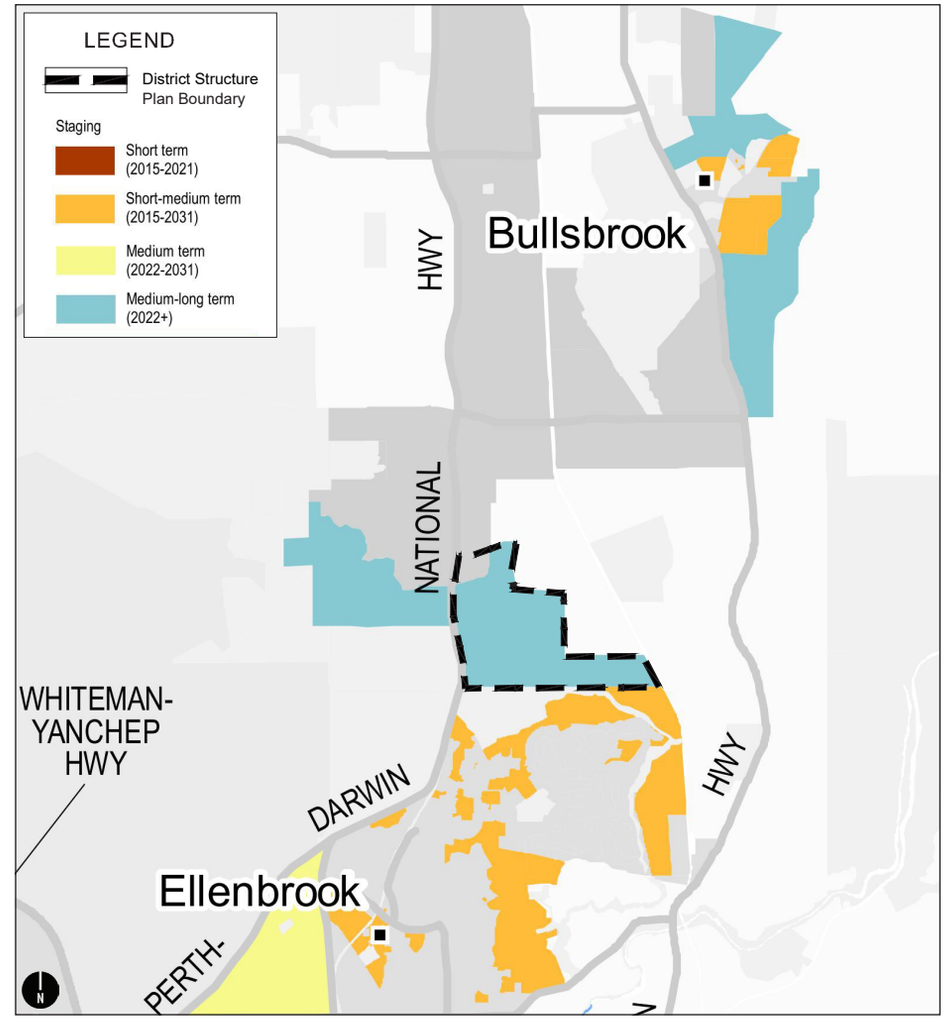


Figure 4: Urban Staging
Source: Sub Regional Frameworks Plan (2018)

To better inform and consider the matter of land supply within the north-east sub-region, the proponent of this DSP, Lendlease, commissioned Research4 to undertake an analysis of the north-east sub-region greenfield market and consider the matter of adequate land supply (refer Appendix 1 – Perth North East Land Market Analysis (2019)).

Research4 is a renowned Australian firm who undertake detailed and unique research into Australia's Greenfield markets. This research is used to underpin a range of third party research programs, state government planning programs and private sector land supply programs. The National Greenfield Survey Program covers 44 individual greenfield markets across all major capital cities. The survey has been running continuously since 2008, monitoring over 2,500 land estates that have been delivered by over 900 land developers.

Through analysis of their National Greenfield database, Research4 have identified that effective Greenfield markets are ones where there is an appropriate level of competition relative to underlying demand. A primary objective of any Greenfield market is to respond to the need to accommodate people in a timely and affordable manner. This outcome is achieved by ensuring that the number of active trading estates is sufficient to maintain competition between estates. Healthy levels of competition can best be defined as when the combined development capacity of active land estates doubles that of demand i.e. the industry should be able to produce two blocks of land for every one block of land that is needed. This is referred to as a 2:1 'Development Capacity' ratio and is considered to be what is required to maintain a market wherein the forces of supply and demand are balanced.

Applying this principle to the north-east sub-region, the current Development Capacity ratio is 2:6:1, meaning that the local market is considered 'balanced'.

Currently, there are 36 active trading estates however, over the next two years 20 of these 36 trading estates are expected to be completed. This will result in the Development Capacity Ratio dropping from 2:6:1 down to 1:6:1. A ratio that is under 2:1 results in slower delivery times of required housing stock and upward pressure on land prices.

Research4's analysis determines that in order to maintain a continuous supply of land and prevent prices from escalating (i.e. a 2:1 Development Capacity ratio), land estates that are close to being fully developed within the north-east corridor will need to be replaced by up to seven new 'standard sized estates' (between 250 and 750 lots) within the next three years. Further, there is the potential to consider a new 'Group 1 estate' (> 3,000 lots) based on the fact that other Group 1 and 2 estates (1,500 – 3,000 lots) have historically performed well and that the Vale and Whiteman Edge estates are modelled to be completed by 2024. The DSP area is expected to yield approximately 5,500 lots (i.e. greater than 3,000 lots) and would be classified as a 'Group 1 estate'. The estimated commencement timeframe for North Ellenbrook in circa 2026 would assist to offset the loss of development capacity anticipated to occur post 2024 when other Group 1 and 2 estates have been completed.

Table 3: Frameworks Staging Criteria

Frameworks Criteria	DSP Response
The proposal represents a logical expansion and consolidation of the existing developed urban form.	The DSP is a logical extension of the Ellenbrook urban area, which is located directly to the south. Development of the DSP represents a coordinated and consolidated urban form based on the fact that it is an extension of the urban front coordinated by an overarching DSP. The proposed location of the Ellenbrook passenger rail station approximately 5.5 km to the south further supports the urbanisation of the DSP area.
The proposal is compatible with the economic development of the area and the planned provision of employment opportunities for the project population within the sub-region.	The DSP is well located with efficient access to both existing and planning employment land that includes South Bullsbrook Industrial and the Muchea Industrial Park. Furthermore, the Economic, Retail and Employment Strategy that supports the DSP (refer Appendix 2) identifies that a fundamental economic growth challenge in the future will be to ensure that there is an adequate workforce living in proximity to South Bullsbrook and Muchea Industrial to provide a nearby resident workforce.
The development can be readily accessed without the provision of additional transport infrastructure, unless that infrastructure is already funded.	The recently constructed Northlink WA directly abuts the western DSP boundary and will provide efficient access to the regional road network. No major road extensions or upgrades are required to service the DSP.
The proposal will not detrimentally impact upon staging timeframes of other urban land, in terms of the ability to service the land.	The DSP is located at the edge of the urban front and forms a sequential and logical progression of urban development. The DSP area can be largely serviced by existing infrastructure, albeit the final routes and alignments are yet to be determined. Should development proceed in a coordinated manner, it will not be taking capacity of existing infrastructure to the extent that other urban areas are detrimentally affected. It is noted that some inter-catchment planning will be required for some services as land progresses from rural to urban purposes as per the standard process for infrastructure planning.
Agreed and finalised funding arrangements are in place with essential service providers, acknowledging that funding is the responsibility of the landowner, unless provided for in a current capital works program of the relevant servicing authority.	Planning for some essential services is an ongoing process which will be informed by the DSP and subsequent planning stages, however where services cannot be provided by a direct connection to existing infrastructure, the landowner will be in continuous engagement with those authorities where extensions or other headworks are required. It is understood that where service infrastructure works are required that do not form part of a capital works programme, that the developer may be required to fund works in order to service the land.
Servicing can be economically provided over its lifespan.	The DSP area can be serviced economically through a combination of both developer and prefunded infrastructure works.

Based on the findings of Research4's analysis, strategic planning for new greenfield areas cannot simply be based on a total available supply vs average consumption or estimated population growth scenario. Whilst this may result in supply being able to perfectly match the demand for housing, it is incapable of considering and responding to market forces. Research4's market analysis shows that planning for the *affordable* supply of land must consider the economics of land supply. In order to manage land prices and prevent a situation where they escalate at an overinflated rate, land supply needs to be able to support a range of active land estates with a combined development capacity that exceeds demand by a ratio of 2 to 1. Whilst the ratio for the north-east sub-region currently sits at 2:1, without new estates being released over the next two years demand is expected to outstrip supply - a situation that should be avoided through the strategic planning for new urban land in the north-east sub-region.

Notwithstanding the fact that the anticipated project timing to commence development of the DSP area matches the urban staging program under the Frameworks, North Ellenbrook (east) addresses the staging criteria of the Frameworks as shown in Table 3.

3.1.2 City of Swan Local Planning Strategy

The City of Swan's Local Planning Strategy provides the strategic planning framework to guide planning decision-making at the local level.

The Local Planning Strategy identifies North Ellenbrook as a 'Future Urban Area' (refer Figure 5 – City of Swan Local Planning Strategy).

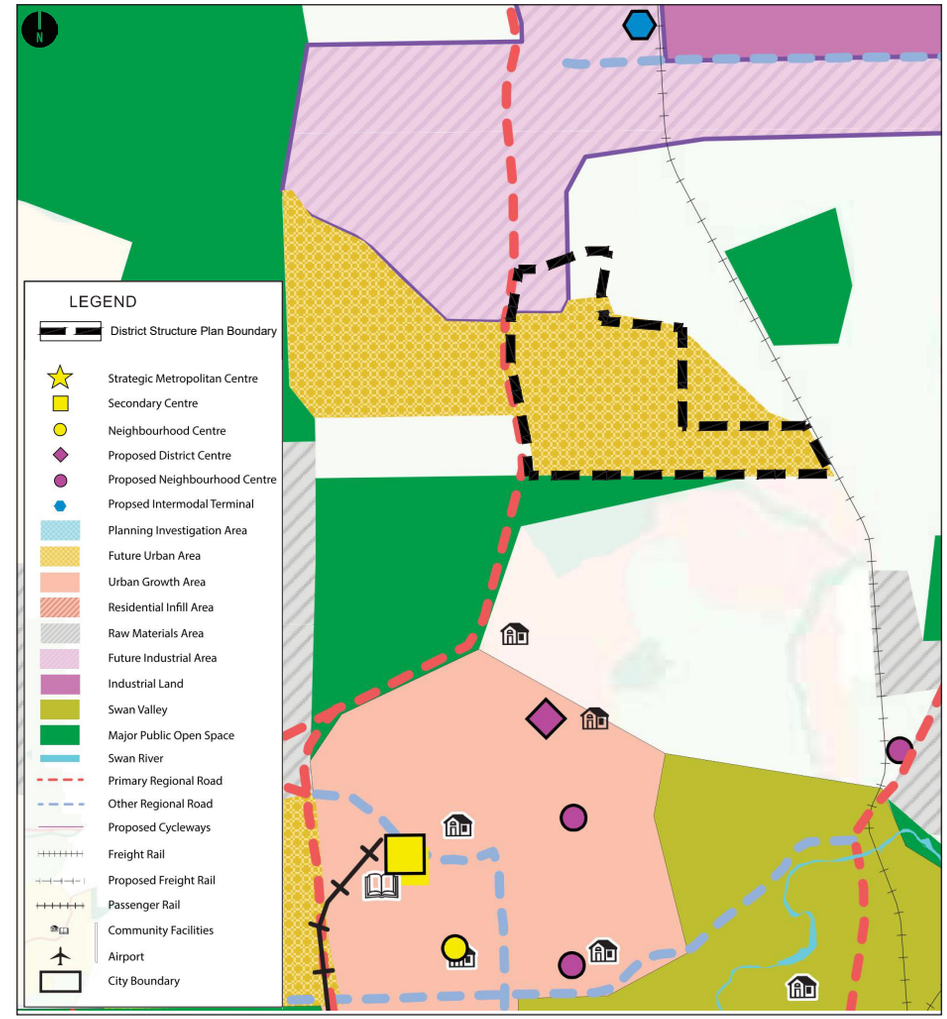


Figure 5: City of Swan Local Planning Strategy
Source: City of Swan

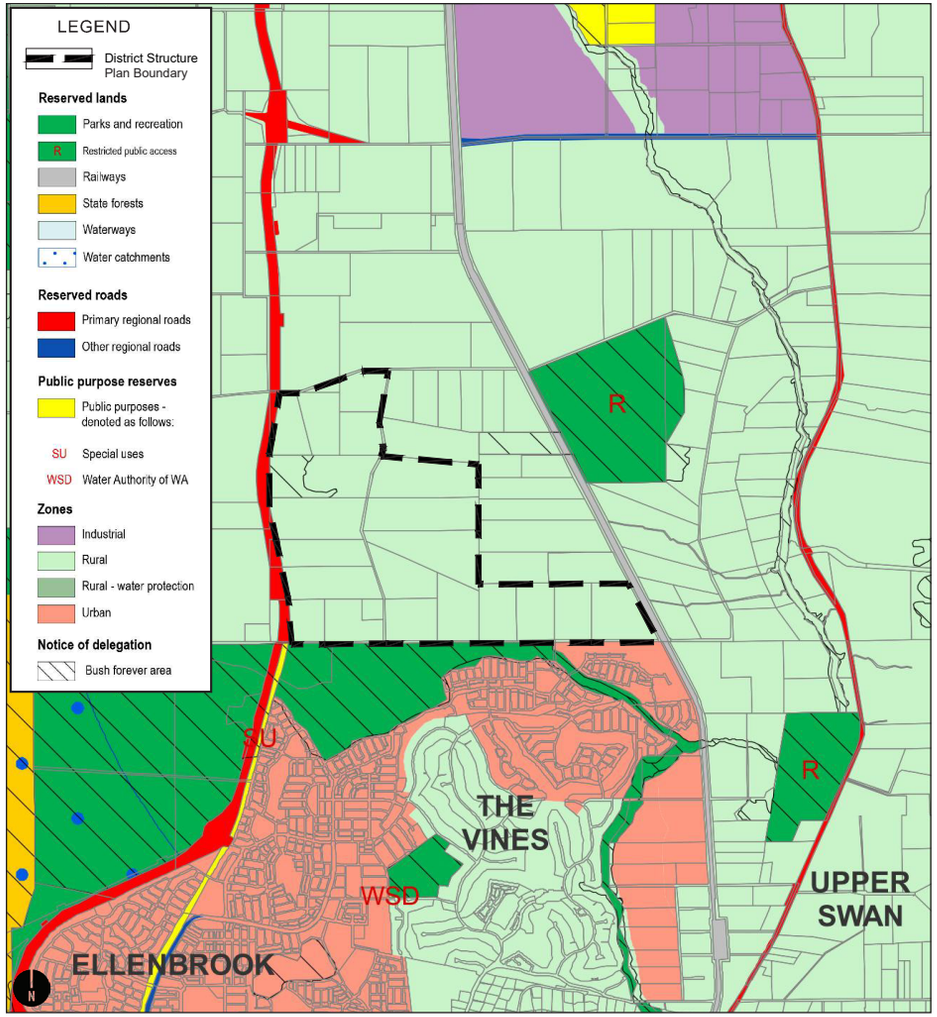


Figure 6: Metropolitan Region Scheme

Source: Metropolitan Region Scheme

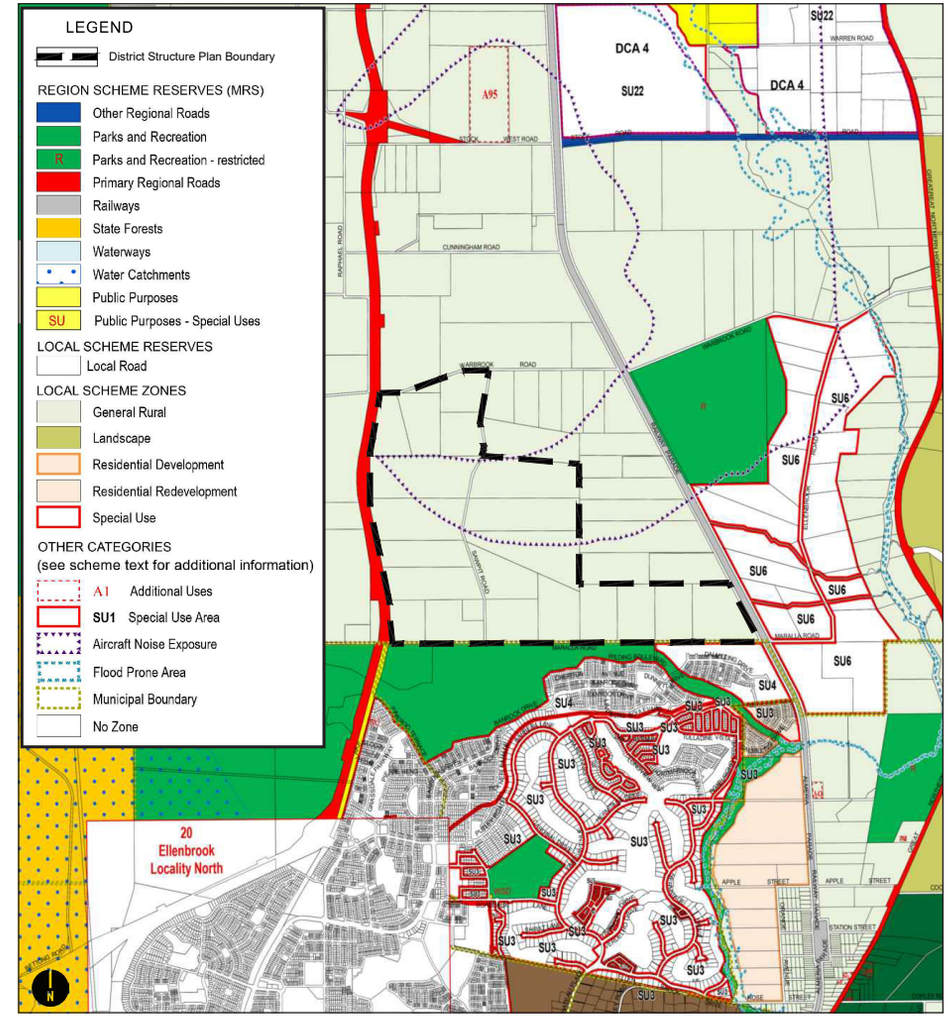


Figure 7: Local Planning Scheme

Source: City of Swan Local Planning Scheme No. 17

3.2 Zoning And Reservations

3.2.1 Metropolitan Region Scheme

The Metropolitan Region Scheme is the statutory planning framework that zones and reserves land for the Perth Metropolitan Region.

The entire DSP area is zoned 'Rural' under the Metropolitan Region Scheme (refer Figure 6 – Metropolitan Region Scheme). Whilst not a zoning or reserve, the Bush Forever layer on the MRS Map identifies 'Bush Forever Site 13' over the western third of lot 5.

As outlined under the 'Future Processes' section of the Part 1 – Implementation Report, amendments to the MRS will be required in order to implement this DSP.

3.2.2 City of Swan Local Planning Scheme No. 17

The DSP area is zoned 'Rural' under the City of Swan's Local Planning Scheme No. 17 (LPS 17) (refer Figure 7 – Local Planning Scheme 17).

The LPS 17 Map also identifies portions of lots 5, 110, 15, 14 and 13 as being within a Special Control Area for 'Aircraft Noise Exposure' in association with RAAF Base Pearce. As per clause 6.2 'Aircraft Noise Exposure Areas' of LPS 17, the Special Control Area seeks to ensure potential noise impacts are mitigated at the development application stage. It should be noted however, that the Special Control Area as shown on the LPS 17 Map is not consistent with the most recent Australian Noise Exposure Forecast (ANEF) Map for RAAF Base Pearce as published by the Department of Defence (refer Figure 8 – RAAF Base Pearce ANEF (2012)). As demonstrated by the ANEF, the DSP area is not impacted by noise contours from RAAF Base Pearce.

Future amendments to LPS 17 may seek to revise the boundary of the Special Control Area to more accurately reflect the ANEF.

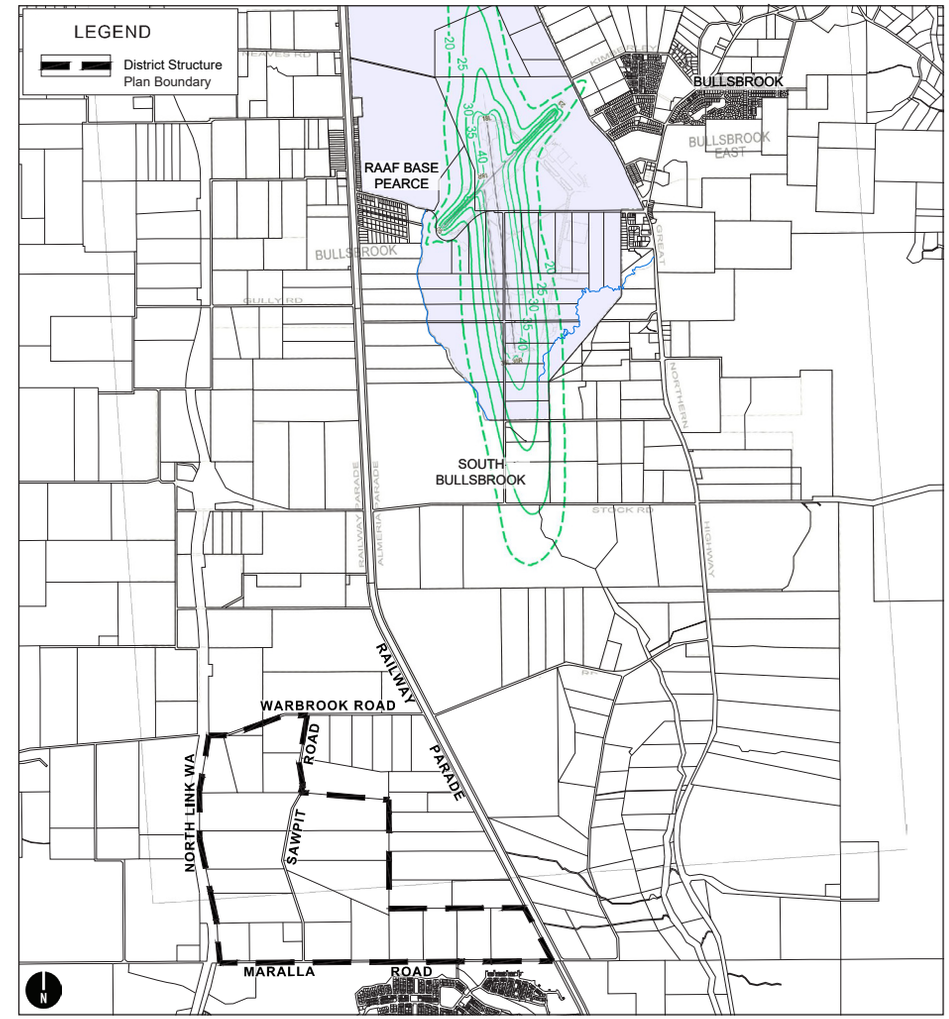


Figure 8: RAAF Base Pearce ANEF (2012)
Source: Airport Consulting 2012

3.3 State Planning Policies

The following state planning policies are relevant to the DSP and have informed its preparation:

- *State Planning Policy 2 - Environment and Natural Resources (SPP 2)*
- *State Planning Policy 2.2 - Gnangara Groundwater Protection (SPP 2.2)*
- *State Planning Policy 2.4 - Basic Raw Materials (SPP 2.4)*
- *State Planning Policy 2.5 - Rural Planning (SPP 2.5)*
- *State Planning Policy 2.7 - Public Drinking Water Source (SPP 2.7)*
- *State Planning Policy 2.8 - Bushland Policy for the Perth Metropolitan Region (SPP 2.8)*
- *State Planning Policy 2.9 - Water Resources (SPP 2.9)*
- *State Planning Policy 3.0 - Urban Growth and Settlement (SPP 3)*
- *State Planning Policy 3.6 – Infrastructure Contributions (SPP 3.6)*
- *State Planning Policy 3.7 - Planning in Bushfire Prone Areas (SPP 3.7)*
- *State Planning Policy 4.2 - Activity Centres for Perth and Peel (SPP 4.2)*
- *State Planning Policy 5.4 - Road and Rail Transport Noise and Freight Considerations in Land Use Planning (SPP 5.4)*
- *State Planning Policy 7 - Design of the Built Environment (SPP 7)*

3.3.1 Liveable Neighbourhoods

Whilst not technically a state planning policy, *Liveable Neighbourhoods* is an operational policy which serves as the primary tool for guiding the planning and design of greenfield areas. The principles and requirements of *Liveable Neighbourhoods* have informed the DSP, particularly with regards to the spatial distribution of non-residential land uses depicted on the DSP Map. *Liveable Neighbourhoods* will continue to guide subsequent planning processes specifically, the local structure plan and subdivision design stages.

3.4 Consultation

The following government agencies have been consulted in the preparation of this DSP:

- Department of Planning, Lands and Heritage;
- Department of Water and Environmental Regulation/EPA Services;
- Department of Education;
- Main Roads Western Australia;
- Water Corporation; and
- City of Swan.

The DSP incorporates and responds to the information provided by the relevant government agencies which are discussed in further detail under the relevant sections of this report.

4.0 EXISTING SITE CONDITIONS

4.0 | EXISTING SITE CONDITIONS

4.1 Environmental Assets and Constraints

4.1.1 Flora and Vegetation

As outlined above, the majority of the site has been historically cleared with limited areas of remnant native vegetation remaining. A number of site specific flora and vegetation surveys were completed to determine the flora and vegetation values within the site. Detailed information regarding the outcomes of the flora and vegetation surveys is provided within the Environmental Assessment Report prepared by Emerge Associates in support of the DSP (refer Appendix 3).

The key flora and vegetation values identified by the Environmental Assessment Report are summarised as follows:

- 9% of the site (approximately 41.7 ha) comprises intact native vegetation in 'good' or better condition. This vegetation primarily occurs in the north-western portion of the site, within and surrounding Bush Forever Site 13 and various surface water features. The remaining 91% of the site contains highly disturbed native vegetation or cleared areas.
- 72% of the site (approximately 363 ha) comprises non-native vegetation, bare soil, pasture weeds, planted trees or scattered remnant trees and shrubs. The remaining 28% of the site (approximately 138 ha) comprises a range of wetland, transitional and upland plant communities. The majority of vegetation within the site is associated with wetland-type communities due to the predominant underlying wetland landform.
- The majority of the site is mapped within the Yanga vegetation complex, of which 16.5% of its pre-European extent remains across the Swan Coastal Plain. The south-western corner of the site is mapped within the Bassendean North complex, of which 71.8% of its pre-European extent remains.
- With regard to threatened ecological communities (TECs), the site contains:
  - 9.3 ha of the 'Banksia Woodlands of the Swan Coastal Plain' TEC, which is listed under the Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999*. Patches of this TEC vary in condition from 'degraded' to 'very good' and were not considered significant. This is on the basis that they are either isolated, small in area and/or highly disturbed from their natural form. Collectively, these factors reduce their overall conservation value.
  - 5.7 ha of the state-listed priority ecological community (PEC) 'Banksia dominated woodlands of the SCP IBRA region'.
  - Potentially 0.6 ha of the state-listed 'Forests and woodlands of deep seasonal wetlands of the Swan Coastal Plain'. All of this vegetation was assessed to be in 'degraded' condition and as such was only considered to be potentially representative of the TEC.
- The site contains two occurrences of State and Commonwealth listed threatened flora species *Grevillea curviloba* subsp. *curviloba* (Narrow curved-leaf Grevillea). Both occurrences of this species occur within Lot 29.

No other priority or threatened flora species were identified within the site or are considered likely to occur.

The mapped vegetation condition for the site is shown at Figure 9 – 'Vegetation Condition' with Figure 10 – 'Threatened and Priority Ecological Communities' showing the identified TEC's and PEC's.

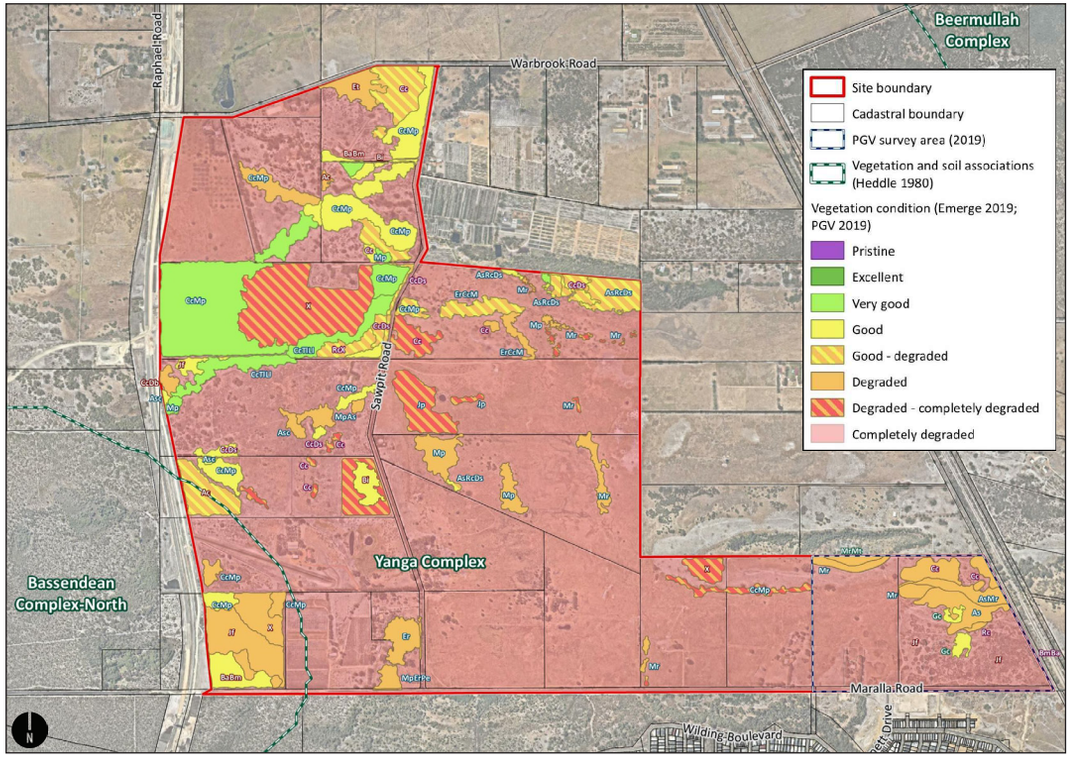


Figure 9: Vegetation Condition

Source: Emerge

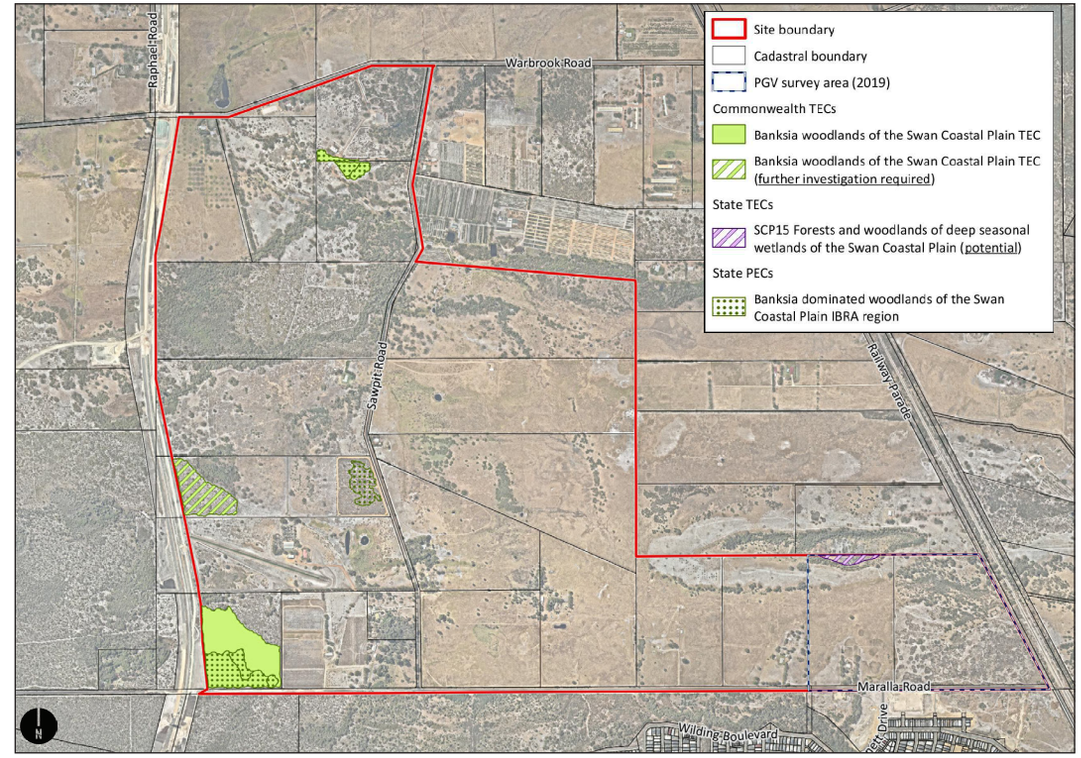


Figure 10: Threatened and Priority Ecological Communities

Source: Emerge

4.1.2 Terrestrial Fauna

As outlined above, the majority of the DSP area is cleared of native vegetation and associated fauna habitat. Some discrete areas of fauna habitat remain and the DSP is situated in proximity to habitat reserves for the endangered Western Swamp Tortoise (WST). As such, a number of site specific fauna surveys have been completed to determine fauna habitat values within the DSP area.

Detailed information regarding terrestrial fauna considerations for the site is provided in the Environmental Assessment Report (refer Appendix 3) and are summarised as follows:

- The majority of the DSP area has been cleared of native vegetation and associated terrestrial fauna habitat. Some good habitat connectivity occurs in the northern portion of the DSP within, and in proximity to, Bush Forever Site 13. This area is characterised by contiguous areas of intact riparian vegetation and associated fauna habitat. Scattered native mature trees across the site also provide some fauna habitat values, particularly for avifauna species such as black cockatoos.
- No threatened fauna species listed under State or Commonwealth legislation were identified within the DSP area. A targeted assessment of threatened species of black cockatoo determined that both Carnaby's black cockatoo (CBC) and forest red-tailed black cockatoo (FRBC) are regular visitors to the site, with some suitable foraging, roosting and breeding habitat identified. No evidence confirming that the species roost or breed within the DSP area was observed, although evidence that both species forage within the DSP area was sighted.
- The quenda, which is a state listed priority fauna species, was determined to be a resident of the site, with evidence of diggings observed in multiple locations within areas of suitable habitat.
- The site is situated approximately 850m west of Twin Swamps Nature Reserve and 1.4 km north-west of Ellen Brook Nature Reserve, which support the only two known wild populations of the WST species. Both reserves are highly managed by the Department of Biodiversity, Conservation and Attractions to ensure ongoing survival of the two WST populations. As such, the reserves are bound by predator-proof fencing, are restricted from public access and have their hydrological regime managed to ensure adequate surface water is available (which is critical to the WST life cycle). These two reserves are located within *Environmental Protection (Western Swamp Tortoise Habitat) Policy 2011* area, which directly abuts the eastern DSP boundary.
- A targeted WST assessment of the site was completed to support preparation of the DSP, which identified small areas of suitable habitat for WST within the site, generally associated with areas of intact riparian vegetation associated with surface water features. The presence of WST within the site however, was not considered to be likely, given that;
  - Areas of suitable habitat within the site are not protected from predators (such as foxes and feral cats) and are not actively managed for conservation purposes (in contrast to Twin Swamps and Ellen Brook Nature Reserves), reducing the likelihood of survival of any WST individuals within the site.
  - A road, railway line and predator-proof fencing separate the site from the known WST populations, which provide significant physical barriers to any potential movement of WST into the site from Twin Swamps or Ellen Brook Nature Reserves, reducing the likelihood of vagrant WST individuals reaching the site.

4.1.3 Bush Forever

Bush Forever Site 13 is located within lot 5, in the north-western portion of the DSP, covering an approximate area of 15.7 ha. No other Bush Forever sites occur within the DSP area.

Bush Forever Site 13 is associated with a conservation category wetland and comprises remnant vegetation determined to be in 'very good' condition. Vegetation within and surrounding Bush Forever Site 13 represents the largest and most contiguous areas of intact native vegetation.

4.1.4 Wetlands

A review of the geomorphic wetland mapping for the Swan Coastal Plain (refer Figure 11 – Bush Forever and Geomorphic Wetlands) confirmed that the following wetlands occur within the site:

- Two conservation category wetlands (CCW) (UFIs #16148 and #8926);
- Three resource enhancement wetlands (UFIs #16149, #12283 and #12444); and
- Three multiple use wetlands (UFIs #8935, #8936 and #15732).

Where the DBCA-mapped boundary of wetlands within the site does not align with on-ground conditions (for example, where portions of conservation category wetlands are mapped over cleared rural paddocks), more accurate wetland boundaries have been determined based on an assessment of landform, topography, surface water features and extent of riparian vegetation. This has resulted in some minor updates to mapped wetland boundaries within the site, which has informed preparation of the DSP. Detailed discussion on the updates to the wetland boundaries is provided within the Environmental Assessment Report (refer Appendix 3).

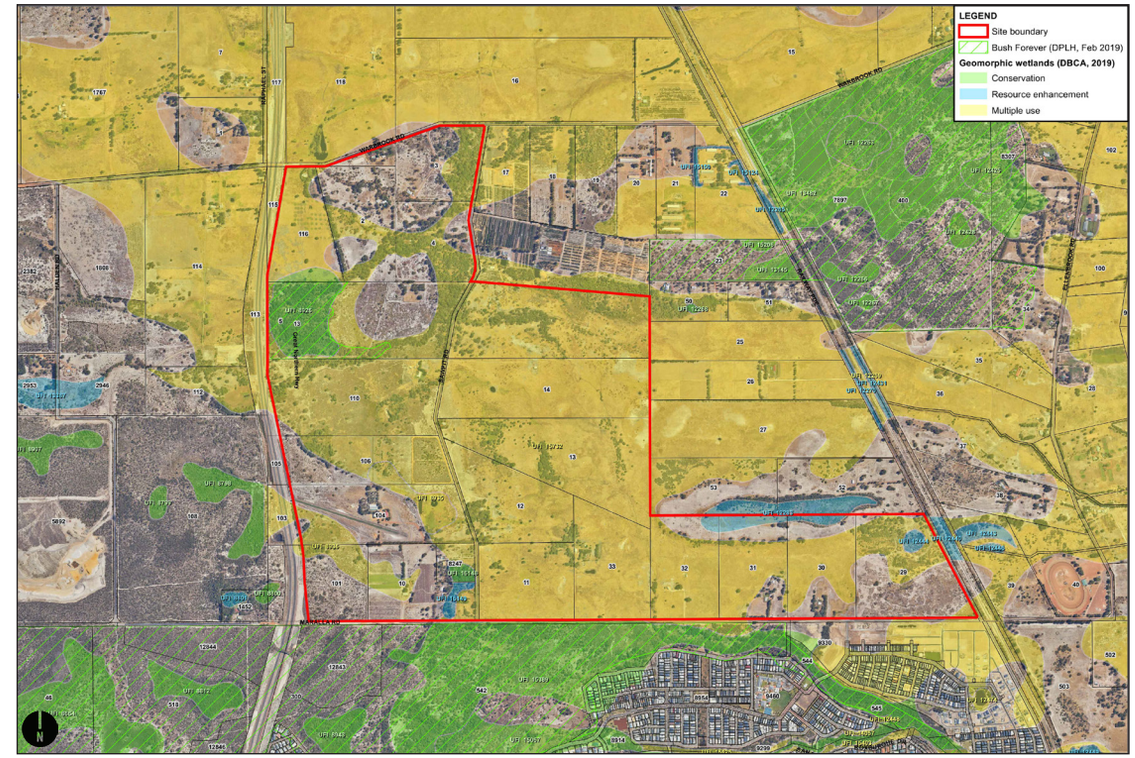


Figure 11: Bush Forever and Geomorphic Wetlands
Source: Emerge

4.2 Landform and Soils

The DSP area generally grades west to east from a height of RL59m Australian Height Datum (AHD) in the south-west corner down to RL27m AHD in the south east corner. Some topographical features exist on the site, specifically three elevated ridges – one located in the south-west corner, one mid-way along the western boundary and the third in the northern portion of the DSP to the west of Sawpit Road (refer Figure 12 – Landform and Topography).

Soil types within the DSP area comprise a majority of Bassendean Sand and Sand over Pebbly Silt (Guildford Formation). Bassendean sand is free-draining and suitable for development as proposed by the DSP. Pebbly Silt is generally consistent with a water table close to the surface and development in these areas may require additional free draining sand and subsurface drainage.

Sections of peaty clay are indicated within the western portion of the DSP area and may require removal or remediation prior to development.

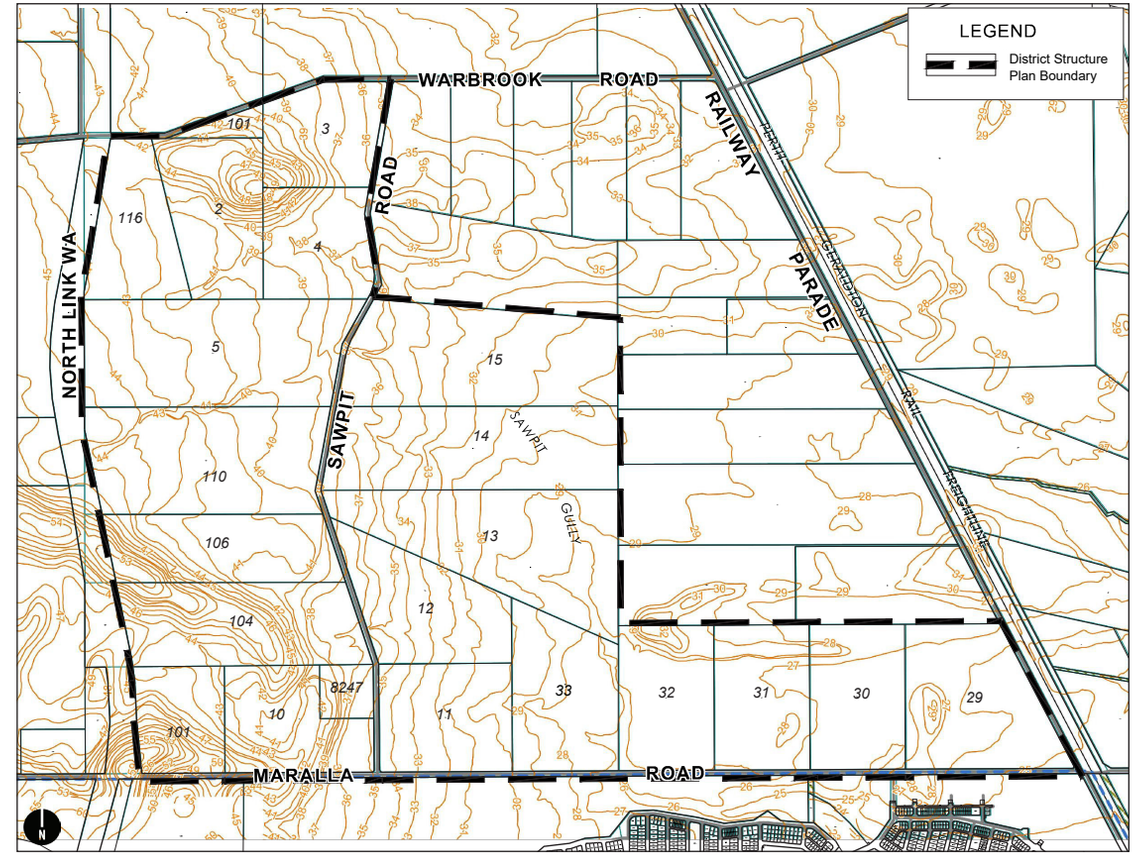


Figure 12: Landform and Topography
Source: City of Swan Intramaps, 2019

4.2.1 Acid Sulphate Soils

The Department of Environment and Conservation's Acid Sulphate Soils (ASS) Risk mapping indicates that the majority of the DSP area is classified as having a moderate to low risk of ASS occurring within 3m of the natural soil surface. Sections of high to moderate risk ASS are present, which may require treatment as part of future development in accordance with standard practice.

The Engineering Servicing Report (refer Appendix 4) that supports the DSP recommends that further testing is undertaken at the more detailed planning stages to confirm the presence of ASS on site.

4.2.2 Potential Contamination

Based on a review of the *Contaminated Sites Database* maintained by the Department of Water and Environmental Regulation (DWER), no registered contaminated sites ('contaminated – remediation required', 'contaminated – restricted use', or 'remediated for restricted use') occur within the site, nor are any registered within 3 km.

Historic and existing land uses

Based on DWERs *'Assessment and management of contaminated sites: Contaminated sites guidelines*', historic and existing rural land uses (which occur across the majority of the site) are not identified as potentially contaminating land uses.

The Guidelines identify *'market gardens, orchards, poly-tunnels, plant nurseries'* (which may incorporate turf farms, such as that within Lot 10) as potentially contaminating land uses. Site-specific investigations will be required to determine whether any contamination occurs within Lot 10, with such investigations typically undertaken in response to a standard condition of subdivision approval.

Per- and poly-fluoroalkyl substances (PFAS)

The DSP is situated approximately 3.7 km south-west of RAAF Base Pearce, which is known to be subject to PFAS contamination. The Department of Defence has undertaken a range of associated PFAS investigations, including a Preliminary Site Investigation, a Detailed Site Investigation, a Human Health Risk Assessment and an Ecological Risk Assessment. The outcomes of these investigations have informed the *RAAF Base Pearce PFAS Management Area Plan* (PMAP) which was published in July 2019.

The PMAP 'management area' does not extend into the DSP and is approximately 2.7 km from the DSP boundary at its closest point. In this regard, the PMAP states: *'The Management Area excludes portions of the Investigation Area that were not found to be impacted by PFAS or were not found to present an elevated risk of PFAS exposure to receptors (e.g. land to the south of the Site* [RAAF Base Pearce] and *Twin Swamps Nature Reserve*)'. PFAS contamination considerations related to RAAF Base Pearce are therefore not a relevant consideration for the DSP.

4.3 Groundwater and Surface Water

A District Water Management Strategy (DWMS) (refer appendix 5) has been prepared by project hydrologist RPS to inform and accompany the DSP. A key component of the DWMS is determining the existing groundwater and surface water conditions / characteristics that will guide the water management approach for the DSP.

4.3.1 Existing Groundwater Conditions

The pre-development Average Annual Maximum Groundwater Level (AAMGL) for the DSP area and surrounds was calculated using a combination of groundwater, drain and surface water monitoring data and topography.

Eleven bores located across the DSP area were monitored between June and December 2019 in order to capture the winter peak. Further monitoring capturing a second winter peak will be required at the Local Water Management Strategy (LWMS) stage. Long term historical data from twelve Department of Water and Environmental Regulation (DWER) bores were also used for the AAMGL calculations.

Contours and depths to AAMGL across the DSP area are shown at Figure 13 – 'Predevelopment groundwater and surface water conditions'. The AAMGL ranges from approximately 24 to 44m AHD and groundwater migrates to the southeast.

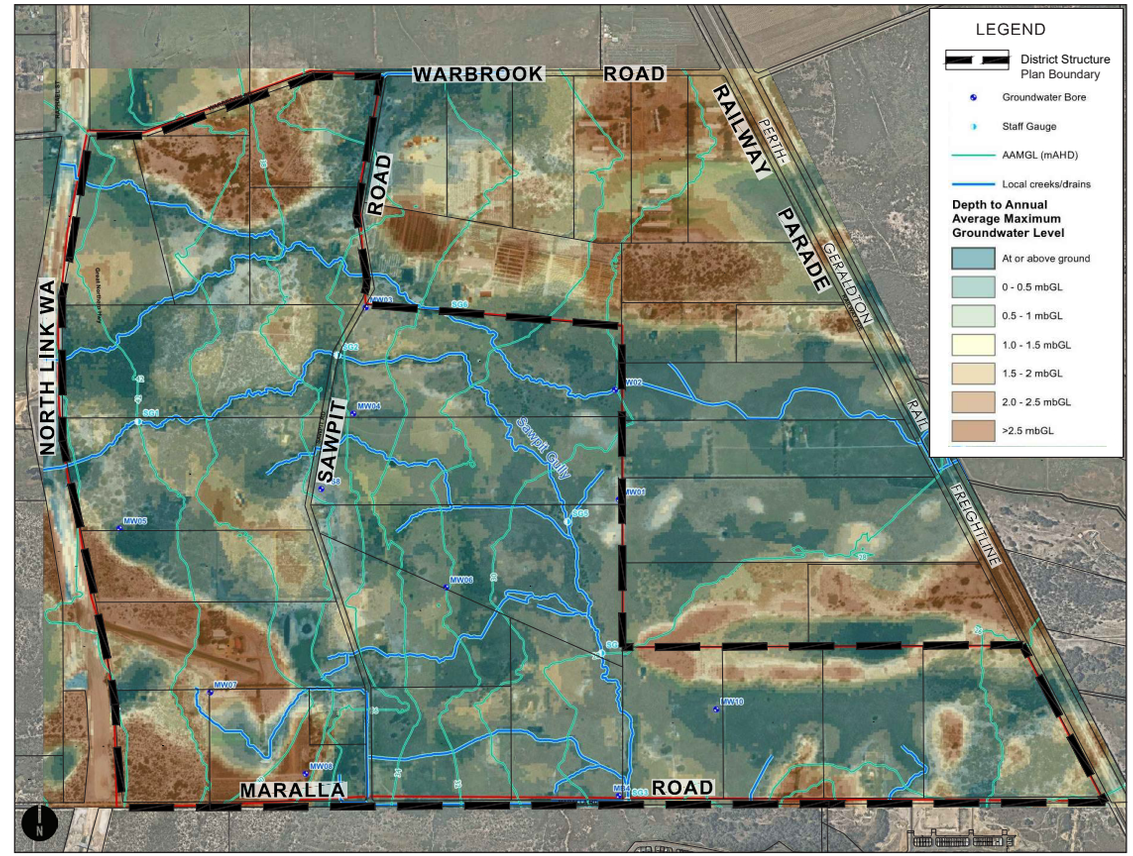


Figure 13: Predevelopment Groundwater and Surface Water Conditions

Source: RPS

The majority of the site is inundated or has very low clearance to groundwater with approximately:

- 25% of the DSP area has groundwater which is at or above natural surface level (NSL);
- 52% of the DSP area has groundwater which is between 0 and 1 m below NSL; and
- 23% of the DSP area has groundwater which is at a depth of greater than 1 m below NSL.

Groundwater can be managed through the design and construction process, where innovative solutions will be investigated. The DWMS approach to managing existing groundwater levels post-development of the DSP is outlined at section 5.6.1 of this report.

Groundwater Quality

Groundwater was sampled in August 2019 from nine bore locations as part of the DWMS. The monitoring results indicate groundwater at the site is acidic and generally fresh with the exception of one monitoring bore located in the northeastern area of the site which has a notably higher salinity than all other bores. Total nitrogen (TN) levels exceed Australian and New Zealand and Environmental and Conservation Council freshwater guidelines and Swan-Canning Water Quality Improvement Plan (SCWIP) guidelines for eight of the nine bores except one bore on the eastern boundary of lot 15 which is significantly higher. Similarly, total phosphorus (TP) levels in this bore are much higher than for all other bores. The notably higher salinity and nutrient concentrations for this bore location are interpreted to be due to the nursery located immediately north and upstream of this location. Additional groundwater monitoring will be undertaken in this area to inform the subsequent LWMS and Urban Water Management Plans.

Relationship with Western Swamp Tortoise habitats

Only the northern portion of the DSP area (lots 2 – 4 and lot 116) is located upstream of the Twin Swamps Nature Reserve and has the potential to interact with the Western Swamp Tortoise habitat in terms of groundwater.

The balance of the DSP area (Local Structure Plans 1 – 3) is not connected to Western Swamp Tortoise habitat (Twin Swamps Nature Reserve or Ellen Brook Nature Reserve) in terms of groundwater.

Relationship with Gnangara groundwater resources (existing Priority 3 Source Protection Area

As demonstrated at Figure 14 – 'Western Swamp Tortoise EPP & Public Drinking Water Source Areas', the site is not within a public drinking water source area. It is located 2 km downstream of existing Priority 1 and Priority 3 areas and will not impact the Gnangara groundwater resource.

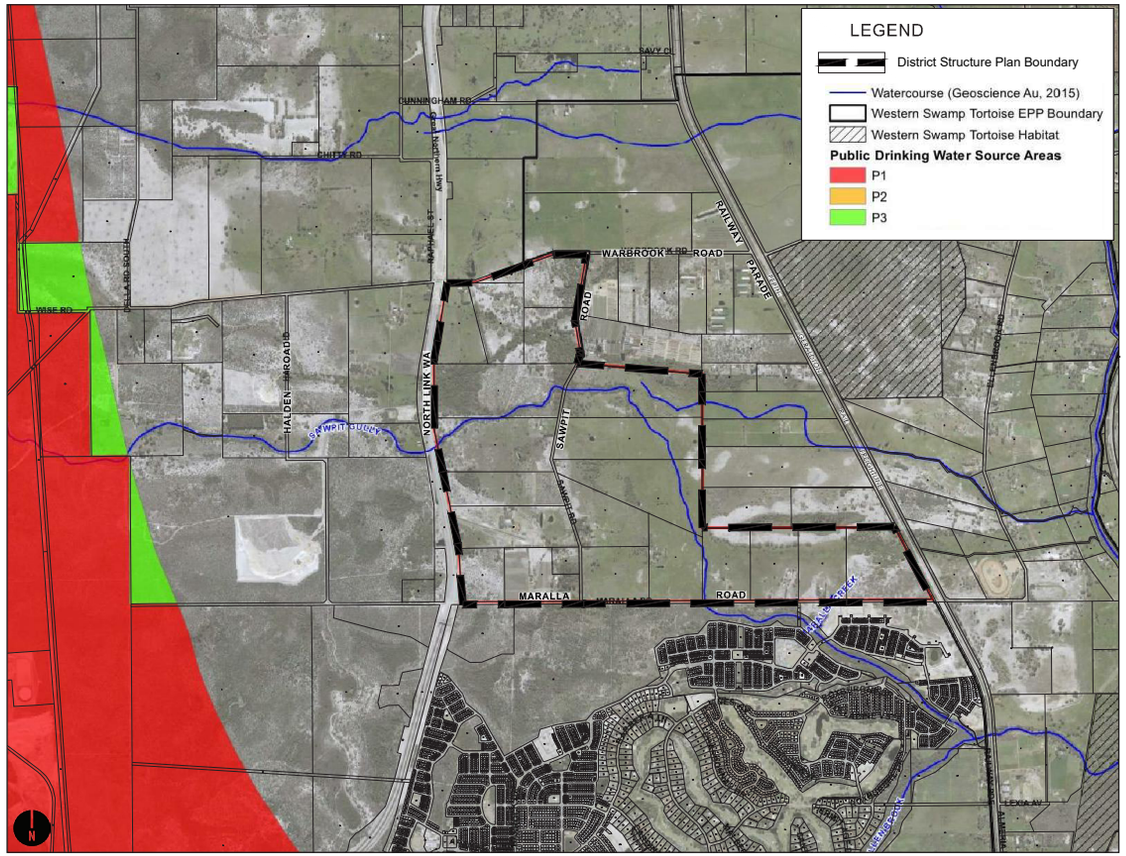


Figure 14: Western Swamp Tortoise EPP & Public Drinking Water Source Area

Source: RPS

4.3.2 Existing Surface Water Conditions

A system of local drainage lines and natural water courses convey surface water across the site. Surface water originates from seven external catchments which discharge into the DSP area from the west via existing culverts under Tonkin Highway. Surface water originates from 25 local catchments within the DSP which drain into the network of drainage lines and water courses. Existing surface water features and catchments are depicted at Figure 15 – 'Predevelopment Surface Water '.

Sawpit Gully runs through the site and conveys surface water flows from three of the external catchments west of the DSP. It also conveys the majority of surface water flows originating from catchments within the DSP area. Sawpit Gully exits the DSP to the south and ultimately discharges into the Ellen Brook, approximately 2km to the south east.

The remaining four external catchments west of Tonkin Highway discharge into the DSP area north of Sawpit Gully and into a creek line on an east-west alignment which also receives runoff from five of the local catchments within the DSP. The creek line exits the DSP area to the east before discharging into the Ellen Brook 3km downstream.

Two small local catchments discharge directly to the north of the DSP via culverts under the road network. Three small catchments in the south east of the DSP discharge to the east via a culvert under Railway Road.

Surface Water Quality

As part of the DWMS, surface water quality sampling was undertaken at six locations along Sawpit Gully and the northern creek, as depicted at Figure 13 – 'Predevelopment Groundwater and Surface Water'. The monitoring results indicate that surface water at the site is fresh. TN and TP levels exceed ANZECC and SCWIP guidelines at most locations.

Relationship with Western Swamp Tortoise habitats

As depicted at Figure 14 – 'Western Swamp Tortoise EPP & Public Drinking Water Source Area', no surface drainage lines from the DSP traverse or drain into the Twin Swamps Nature Reserve. The majority of surface drainage from the DSP discharges into Sawpit Gully which then discharges into the Ellen Brook downstream of Twin Swamps Nature Reserve.

Surface drainage from the two areas within the DSP traverse the Environmental Protection Policy (EPP) area and discharge into the Ellen Brook upstream of the Ellen Brook Nature Reserve. These areas are as follows:

- The northern portion of the DSP (lots 2, 4, 5, 15 and 116) which discharges into the northern creek traversing the EPP area downstream of the Twin Swamps Nature Reserve through an area that is cleared and a highly modified multiple use wetland; and
- A small eastern area of the DSP (lots 29 - 32) which drains across Railway Parade, traversing the EPP area before discharging into the Ellen Brook.

These areas contribute to the Ellen Brook Nature Reserve (not the Twin Swamps Nature Reserve) and predevelopment flow quantity and quality will be maintained or improved to avoid impacting the habitat.

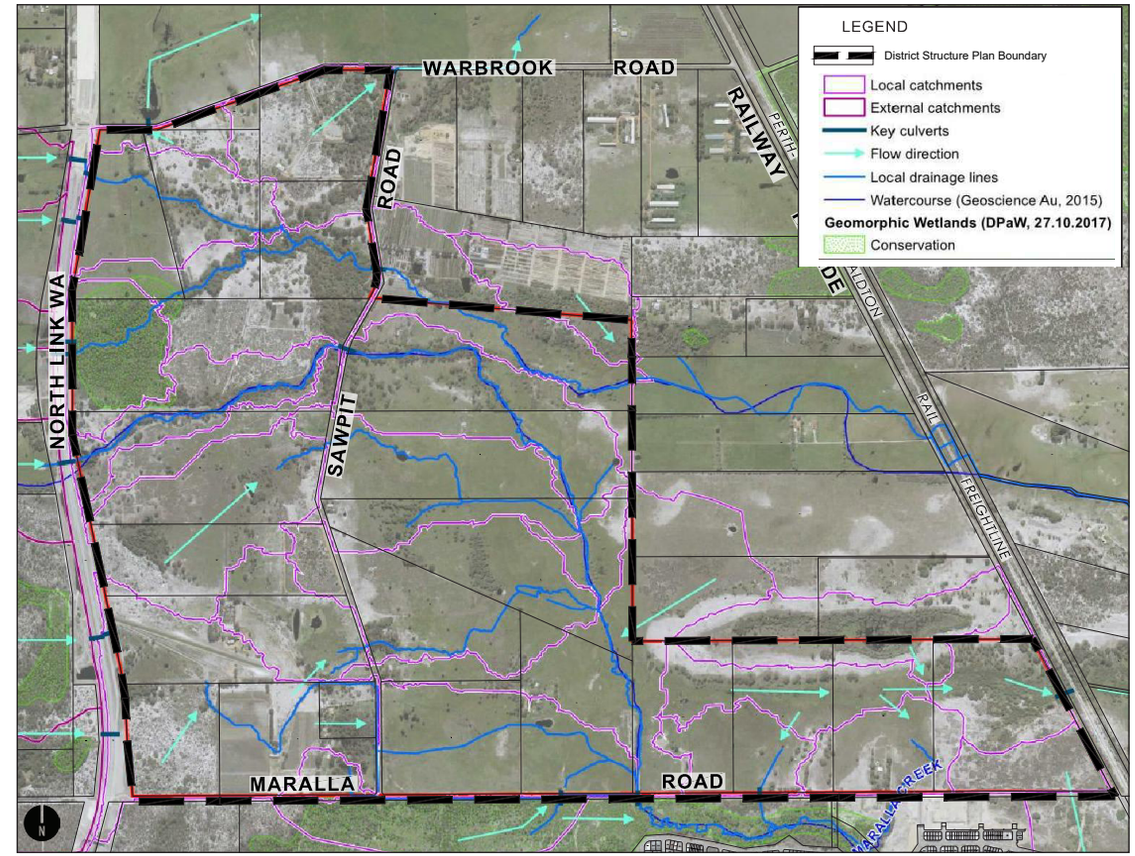


Figure 15: Predevelopment Surface Water
Source: RPS

4.4 Bushfire Hazard

The site is currently identified as a 'bushfire prone area' under the Map of Bush Fire Prone Areas prepared by the Office of Bushfire Risk Management (OBRM). The identification of a site within a declared bushfire prone area necessitates further assessment of the bushfire risk and suitability of the proposed development to be undertaken in accordance with *State Planning Policy 3.7 Planning in Bushfire Prone Areas* (SPP 3.7) and the *Guidelines for Planning in Bushfire Prone Areas Version 1.3* (the Guidelines).

A Bushfire Management Plan has been prepared to support the DSP (refer Appendix 6), which includes an assessment of vegetation within and surrounding the site to determine applicable bushfire hazards.

The assessment identified that grassland vegetation associated with areas of cleared pasture is the predominant bushfire risk for the DSP. Some areas of forest, shrubland and scrub vegetation associated with discrete areas of remnant and regrowth native vegetation were also identified as bushfire hazards.

The site is predominantly exposed to a moderate Bushfire Hazard Level (BHL), with areas of extreme BHL identified primarily in the northern and south-eastern portions of the site where areas of native vegetation primarily occur.

The DSP response to bushfire management is discussed in further detail under section 5.5.2 of this report.

4.5 Heritage

4.5.1 Aboriginal Heritage

Consistent with the *Aboriginal Heritage Due Diligence Guidelines*, a search of the *Aboriginal Heritage Inquiry System* was undertaken in association with the DSP. Part of Registered Site 3525 (Ellen Brook: Upper Swan) is mapped as occurring across the majority of the DSP area. No other Aboriginal Heritage Places are mapped as occurring.

Site 3525 is a registered mythological site associated with the Ellen Brook waterway and its tributaries and is mapped as extending across a total area of 20,819 ha of which 499 ha (2.4%) intersects the DSP. It is likely that any Aboriginal heritage values that are associated with site 3525 would be limited to the two arterial surface water drainage features (Sawpit Gully and the unnamed northern creekline) based on their function as tributaries to the Ellen Brook.

Section 18 of the *Aboriginal Heritage Act 1972* provides a statutory mechanism to resolve potential impacts to Aboriginal heritage sites associated with development proposals. As such, Aboriginal heritage considerations can be addressed and resolved at future stages of the land use planning process and do not need to be resolved as part of the DSP.

Further detail with regard to Aboriginal heritage is provided in the Environmental Assessment Report (refer Appendix 3).

4.5.2 European Heritage

Based on a review of various publicly available datasets, one non-indigenous heritage site is mapped as occurring within the DSP area. The Barnard Springs Trough & Wetland, which is listed on the City of Swan Heritage List, is mapped as occurring within Lot 8247 and is identified as a 'Category 2' heritage place, meaning it is considered to be of 'considerable significance to the locality'. The City of Swan Heritage List describes The Barnard Springs Trough & Wetland as consisting of:

> *'an historic dam and stock watering trough carved from two sections of trees and includes a feeder pipe between the dam and the trough. A permanent natural spring feeds the dam which feeds the natural wetland after passing through the pipe and trough. There are also other small springs in the wetland. The flooded gum forest is also a significant vegetation complex which is rare.'*

A further investigation of the heritage site will be undertaken as part of the local structure planning process for lot 8247 to confirm the location, extent and heritage values of the site. Should these further investigations identify the need to retain the heritage site, there will be the opportunity to accommodate its retention within local reserves.

Further detail with regard to non-indigenous heritage is provided in the Environmental Assessment Report (refer Appendix 3).

4.6 Noise

4.6.1 Road and Rail Noise

The DSP area is bound by Tonkin Highway on its western boundary and the Perth to Geraldton Freight Rail Line on its eastern boundary. In accordance with WAPC *State Planning Policy 5.4 'Road and Rail Noise*' (SPP 5.4), both Northlink and the freight line are required to be assessed against the policy requirements. An Acoustic Assessment has been prepared by acoustic consultants Herring Storer in accordance with SPP 5.4 and is appended to the DSP (refer Appendix 7).

The predicted noise levels for road and rail have been assessed against SPP 5.4 and where exceedances are predicted, the Acoustic Assessment makes recommendations on possible noise amelioration options to achieve compliance with the policy. The DSP response to potential noise constraints is discussed in further detail under section 5.5.3 of this report.

4.6.2 Other Potential Noise Sources

RAAF Base Pearce

The DSP area is not impacted by noise contours as demonstrated by the most recent Australian Noise Exposure Forecast (ANEF) Map for RAAF Base Pearce as published by the Department of Defence. No further response is therefore required as part of the DSP.

Ellenbrook Speedway

An assessment of local noise sources undertaken by Herring Storer (refer Appendix 7) identified that noise emissions from the Ellenbrook Speedway have the potential to marginally impact the south-east corner of the DSP. Noise mitigation strategies can be implemented to effectively mitigate this potential source and are discussed in further detail at section 5.5.3 of this report.

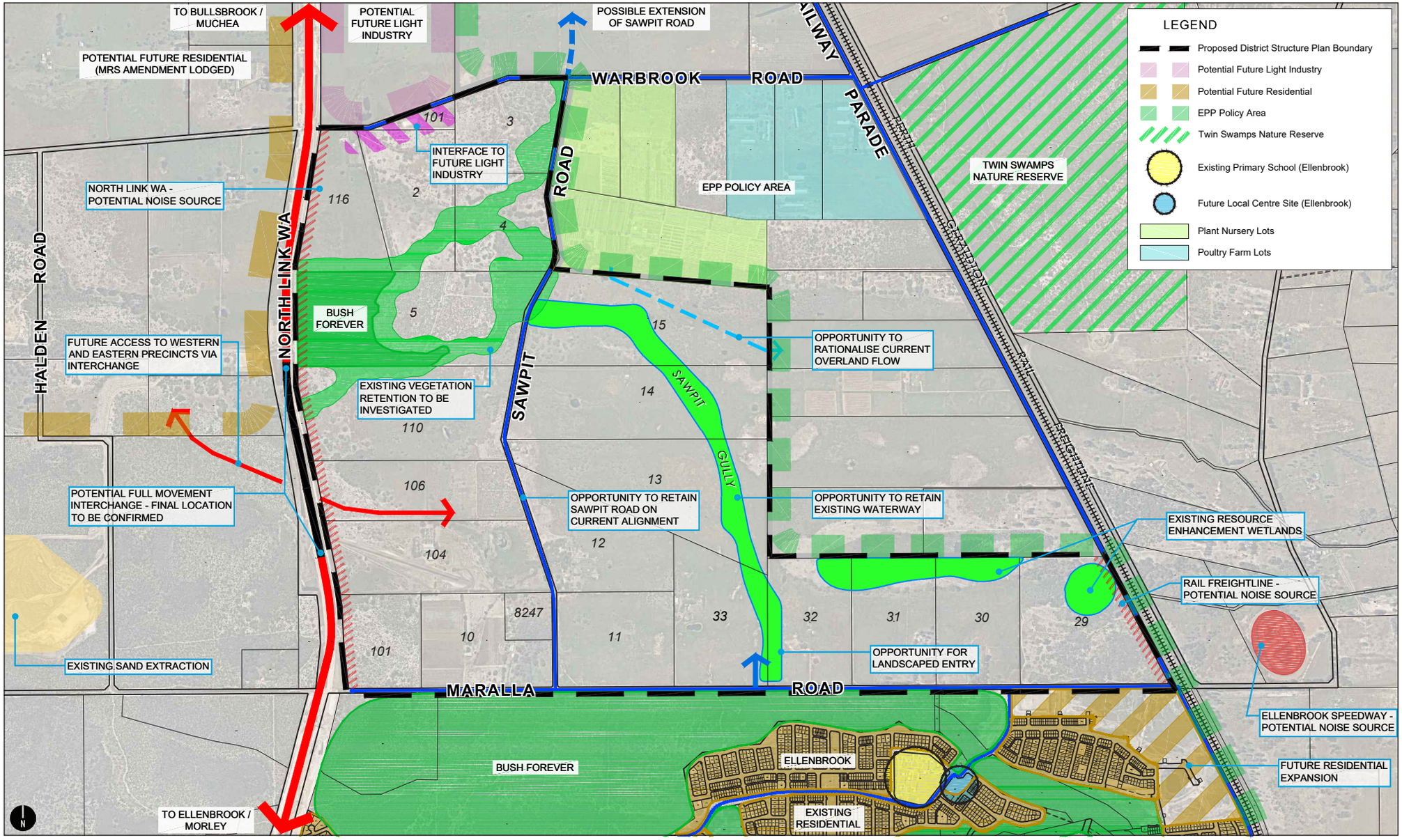


Figure 16: Context and Constraints Plan

4.7 Context and Constraints Analysis

The context and constraints analysis for the DSP is illustrated at Figure 16 – 'Context and Constraints Plan' with the key aspects summarised under the following headings.

4.7.1 Transport and Access

Tonkin Highway

As a key Primary Regional Road directly abutting the western boundary of the DSP, Tonkin Highway will be a dual carriageway national highway with four lanes providing free-flowing access to key commercial and industrial areas such as Muchea, Malaga, Kewdale, Perth Airport and the Perth CBD. This immediate proximity to a key piece of infrastructure provides the DSP with a significant opportunity to achieve quick and efficient access to the regional road network.

To access Tonkin Highway, the DSP identifies an approximate location of a full movement interchange that will service the future urban areas both east and west of Tonkin Highway. The proposed interchange access scenario is discussed in further detail at section 5.3 of this report.

Morley-Ellenbrook Rail Line

The Morley-Ellenbrook passenger rail line is a planned 21km rail line that will connect Ellenbrook to Bayswater station. From Bayswater station, passengers will have access to Midland and the Perth CBD via the Midland line as well Perth Airport via the Forrestfield Airport Link. Ellenbrook Station is planned within the Ellenbrook Town Centre and approximately 5.5 km from the DSP area. Convenient access to the station would be available from the existing 'The Broadway' intersection with Tonkin Highway.

In terms of the State Government's infrastructure planning, the Stage 3 Business Case submission to Infrastructure Australia is being finalised in the coming months, with upgrades to Bayswater Station having commenced in 2019.

Extension of the rail line and a station at the Ellenbrook Town Centre provides North Ellenbrook with an excellent opportunity to access passenger rail services that will provide connections to a range of key destinations. It will provide North Ellenbrook with access to sustainable transport methods and will assist to maximise the customer base utilising the Ellenbrook services, supporting the business case for the infrastructure and providing Government with maximum return on infrastructure spend through urbanisation of the catchment.

4.7.2 Jobs and Employment

North Ellenbrook is strategically located within close proximity of a broad range of existing and planned employment nodes within the north-east corridor including:

- South Bullsbrook Industrial Precinct– 5 km;
- South Bullsbrook Indusial Expansion area– 1 km;
- Muchea Industrial Park – 20 km;
- Malaga Light Industrial – 17 km;
- Hazelmere Industrial – 19km;
- Wangara Light Industrial / Service Commercial – 18km;
- Ellenbrook Secondary Centre – 5km;
- Midland Strategic Metropolitan Centre – 17km;
- Morley Strategic Metropolitan Centre – 20km.

The completion of Tonkin Highway and the proposed interchange will provide efficient and direct access to South Bullsbrook, Muchea, Malaga and Morley as referenced above.

Not only will the abovementioned employment centres provide access to jobs within an immediate catchment of the DSP, North Ellenbrook itself will provide a residential workforce for future industrial uses that are expected to gravitate to the locality. Such future industrial uses are anticipated in Muchea and South Bullsbrook which are strategically located adjacent Tonkin Highway to accommodate transport / logistics-type uses associated with the mining sector in regional north-west WA.

An 'Economic, Retail and Employment Strategy' (refer Appendix 2) prepared by Macroplan supports the DSP, confirming that a fundamental growth challenge for the north-east sub-region will be to ensure that there is a sufficient local resident workforce to meet the employment demand from businesses investing in Bullsbrook and Muchea. In a strategic sense, the key challenge is to ensure that sufficient housing for future workers is provided close to their places of work. Further discussion on employment opportunities for future DSP residents is discussed at section 5.8.3 of this report.

4.7.3 Potential Land Use Buffers

Poultry Farms

Two poultry farms are located to the north of the site within lots 20 and 21 Warbook Road and lot 22 Railway Road. Across the two poultry farms, up to 15 poultry sheds are in operation, with the closest shed situated approximately 350 m north of the DSP.

EPA Guidance Statement No. 3 *'Separation Distances between Industrial and Sensitive Land Uses'* outlines that 'poultry industry' land uses have the potential to produce odour, dust and noise emissions and recommend a separation distance of between 300-1,000 m (depending on the size of the poultry operation) to sensitive land uses.

The *Environmental Guidelines for the Australian Egg Industry* (AECL 2008) recommends a minimum separation distance of 500m between the impact source and any land use zone that is not compatible with the development of poultry facilities, such as residential, in lieu of any specified separation distances from state/federal governments.

The *Environmental Code of Practice for Poultry Farms in Western Australia* (Poultry Farmers Association of WA 2004) recommends a minimum 500 m separation distance between new poultry sheds and any existing or future residential zones.

With regards to the potential impacts from the existing poultry operations to the north, prevailing easterly and south-easterly winds, which are typically associated with occurrences of significant odour issues for poultry farms, are unlikely to impact the DSP.

Further investigations will be required at the 'lifting of Urban deferment' stage to assess the potential odour impact from the poultry sheds. Depending on the outcomes of these investigations, a land use buffer may be required in order to provide a suitable separation distance between the poultry farms and sensitive land uses. Based on generic recommended separation distances outlined above, any such buffer would likely only impact the north-eastern extent of the DSP (lot 15).

Basic Raw Materials Extraction

Two basic raw materials 'extraction sites' mapped in State Planning Policy 2.4 Basic Raw Materials and the *Draft State Planning Policy 2.4 Basic Raw Materials* are located to the west of the DSP area. At its closest point, the site is approximately 900m from the mapped extraction sites, both of which are understood to be operational sand mines.

EPA Guidance Statement No. 3 *'Separation Distances between Industrial and Sensitive Land Uses'* outlines that 'extractive industries – sand and limestone extraction' land uses have the potential to produce noise and dust emissions, recommending a generic separation distance of between 300-500 m (depending on the size of the extraction operation) to sensitive land uses.

Given the 900 m separation distance between the DSPs western boundary and the mapped sand extraction sites, it is unlikely that any noise or dust emissions would impact future residential land uses within the DSP and no further response at subsequent planning stages is required.

Plant Nursery

Plant nurseries currently operate on lots 16 and 17 Sawpit Road and lot 18 Warbrook Road which are adjacent the northern DSP boundary.

EPA Guidance Statement No. 3 '*Separation Distances between Industrial and Sensitive Land Uses'* outlines that 'nurseries' have the potential to produce noise emissions and recommend a generic separation distance of 100 m to sensitive land uses. Based on the generic recommended separation distances outlined above, any buffer would likely only impact the north-eastern extent of the DSP (lot 15).

Further investigations will be required at future planning stages to assess the potential impact from the adjoining nurseries. Depending on the outcomes of these investigations, a land use buffer may be required in order to provide a suitable separation distance between the nurseries and sensitive land uses.

4.7.4 Western Swamp Tortoise

The DSP abuts the western boundary of the *Environmental Protection (Western Tortoise Habitat) Policy* (EPP) area. It is situated outside of the EPP area and as such, the provisions of the policy are not applicable to the DSP. It should be noted that the DSP abuts the buffer area only and that the actual habitat of the Western Swamp Tortoise (Twin Swamps Nature Reserve) is located approximately 850m from the DSP at its closest point. A second Western Swamp Tortoise habitat is located within Ellen Brook Nature Reserve located approximately 1.4 km south-east of the DSP. Given that the DSP is physically separated from both habitats, the relationship is limited to hydrological considerations, as discussed under section 4.3 above.

Notwithstanding the fact that the DSP is outside of the EPP area, the DSP addresses the principles outlined in the EPP as shown in Table 4.

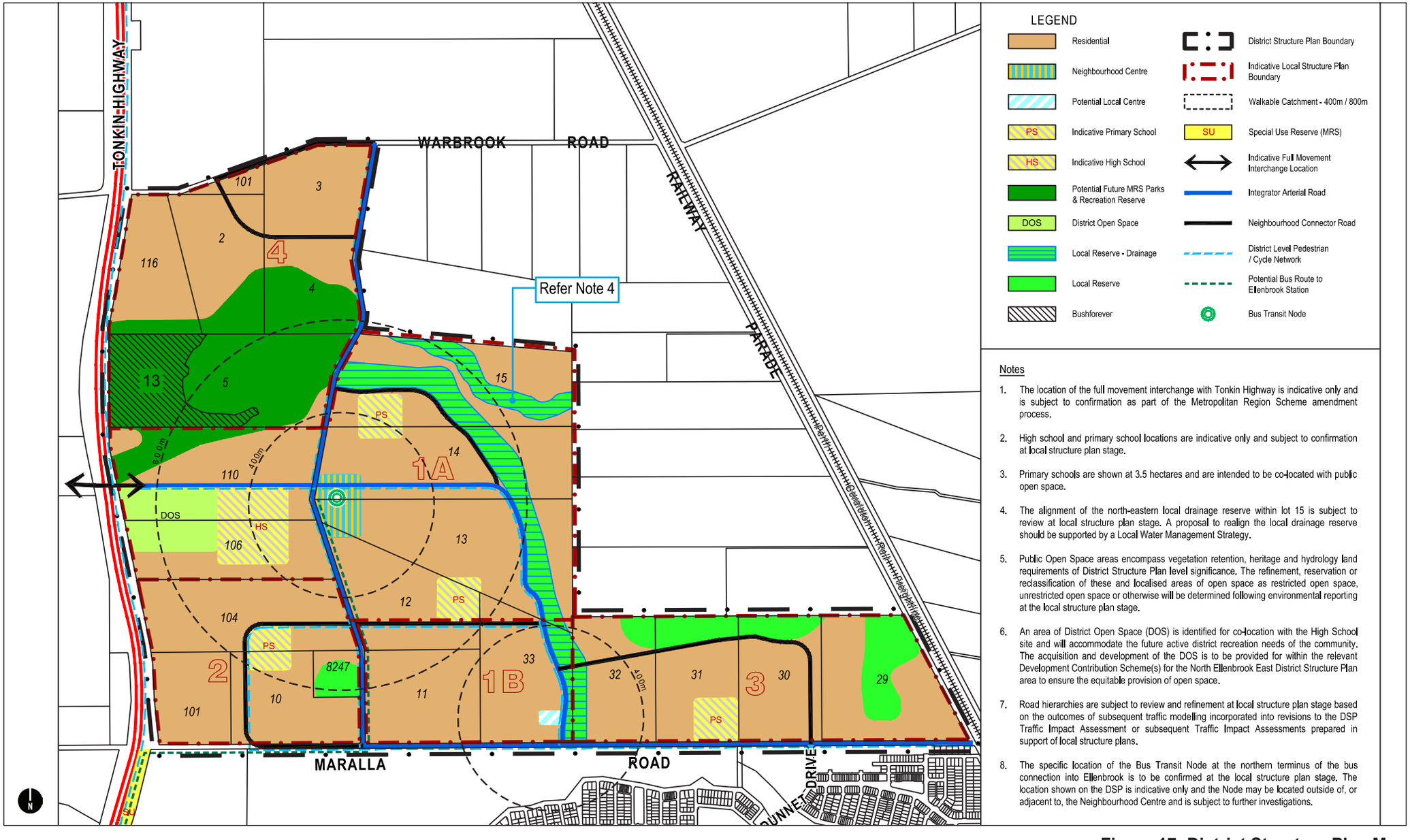
Overall, the existing spatial separation and proposed management of groundwater and surface water within the site will ensure that implementation of the proposed DSP and associated future urban development of the site will not impact existing populations of Western Swamp Tortoise within Twin Swamps Nature Reserve or Ellen Brook Nature Reserve.

Table 4:Western Swamp Tortoise Environmental Protection Policy - Protection Principles

EPP Principle (clause 6)	DSP Response
Knowledge of ecological processes and the interconnectedness of terrestrial and aquatic ecosystems.	The DSP area does not interact with the Twin Swamps Nature Reserve in terms of groundwater or surface water. With regards to the Ellen Brook Nature Reserve, existing surface water from the DSP area discharges to the Reserve via the Ellen Brook. To address this relationship, the DSP will improve or maintain predevelopment flow quantity and quality to avoid impacting the habitat.
Discharges to the western swamp tortoise habitat not exceeding pollutant levels that would be to the detriment of any of the beneficial uses.	As outlined above, the quantity and quality of surface water that does discharge into the Ellen Brook Nature Reserve via the Ellen Brook will be improved or maintained under the post-development scenario.
Maintenance of water quality and quantity so that ecological processes and ecological integrity are not threatened, impaired or degraded.	Predevelopment flow quantity and quality will be maintained or improved to avoid impacting the habitat.
Appropriate land use, land management planning, fire management and conservation in the policy area.	This principle is not applicable as the DSP is not within the policy area.


SUPERMARKET
CAFE

5.0 DISTRICT STRUCTURE PLAN



Notes

1. The location of the full movement interchange with Tonkin Highway is indicative only and is subject to confirmation as part of the Metropolitan Region Scheme amendment process.
2. High school and primary school locations are indicative only and subject to confirmation at local structure plan stage.
3. Primary schools are shown at 3.5 hectares and are intended to be co-located with public open space.
4. The alignment of the north-eastern local drainage reserve within lot 15 is subject to review at local structure plan stage. A proposal to realign the local drainage reserve should be supported by a Local Water Management Strategy.
5. Public Open Space areas encompass vegetation retention, heritage and hydrology land requirements of District Structure Plan level significance. The refinement, reservation or reclassification of these and localised areas of open space as restricted open space, unrestricted open space or otherwise will be determined following environmental reporting at the local structure plan stage.
6. An area of District Open Space (DOS) is identified for co-location with the High School site and will accommodate the future active district recreation needs of the community. The acquisition and development of the DOS is to be provided for within the relevant Development Contribution Scheme(s) for the North Ellenbrook East District Structure Plan area to ensure the equitable provision of open space.
7. Road hierarchies are subject to review and refinement at local structure plan stage based on the outcomes of subsequent traffic modelling incorporated into revisions to the DSP Traffic Impact Assessment or subsequent Traffic Impact Assessments prepared in support of local structure plans.
8. The specific location of the Bus Transit Node at the northern terminus of the bus connection into Ellenbrook is to be confirmed at the local structure plan stage. The location shown on the DSP is indicative only and the Node may be located outside of, or adjacent to, the Neighbourhood Centre and is subject to further investigations.

Figure 17: District Structure Plan Map

5.0 | DISTRICT STRUCTURE PLAN

The DSP area encompasses all of the North Ellenbrook 'Urban Investigation' area identified under the Frameworks east of Tonkin Highway as well as a small portion of land identified as 'Industrial Expansion'. The eastern 'Urban Investigation' area forms a logical DSP area based on the following considerations:

- As the proponent for this DSP, Lendlease have consolidated ownership over a majority of the eastern area and are working with other landowners to progress the detailed planning of the land. This allows for simpler management of the DSP design and process as the number of competing interests from separate landowners is reduced.
- A separate proponent represents landowners for the 'Urban Investigation' area west of Tonkin Highway who have lodged a request with the WAPC to rezone the western precinct from 'Rural' to 'Urban Deferred' under the MRS. These precincts are separated by North Link WA and form logical and separate DSP areas given their different environmental, drainage, land use and road access considerations.
- The two 'Urban Investigation' precincts (east and west of Tonkin Highway) are relatively self-contained and are expected to each generate the need for their own district-level infrastructure. This removes the need for shared infrastructure allowing for each precinct to progress independently. The interchange with Tonkin Highway is one piece of development infrastructure that will require a shared funding contribution and is discussed in further detail at section 5.3.2 of this report.

Inclusion of 'Industrial Expansion' area within DSP

As outlined above, the DSP proposes to include approximately 30 ha of the 'Industrial Expansion' area identified under Frameworks within the DSP as future urban land. The 'Industrial Expansion' area is located south of Warbrook Road and is shown by the Frameworks to directly abut the 'Urban Investigation' area. This 30ha area is more appropriately identified as future urban land based on the following:

- The existing Warbrook Road alignment forms a logical boundary between future urban and industrial precincts as road reserves provide an effective interface treatment between residential and light industrial land;
- The scenario depicted under the Frameworks i.e. 'Industrial Expansion' directly abutting 'Urban Investigation' land would likely lead to land use conflicts and unnecessary management strategies to address the undesirable interface;
- The loss of approximately 30 ha of potential industrial land is not considered to be significant in the context of the vast tracts of future industrial identified under the Frameworks; and
- As part of preparing the draft 'Bullsbrook Freight and Industrial District Structure Plan', the Department of Planning, Lands and Heritage (DPLH) has identified this area as 'potential inclusion in Urban Investigation', with the area north of Warbrook Road shown as 'Light Industry'.

5.1 Land Use

Consistent with its identification as an 'Urban Investigation' area under the Frameworks, the DSP seeks to coordinate and inform future scheme amendment processes as well as the more detailed local structure planning towards an urban outcome. As part of its urban designation, the DSP area is planned to accommodate approximately 5,500 dwellings at a range of densities that will provide housing choice and housing affordability for future residents. The DSP will guide the distribution of higher density in appropriate locations with good access to transport, amenities and open space.

A summary table of the various land uses identified by the DSP is provided at Table 5.

The DSP coordinates the spatial distribution of non-residential land uses that are necessary to accommodate a future residential population such as activity centres, schools and open space. The DSP also identifies and responds to environmental features that are to be retained and protected as part of subsequent planning processes.

Table 5: Land Use Summary

Item	Data
Total area covered by structure plan	499 ha
Approximate area of each land use proposed:	
Residential	336 ha
Neighbourhood Centre	4.3 ha
Local Centre (potential)	0.5 ha
Parks and Recreation Reserve (excluding Bush Forever Site 13)	45.6 ha
Bush Forever	15.7 ha
District Open Space	11 ha
Local Reserves (drainage)	26.5 ha
Local Reserves (other)	19.2 ha
Other (roads and primary schools)	39.9 ha
Total estimated lot yield	5,500
Estimated Residential site density	27 dwellings per site hectare
Estimated population	16,500 @ 3 people per household
Number of Secondary Schools	1
Number of Primary Schools	4
Estimated commercial floor space	10,000m² net lettable area

The following principles have informed the design of the DSP Map:

The retention of significant environmental features in a manner capable of integrating with the future urban form;

Primary access to the regional road network via an interchange with Tonkin Highway that will accommodate the majority of traffic movements to and from the DSP area;

Locating land uses that generate higher traffic volumes such as the Neighbourhood Centre, District Open Space and High School in close proximity to the Tonkin Highway interchange and the connecting integrator arterial roads;

A centralised Neighbourhood Centre that maximises the number of potential dwellings within a 400m walkable catchment;

The distribution of primary schools throughout the DSP area, consistent with neighbourhood structures and to match the anticipated staging of the DSP;

Non-residential land uses abutting Tonkin Highway and the interchange to effectively mitigate any potential noise and amenity impacts;

Strong linkages and connections with Maralla Road as an established east-west road in the locality. Integrator arterial and neighbourhood connector roads intersecting with Maralla Road will comprise the main movement network through the DSP, providing accessibility for initial stages and serving as key entry points;

A water management strategy that seeks to retain natural water courses and conveyance swales on their existing alignments where possible. These multiple use drainage corridors will also serve an amenity function and coincide with the alignment of neighbourhood connector roads where possible; and

Innovative drainage and earthworks strategies that seek to minimise the amount of fill necessary to accommodate development.

The proceeding sections discuss the DSPs design rationale in further detail based on the individual components that collectively define the plan. With regards to residential land uses and the distribution of density and dwelling typologies, the DSP is separated into five local structure plan areas that will inform the subsequent stages of planning.

5.2 Residential

The distribution of residential density and the housing strategy for the DSP are discussed in further detail below based on the local structure plan areas that form the basis for individual neighbourhoods within the DSP.

Whilst density coding will be established at the local structure planning stages, it is envisaged that R-Code ranges will be implemented across the DSP area in accordance with the WAPCs 'Structure Plan Framework, part 10.4. In accordance with the 'Structure Plan Framework', the following medium density R-Code ranges are expected to be implemented at local structure plan stage:

- R25 – R40 applied as the default R-Code range across the DSP area. Local structure plans will then establish locational criteria as to where the higher density codes within this range (R30 and R40) may be applied;
- An R25 – R60 R-Code range applied within 400m of the Neighbourhood Centre and 200m of the Local Centre (if proposed). Higher density codes within this range (above R40) are expected to occur mostly within 200m of activity centres. Additional locations for this R-Code range may be identified as part of the local structure plan process.

Table 7 of the Frameworks outlines a density target of 15 dwellings per gross hectare of urban zoned land for 'Urban Investigation' areas which equates to 26 dwellings per site hectare. These density targets should be considered in determining the appropriate R-Code ranges at local structure plan stage and inform subsequent subdivision processes.

The R-Code range and locational criteria confirmed at the local structure plan stage should also aim to deliver a range of housing typologies to achieve housing diversity and affordability options within the local structure plan areas.

The locational criteria to be prepared as part of subsequent local structure plans should be based on the principle of delivering higher densities around areas of natural amenity, public transport routes, school sites, open space and activity centres.

5.2.1 Local Structure Plan 1A

It is expected that R-Code ranges of R25 – R40 and R25 – R60 will be applied to the Local Structure Plan 1A area. Locational criteria for coordinating densities at the local structure plan stage should be informed by the following principles:

- An R25 – R60 R-Code range within 400m of the Neighbourhood Centre in accordance with SPP 4.2; and
- Higher densities within the R25 - R40 R-Code range around areas of natural amenity, public transport routes, schools and the district open space.

5.2.2 Local Structure Plan 1B

It is expected that R-Code ranges of R25 - R40 and R25 - 60 will be applied to the Local Structure Plan 1B area. Locational criteria for coordinating densities at the Local Structure Plan stage should informed by the following principles:

- An R25 – R60 R-Code range within 400m of the Local Centre (if proposed) in accordance with SPP 4.2; and
- Higher densities within the R25 – R40 R-Code range within 250m of any planned bus routes, around areas of natural amenity and the primary school within LSP 1A.

5.2.3 Local Structure Plan 2

It is expected that R-Code ranges of R25 – R40 and R25 – R60 will be applied to the Local Structure Plan 2 area. Locational criteria for coordinating densities at the local structure plan stage should be informed by the following principles:

- An R25 – R60 R-Code range within 400m of the Neighbourhood Centre in accordance with SPP 4.2; and
- Higher densities within the R25 – R40 R-Code range around areas of natural amenity, public transport routes, the district open space and school sites.

5.2.4 Local Structure Plan 3

It is expected that an R-Code range of R25 – R40 will be applied to the Local Structure Plan 3 area. Locational criteria for coordinating densities at the local structure plan stage should focus on higher densities within 200m of the Local Centre on the opposite side of Sawpit Gully (if proposed), adjacent the primary school, within 250m of any planned bus routes and around areas of natural amenity.

5.2.5 Local Structure Plan 4

It is expected that an R-Code range of R25 – R40 will be applied to the Local Structure Plan 4 area. Locational criteria for coordinating densities at the local structure plan stage should focus on higher densities within 250m of any planned bus routes and around areas of natural amenity.

5.3 Movement Network

In accordance with the WAPC's 'Transport Impact Assessment Guidelines', a Traffic Impact Assessment (TIA) has been prepared by GHD in support of the DSP (refer Appendix 8). The TIA provides a summary of the existing transport network, identifies necessary upgrades to roads and intersections and assigns a road hierarchy for the DSP based on detailed traffic modelling.

The following sections provide a summary of the key findings from the TIA as well as key matters to be considered and implemented at subsequent stages of planning.

5.3.1 Existing Road Network

Tonkin Highway

As a key Primary Regional Road directly abutting the western boundary of the DSP, Tonkin Highway is a dual carriageway national highway with four lanes providing free-flowing access to key commercial and industrial areas such as Muchea, Malaga, Kewdale, Perth Airport and the Perth CBD. This immediate proximity to a key piece of infrastructure provides the DSP with a significant opportunity to achieve quick and efficient access to the regional road network.

To access Tonkin Highway, the DSP proposes a full movement interchange that will service the future urban areas both east and west of Northlink. The proposed interchange access scenario is discussed in further detail at section 5.3.2 of this report.

Great Northern Highway

Located approximately 1.8km to the east of the DSP area, Great Northern Highway (GNH) is a primary distributor road under the control of Main Roads WA (MRWA). The GNH carriageway is approximately 10.7m wide with two lanes northbound and one lane southbound. Heavy traffic is expected to divert from GNH to Tonkin Highway once the latter is completed.

The TIA identifies that the existing intersection of GNH with Warbrook Road requires upgrading based on the current scenario, due to disproportionate crash patterns.

Other Roads

Other roads in and around the DSP area are under the control of the City of Swan. These roads are described as follows:

- Warbrook Road east of Railway Parade is a local distributor road with an approximate 7m wide carriageway. West of Railway Parade, Warbrook Road is an access road with an approximate 6m wide carriageway;
- Maralla Road, which forms the southern boundary of the DSP, is a local access road with an approximate 4m wide carriageway;
- Sawpit Road which bisects the DSP area on a north-south alignment is a local access road with an approximate 6m wide carriageway; and
- Railway Parade abutting the far-eastern DSP boundary on a north-south alignment is a local access road with an approximate 6m wide carriageway.

5.3.2 Proposed Road Network

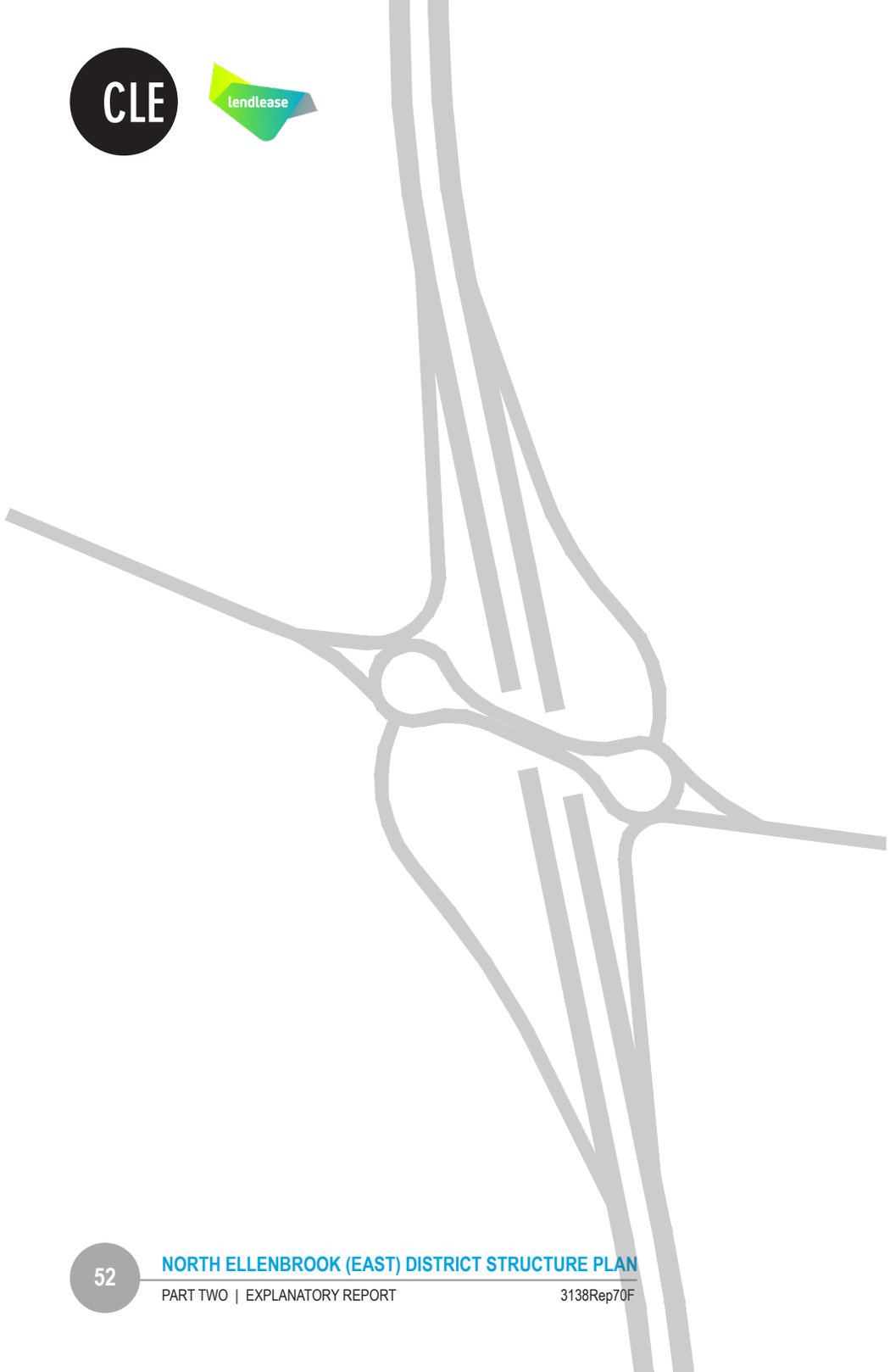
The TIA is based on detailed traffic modelling that was developed by GHD to inform the road planning for the DSP. In developing the traffic model, the following inputs/assumptions were used:

- An estimated 5,500 residential dwellings at ultimate development with a daily trip rate of 9 trips for single dwellings and 3 trips for grouped dwellings;
- An estimated 10,000m² of retail floor space generating 121 daily trips per 100m² of gross lettable floor area; and
- An estimated 540 students per primary school and 1,400 students for the high school. As per the WAPC's TIA Guidelines, two trips per student per day were assumed for the school sites.

The TIA traffic modelling is based on the assumption that the Tonkin Highway interchange will be constructed and operational prior to first residents establishing within the DSP.

As demonstrated at Figure 18, the proposed interchange will provide the primary access to and from the DSP due to its direct connection to Tonkin Highway which provides good north-south connectivity to key destinations. Based on the access to Tonkin Highway being the focal point for the majority of trip movements, the internal road network aims to provide efficient connections to the interchange via a network of integrator arterial and neighbourhood connector roads. Connections to alternative external access points via Warbrook Road to the north and Railway Parade to the south are also provided however, these connections are expected to accommodate significantly less movements than the interchange with Tonkin Highway.

It should be noted that the estimated traffic volumes within the TIA are based on ROM24 data prepared by Main Roads WA. The TIA has been modified to reflect the ROM24 data in accordance with the WAPC schedule of modifications required pre-advertising and further guidance post-advertising. The updated modelling has resulted in significantly higher volumes on the DSP road network than originally modelled for example, 39,000 vehicles per day are estimated on the integrator arterial road connecting the DSP with the proposed interchange. More than half of these movements (21,400 vehicles per day) are generated by external movements to / from the DSP i.e. non-DSP traffic. These volumes are considered high and as such, subsequent local structure planning processes should be adaptive to consider and respond to refinements in the traffic modelling as development progresses over time. Further traffic investigations are therefore required at the local structure plan stage to refine the movement network to achieve an optimum result that reflects contemporary travel behaviour (work from home), aligns with the objective of encouraging sustainable travel methods (walking, cycling, public transport) and supports good urban design outcomes.



Interchange with Tonkin Highway

As outlined above, the proposed interchange with Tonkin Highway is an important piece of infrastructure that will provide North Ellenbrook with a direct connection to the regional road network. As the first stage of planning for North Ellenbrook, the DSP identifies an approximate location for the interchange and outlines the subsequent processes for its delivery.

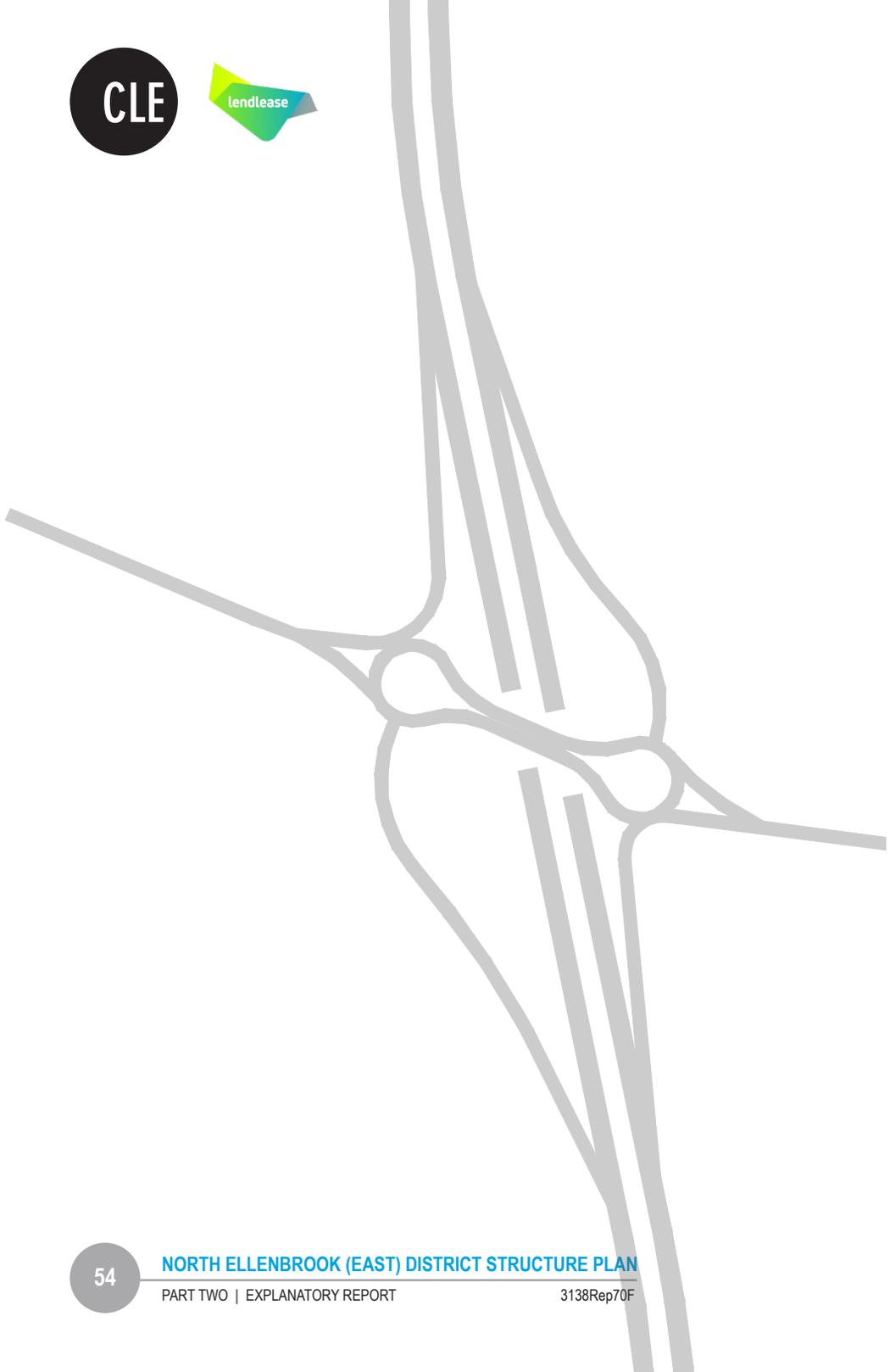
Given the DSP's role as a high level, strategic planning document, the DSP Map identifies a preferred interchange location based on the investigations undertaken to date and the outcomes of the district planning process involving key stakeholders including Main Roads WA and the Department of Biodiversity, Conservation and Attraction.

The interchange location depicted by the DSP responds to MRWA's advice regarding intersection spacing and DBCA's objective to minimise the impact on the Banksia Woodland Threatened Ecological Community.

The detailed design and exact location of the interchange will need to be confirmed at the MRS Amendment stage in order to determine the land required to be reserved to spatially accommodate the interchange and inform the land acquisition process. As the interchange is classified as State-level infrastructure, MRWA will lead the design process which is expected to occur shortly after the DSP is determined. The DSP proponents will work closely with MRWA regarding the location and spatial requirements for the interchange in order to confirm the 'Primary Regional Road' reservation under the MRS.

Table 6: Northlink WA Interchange Location: Key Considerations

Key Parameter	Summary of Potential Issue	Comments
Spacing of Intersections	The need to maintain sufficient spacing between existing intersections at Stock Road to the north and The Promenade to the south was identified as a key design parameter for the interchange location.	Early discussions with MRWA confirmed that a potential interchange location north of Bush Forever Site 13 would not be entertained due to an inadequate separation distance from Stock Road. In terms of spacing, this meant that the intersection would need to be south of Bush Forever Site 13.
East-west Connection	The Frameworks identify 'Urban Investigation' areas to the east and west of Northlink WA. The location of the interchange therefore needs to be capable of servicing both precincts.	Ongoing meetings with the proponent for the western precinct and Lendlease were held, including a joint meeting with MRWA. Given the minimal extent to which the western and eastern 'Urban Investigation' areas abut south of the Bush Forever site, the opportunity to accommodate an interchange that services both eastern and western precincts is somewhat limited.
Environmental Constraints	Environmental features both east and west of Northlink WA were assessed in order to balance the need for the interchange to service both eastern and western precincts whilst minimising potential impacts on environmental features.	Directly south of Bush Forever Site 13 and within lot 110 is a low-lying area that accommodates an existing drainage flow path. Yanga complex vegetation in 'very good' condition was also identified in this location. Given the impact on 'very good' condition Yanga complex vegetation and natural waterways, this location is proposed to be avoided. The land required to accommodate the necessary on / off ramps for the interchange has the potential to impact on Bush Forever Site 13. The interchange location was therefore proposed to be far-enough south so that the associated ramps would not impact the Bush Forever site. To the west of Northlink WA and within lot 108 is vegetation that is likely representative of the Banksia woodland TEC as well as a CCW. It was determined that the interchange location would need to avoid impacts to the CCW but that any impacts to the Banksia woodland TEC could most likely be suitably mitigated and, if required, offset.
Site Works / Fill	The location of the interchange should aim to minimise the amount of fill necessary to achieve vertical separation over Northlink WA. Reducing fill minimises the consumption of basic raw materials and reduces project costs.	A natural ridgeline exists in the vicinity of lot 6 within the DSP area which provides a natural vertical separation from Northlink WA, thereby reducing the amount of fill needed to construct the interchange. Conversely, the land immediately south of the Bush Forever site and within lot 110 is low-lying and would require significantly more fill to construct the interchange and a more complicated drainage management response.
Land Tenure	The proponents for the DSP as well as the proponents for the precinct to the west are motivated to provide the land necessary to accommodate the interchange. Land required to accommodate the interchange that is outside of the proponents control would require an acquisition process to be progressed.	Based on the need to avoid any impacts on the Bush Forever site as outlined above, any interchange location south of the Bush Forever site will require a land-take from lot 108 to the west. An acquisition process is therefore considered unavoidable with the only variable factor being the extent of the land that needs to be acquired.



In conjunction with the MRS Amendment process, the land acquisition required to facilitate the interchange will need to be progressed. This could either occur through a private commercial arrangement facilitated by MRWA or alternatively, MRWA could progress a formal taking action under powers contained in the *Land Administration Act 1997*. Under either scenario, it is acknowledged that the land acquisition costs will be funded by a combination of funding sources, as discussed under the 'Funding of the Interchange' section below.

Once the land is reserved under the MRS, the location and standard of the interchange will be confirmed. Delivery of the interchange will then be coordinated through the 'Lifting of Urban Deferment' process which will then enable subsequent local scheme amendments and structure planning processes to occur.

Timing for the Interchange

Timing to deliver the interchange will be guided by MRWA in its capacity as the State Government agency tasked with its design and construction. It is planned for the interchange to be operational either prior to, or to coincide with the issuing of titles for first stage lots. Subsequent planning processes such as local scheme amendments, local structure planning and subdivision approvals are therefore planned to occur concurrently to the construction of the interchange so that the opening will coincide with the establishment of first residents.

Funding of the Interchange

As part of it's 2022-23 Federal Budget, the Australian Government committed $50 million towards the delivery of the interchange. As part of the 2022-23 State Budget, the State Government allocated $25 million towards the delivery of the interchange. The cumulative $75 million of Government funding is expected to cover the majority of the infrastructure costs associated with delivering the interchange.

MRWA's current estimated cost to develop the interchange is $100 million. The funding gap will be covered by landowners within both eastern and western DSP's who have agreed to contribute a proportionate share of the $25 million balance (25%). Further arrangements between the landowners will be required in order to formalise an agreement on the contribution structure for the $25 million funding gap. The proportion of funding from each landowner will be determined based on 'need and nexus' and the principles established by *State Planning Policy 3.6 – Infrastructure Contributions.*

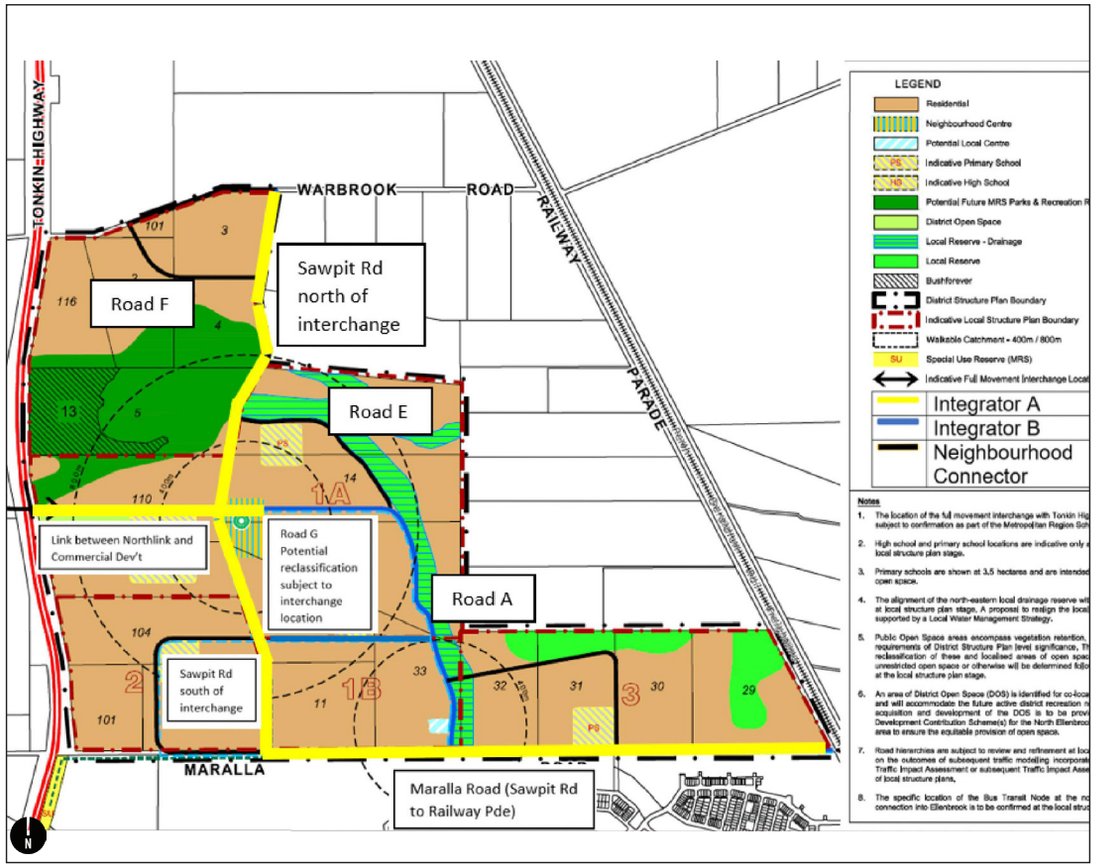


Figure 18: Proposed Road Hierarchy
Source: GHD

Internal Road Network

Informed by the traffic modelling and anticipated traffic volumes, the TIA assigns an appropriate road hierarchy consistent with *Liveable Neighbourhoods*' standard road classifications. In accordance with standard practice, the DSP Map identifies the general alignment of higher-order roads, being neighbourhood connector roads and above.

The proposed road hierarchy shown at Figure 19 – 'Proposed Road Hierarchy' is summarised as follows:

- The interchange connecting road, Sawpit Road and Maralla Road east of Sawpit Road as 'Integrator A' roads;
- 'Integrator B' roads connecting the 'Integrator A' roads through Precinct 1A and 1B; and
- All other key roads estimated to carry above 3,000 vpd are identified as neighbourhood connector roads and are shown on the DSP Map.

It is expected that standard cross-sections in accordance with *Liveable Neighbourhoods* will be applied to these roads and that no specific non-standard cross-sections will be required. Road reserve widths for key roads are expected to be as follows in accordance with the TIA:

- Integrator arterial A roads: 35.6m – 52.6m.
- Integrator arterial B roads: 27m – 29.2m; and
- Neighbourhood connector A or B roads: 29.2m or 24.4m respectively.

It is recommended that design measures are implemented to discourage heavy vehicles associated with the future light industrial land to the north from travelling through the DSP area. These measures are to be documented at the local structure planning stages where relevant.

The location of access streets will be confirmed by the TIA's prepared in support of the respective local structure plans, informed by the road hierarchy depicted on the DSP Map.

Refinement of Road Hierarchy

Further refinements to the road hierarchy will be required as part of local structure planning and as staged development progresses. The volume and distribution of traffic modelled by the DSP is based on the best information available at the time however, as development proceeds and travel behaviour is established, subsequent traffic assessments will be informed by actual demand, behavioural factors and the associated traffic distribution. The refinement of the transport network at subsequent stages will seek to achieve an optimal movement network that reflects contemporary travel behaviour (wok from home), aligns with the objective of encouraging sustainable travel methods (walking, cycling, public transport) and supports good urban design outcomes. Any changes required to the road hierarchy will need to be demonstrated by subsequent TIA's at local structure plan stage.

Internal Intersection Planning

Further analysis will be undertaken at the local structure planning stages to confirm internal intersection treatments. This will be based on any potential modifications to the road network or additional information that arises as a result of the more detailed traffic investigations.

External Road Network

Further modelling will be undertaken to confirm forecast traffic volumes, intersection requirements and road hierarchy requirements external to the DSP area. This modelling will be undertaken in the form of a mesoscopic traffic model prepared by MRWA in conjunction with the City of Swan and DPLH. The outcomes of this further modelling may necessitate updates to the DSP TIA which will then inform all subsequent stages of planning.

Managing the connectivity between the DSP and the existing suburb of Ellenbrook south of Maralla Road will be a key objective of this future exercise. In this regard, specific consideration should be given to any required modifications and / or upgrades to the intersection of Maralla Road and Dunnett Drive as well as the intersection of Maralla Road and Railway Parade.


Bus

5.3.3 Pedestrians, Cyclists and Public Transport

Pedestrian and Cycling Facilities

As a high-order strategic planning document, it is not appropriate for the DSP to define the local network of roads and paths at this preliminary stage. Subsequent local structure plans will define the more detailed planning in this regard, informed by the following principles established by the DSP:

- Integrator arterial roads are to have footpaths on both sides of the street with on-street cycle lanes provided;
- A district level pedestrian / cycle network aligned with integrator roads as depicted on the DSP Map, connecting with the existing path network along Tonkin Highway;
- Neighbourhood connector roads are to have footpaths or shared paths on both sides of the street, depending on whether on-street cycling facilities are provided;
- Access streets are to have footpaths or shared paths on one side of the street; and
- A safe and efficient network of shared paths and crossing facilities is to be provided for residents to access key trip attractors such as school sites and activity centres.

Public Transport

As with all undeveloped greenfield areas, no Public Transport Authority (PTA) bus routes currently service the DSP area. Bus services will be provided when population numbers warrant in discussions with the PTA. In the future, it is expected that two bus routes will service North Ellenbrook (east) with primary access being from the south via Sawpit Road.

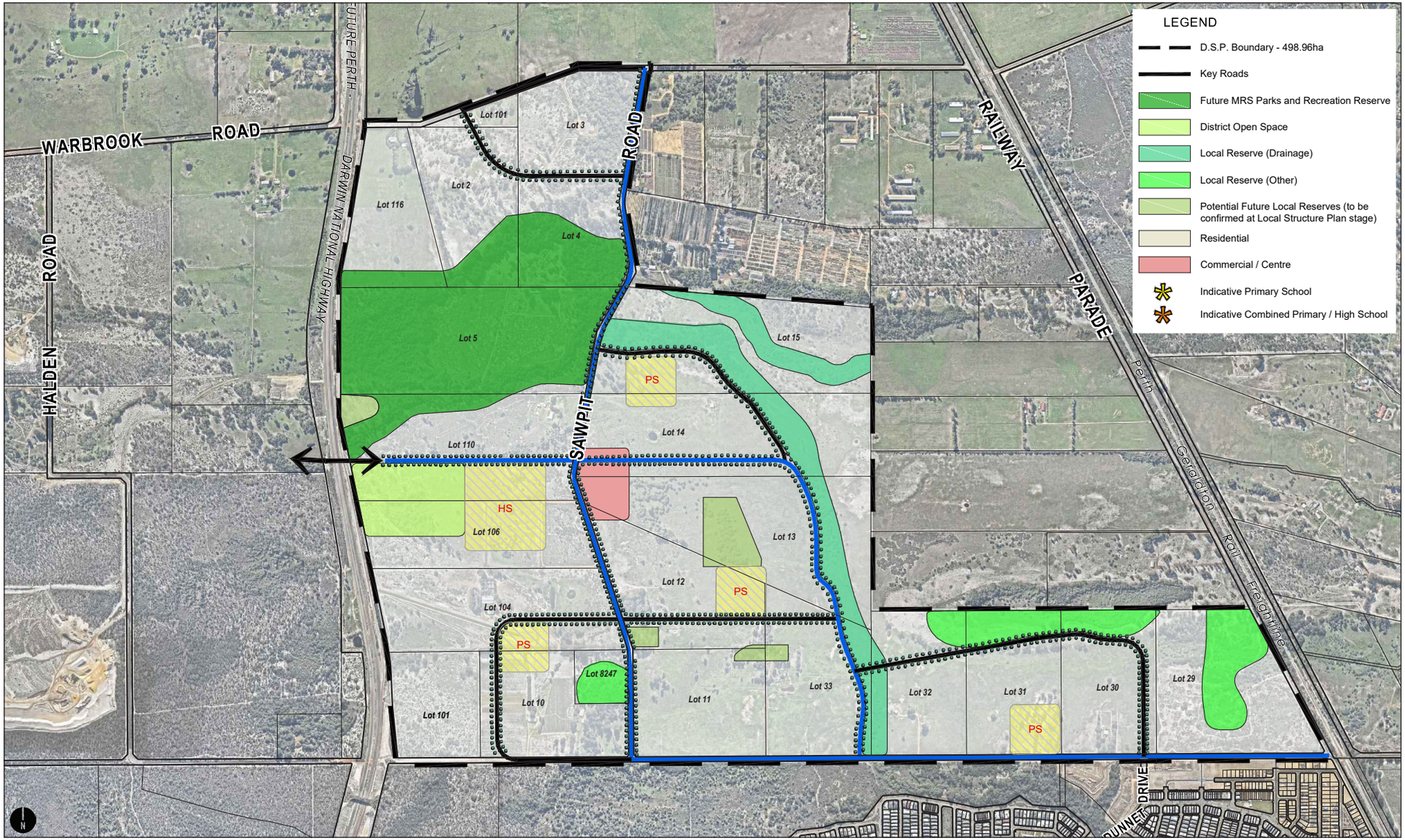


Figure 19: Public Open Space

A key consideration for the DSP is the provision of a public transport connection south into the Ellenbrook Town Centre and Ellenbrook Train Station. As the Ellenbrook Train line is not planned to extend further north of the planned Ellenbrook Station, discussions with PTA and MRWA determined that a bus connection is the most suitable public transport infrastructure to achieve good public transport connectivity. Whilst the exact nature and alignment of the bus connection has not been confirmed, preliminary agreement through the district planning process was that the existing Special Use Reserve may be used as an effective transport corridor to provide an efficient, dedicated bus service that connects both DSP's into Ellenbrook Town Centre and Ellenbrook Train Station. This bus service is planned to connect with a northern terminus in the form of a 'Bus Transit Node' within the DSP (east) which will serve as a central hub, with feeder bus services connecting from the western DSP. Through the district planning process, both MRWA and PTA stated that the Bus Transit Node should be located in close proximity to the interchange in order to efficiently service the western DSP as well.

The location of the Bus Transit Node as shown on the DSP Map is indicative only and the exact location and configuration is to be confirmed at the local structure plan stage in collaboration with relevant stakeholders. This may involve locating the Bus Transit Node within, or adjacent to, the planned Neighbourhood Centre. Final confirmation of the exact alignment and route of the bus connection into Ellenbrook will be a key determining factor in the location of the Bus Transit Node.

5.4 Open Space

As a strategic document, the DSP takes a high-level approach to the identification of open space and does not identify and coordinate every potential reserve and POS area that will be delivered towards satisfying the minimum 10% POS requirement under *Liveable Neighbourhood*s. Neighbourhood and local parks will be confirmed at the subsequent local structure planning stages, with the DSP identifying the following key areas:

- A potential future Parks and Recreation Reserve under the MRS that coincides with Bush Forever Site 13 and the areas of best quality vegetation;
- District Open Space;
- Conservation category and resource enhancement wetlands identified as part of the DSP process that are to be retained within future local reserves; and
- Key drainage corridors to be accommodated within local reserves.

The following headings provide a detailed discussion on the reserves and POS identified on the DSP Map as well as future processes for ensuring an adequate supply of POS for the DSP area.

5.4.1 Future MRS Parks and Recreation Reserve

A potential future Parks and Recreation Reserve under the MRS is identified over Bush Forever Site 13. This aligns with the objective of *State Planning Policy 2.8 – Bushland Policy for the Perth Metropolitan Region* (SPP 2.8) to protect and manage significant bushland recommended for protection. Reservation of this area will afford the Bush Forever site with an additional level of protection than currently exists. By transferring the land into State ownership, access to the bushland can be effectively controlled in line with its conservation status. Further, reserving the bush forever site will allow for the bushland to be managed, as compared to a scenario whereby it would remain in the rural zone and in private ownership, whereby retention in its current state could not be assured. Given the intent for the bushland to be protected and managed in perpetuity, it is reasonable that the State assumes ownership and management responsibility for the bushland through a formal reservation process.

Consistent with the findings of the Environmental Assessment Report, the attributes that distinguish the Bush Forever site extend to a broader area the subject of the proposed Parks and Recreation Reserve. This broader area includes Yanga complex vegetation predominantly in 'very good' condition, which comprises the largest, most consolidated and most intact area of vegetation within the site as well as foraging, roosting and breeding habitat for Carnaby's black cockatoo and forest red-tailed black cockatoo.

5.4.2 District Open Space

The DSP identifies an area of District Open Space (DOS) to service the active sporting and recreational needs of the community. The DOS is intended to provide for organised and formal sporting activities for the entire DSP area. As outlined in the Community Facilities Strategy that accompanies the DSP (refer Appendix 9), the DOS should be designed to accommodate two senior AFL size ovals, two hardcourts and associated sporting pavilion or community facility to support sporting clubs. Whilst the DOS is notionally shown at 11 ha, the exact size and configuration will need to be confirmed at the local structure plan stage in collaboration with the City of Swan.

The DOS is collocated within a combined high school site to allow for joint use of the open space and playing fields. This will assist to strengthen the DOS's role as a community focal point and maximise opportunities for its ongoing usage. It will also assist to minimise turfed areas and by effect, the amount of water required to irrigate playing fields. A co-located DOS and high school will also share the management burden of the playing fields between the City of Swan and Department of Education, allowing for the more efficient management of community infrastructure.

The DOS is proposed adjacent Tonkin Highway and abutting the planned interchange, minimising the extent of sensitive land uses with direct interface to Tonkin Highway. This location adjacent the key east-west integrator arterial road within the DSP also makes the DOS highly accessible for residents east and west of Tonkin Highway, allowing for easy wayfinding and navigation and providing a landscaped entrance to the estate from the elevated interchange. This location is also capable of servicing first stage residents within any future residential development on the west side of Tonkin Highway. Any peripheral landscaped areas around the formalised sporting and recreational areas in the north-west corner could also serve a drainage function for the interchange if required.

The delivery and funding of the DOS is discussed in further detail at section 6 of this report where it is assumed that the DOS - both the land component and development costs – will be funded through a future DCP. As all DSP landowners will contribute to the funding of the DOS, this contribution will need to be acknowledged in the calculation of future POS credits. For example, if one landowner is responsible for contributing towards 5% of the total cost of the DOS (land and development costs), then their 10% POS contribution under *Liveable Neighbourhoods* would need to be reduced proportionately to reflect the DOS contribution.

Source: Lendlease

Source: Lendlease

Source: Lendlease

Source: Emerge

5.4.3 Local Reserves – Drainage

The central waterway identified as drainage on the DSP Map aligns with an existing drainage feature referred to as ‘Sawpit Gully’. Sawpit Gully conveys overland flows from three external catchments to the west of the DSP as well as the majority of catchments within the DSP. Based on the principles for better urban water management, the existing alignment is proposed to be retained to most effectively mimic the predevelopment scenario.

It is envisaged that Sawpit Gully will be developed as a Multiple Use Corridor (MUC) that serves a passive recreation and amenity function in addition to its primary drainage function. At the detailed local structure planning stage, it is expected that local structure plans will provide details regarding:

- Indicative cross sections depicting drainage areas, batter gradients and integration with the surrounding urban form;
- Drainage calculations to inform POS schedules determining areas of restricted and non-restricted POS; and
- Indicative landscape plans for the development of the MUC.

5.4.4 Other Local Reserves

The DSP Map identifies future local reserves that coincide with known environmental features that have been identified as part of the DSP process for retention.

The proposed local reserve that covers the northern portions of lots 30 – 32 relates to a mapped resource enhancement wetland. Similarly, the proposed local reserve over lot 29 coincides with a resource enhancement wetland in the north-east corner. The proposed reserve over lot 29 also responds to the presence of a State and Commonwealth listed threatened flora species *Grevillea curviloba* subsp. *Curviloba*. Post-advertising, a conservation category wetland was mapped by DBCA within lot 8247.

Accordingly, the DSP identifies these areas for retention and protection within future local reserves. The exact areas and the associated buffers will be determined through the local structure planning process however, the DSP provides a commitment to retain these features. Future local structure plans should provide indicative cross sections to demonstrate that these environmental features are integrated within the urban form which should also be considered at the civil construction stage as part of the earthworks design when the detailed design aspects are better understood.

5.4.5 Future Neighbourhood and Local Parks

As outlined above, given the strategic role of the DSP, neighbourhood and local parks will be identified and coordinated through subsequent local structure planning processes. The distribution and amount of POS will be in accordance with *Liveable Neighbourhoods* with each local structure plan responsible for demonstrating the minimum 10% POS requirement.

Areas required for drainage will be confirmed at this stage allowing for the accurate calculation of POS credits. Landscaping plans will also be prepared, demonstrating how drainage areas will be incorporated into the overall POS design.

The 'Public Open Space' plan (refer Figure 19) identifies potential local open space areas that coincide with existing vegetation and environmental features. Whilst these features do not necessitate retention, opportunities will be explored at the more detailed local structure planning stage to retain vegetation within local open space to enhance the amenity of North Ellenbrook through the presence of established trees.

5.5 Environmental Management

5.5.1 Response to Environmental Values

The Environmental Assessment Report prepared by Emerge Associates (refer Appendix 3) provides a detailed assessment of the environmental values within the DSP and outlines the environmental response to the retention, protection and management of these values. The Environmental Assessment Report demonstrates that all environmental features and attributes can be appropriately managed through the coordinated development of the DSP for urban purposes.

A range of site specific technical investigations and consultation with key environmental stakeholders has been undertaken to determine the environmental values of the site and their relative significance. This informed the design of the DSP Map, which has responded to the environmental values of the site as follows:

- Provision of a future MRS 'Parks and Recreation' reserve in the north-west of the DSP that provides for the future retention of various environmental values, including:
  - The entirety of Bush Forever Site 13;
  - Yanga complex vegetation predominantly in 'very good' condition, which comprises the largest, most consolidated and most intact (i.e. least disturbed) area of vegetation within the site;
  - The only mapped conservation category wetland within the DSP;
  - The most intact portion of the primary watercourses traversing the DSP (Sawpit Gully and the unnamed northern creekline) which support riparian vegetation in 'very good' or 'good' condition;
  - Potential Aboriginal heritage values associated with the two watercourses, due to their function as tributaries to the Ellen Brook;
  - Foraging, roosting and breeding habitat for Carnaby's black cockatoo and forest red-tailed black cockatoo; and
  - Suitable habitat for the quenda.

Collectively, the above environmental values were determined to be of the highest relative significance across the site, which warrant the identification of a future MRS 'Parks and Recreation' reserve. The proposed regional reservation will provide for the long-term retention, protection and management of these environmental values within a publicly owned reserve.

- Provision of a local drainage reserve coinciding with Sawpit Gully (where it occurs outside of the future MRS 'Parks and Recreation' reserve) which will provide for the future retention of the following environmental values:
  - Sawpit Gully, which is the primary arterial surface water drainage feature currently existing within the site. This drainage function is proposed to be maintained as part of future urban land uses, as discussed in the District Water Management Strategy (refer Appendix 5);
  - Some occurrences of riparian vegetation along the extent of Sawpit Gully. Due to historic clearing, this is primarily limited to consolidated areas of mature, native trees within lot 15, in addition to scattered mature native trees within lots 13, 14 and 32;
  - Foraging, roosting and breeding habitat for Carnaby's black cockatoo and forest red-tailed black cockatoo;
  - Suitable habitat for the quenda; and
  - Potential Aboriginal heritage values associated with Sawpit Gully, due to its function as a tributary to Ellen Brook. Provision of a local drainage reserve in the north-east corner of the site, which provides for a proposed realigned section of the unnamed northern creekline. This reserve has been provided to maintain the existing (pre-development) surface water flows for the creekline via a modified alignment across lot 15. The current alignment of the creekline within lot 15 is highly disturbed and is primarily situated within cleared areas comprising pasture grasses. Whilst some mature native trees occur in select areas, similar values occur within the proposed realignment along the north and eastern boundaries of lot 15.

- Provision of a local reserve coinciding with the conservation category wetland within lot 8247 mapped by the DBCA post-advertising of the DSP;
- Provision of two local reserves in the south-east of the DSP, which accommodate and will provide for the future retention of the following environmental values:
  - Two resource enhancement wetlands;
  - The identified population of threatened flora species *Grevillea curviloba;*
  - Vegetation potentially representative of the state-listed TEC FCT 15 'Forests and woodlands of deep seasonal wetlands of the Swan Coastal Plain'.
  - Foraging, roosting and breeding habitat for Carnaby's black cockatoo and forest red-tailed black cockatoo;
  - Suitable habitat for the quenda.

Overall, the proposed regional and local reserve network will provide for future conservation outcomes for a range of environmental values within the site, including those determined to be of the highest relative environmental significance.

Given its strategic role and function, the DSP does not identify reserves over all environmental values within the site. Only values determined to be of high relative environmental significance have been identified for protection at this high-level. Environmental values not identified within reserves on the DSP map include:

- Patches of banksia woodland of the Swan Coastal Plain TEC, given occurrences of this TEC within the site are either isolated, small in area, and/or highly disturbed from their natural form, which collectively reduce their overall conservation value. Adjacent regional reserves to the south of the site contain large, contiguous areas of intact Banksia Woodland TEC vegetation which provides a local and regional conservation outcome for this community.
- A resource enhancement wetland within lot 10 to the west of Sawpit Road which was observed to be highly disturbed from its natural form as a result of rural land uses, with limited vegetation values remaining in 'degraded' condition. Given this portion of the site provides a natural low-point, this wetland area may still be partly or wholly accommodated within future local open space to provide a drainage and/or vegetation retention function. This will be determined as part of the local structure planning process.
- Isolated patches of vegetation sporadically located across the site, which occur in varying conditions ranging from 'completely degraded' to 'good'.

Further opportunities to accommodate additional environmental values at a local level will be investigated at the local planning scheme amendment and local structure planning stages.


Source: Emerge

5.5.2 Future Investigations and Management Plans

Site specific flora and fauna surveys will be required at the local planning scheme amendment stage to further investigate and define potential environmental constraints and establish any further management strategies that may be necessary.

Where the abovementioned further investigations identity any specific fauna management measures as being required (such as a 'Kangaroo Management Plan'), proponents are to liaise with the DBCA and the local government at the appropriate stage of planning (local scheme amendment or local structure plan) to ensure that fauna management is suitably considered and ultimately managed under a local government-approved management plan.

5.5.3 Bushfire

The Bushfire Management Plan that accompanies the DSP (refer Appendix 6) confirms that the majority of bushfire risks within the site will be removed as part of future development. This will involve existing areas of classified vegetation being converted to non-vegetated areas or areas of low threat vegetation, such as managed parklands within public open space.

Portions of the site will remain a bushfire risk to future development, including the future MRS Parks and Recreation Reserve and potentially the proposed local reserves. The potential bushfire risk posed by these areas can be appropriately managed in an urban context, primarily through the strategic location and provision of road reserves and managed public open space adjacent these hazards. This will provide appropriate separation between the bushfire hazards and residential land uses and will be addressed in detail through the future local structure plan design process.

- The proposed DSP satisfies the acceptable solutions for each of the Bushfire Compliance Criteria outlined in the Guidelines, as follows:
- **Location:** the proposed DSP design enables future dwellings to be located within areas that will be subject to a low or moderate bushfire hazard and can achieve a BAL rating of BAL-29 or below.
- **Siting and Design:** the site is sufficiently sized to accommodate future development that would enable a BAL rating of BAL-29 or less to be satisfied.
- **Vehicular Access:** the proposed DSP provides an interconnected public road network within the site with a range of connections to the external public road network to the north, east, south and west.
- **Water:** the site is proposed to be serviced with a permanent and reticulated water supply, which will service future onsite firefighting requirements.

5.5.4 Noise

An Acoustic Assessment (refer Appendix 7) has been prepared in support of the DSP in response to its proximity to Tonkin Highway and the Perth to Geraldton Freight Rail Line. The predicted noise levels for road and rail are assessed against SPP 5.4 and where exceedances are predicted, recommendations are made on noise mitigation measures to achieve compliance with the policy requirements.

In addition to the road and rail noise considerations outlined above, the Ellenbrook Speedway is a known source of noise within the locality that requires consideration as part of the DSP.

The recommendations of the Acoustic Assessment are intended to guide the preparation of future, more detailed acoustic assessments that will support and guide local structure planning and subdivision design.

Tonkin Highway

The total northbound traffic volumes on Tonkin Highway adjacent the western DSP in 2031 are estimated at 15,400 vehicles per day and the forecast traffic volumes south bound in 2031 are estimated at 15,500 vehicles per day.

Based on the forecast volumes and the lack of existing acoustic mitigation, the Acoustic Assessment identifies that the predicted noise received within the DSP area adjacent Northlink would exceed the 'Noise Limits' prescribed under SPP 5.4.

To address potential noise impacts from Northlink, the Acoustic Assessment recommends standard noise mitigation measures to ensure compliance with SPP 5.4 requirements. These include either implementation of a buffer or construction of a physical barrier in conjunction with quiet house design standards and notifications on titles of affected lots. Implementation of a buffer is not practical in the context of residential development at urban densities and is therefore not proposed to be implemented at future planning stages.

A noise barrier combined with quiet house design packages is the preferred and proposed strategy for managing noise from Tonkin Highway. The noise barrier could be in the form of a noise wall or earthen bund, with the Acoustic Assessment modelling a 2.4m high noise wall at the western boundary of the DSP. Based on this strategy, resultant noise levels adjacent the western boundary are attenuated sufficiently to enable residential development. Quiet house designs (likely in the form of Packages A and B) and notifications on title are also proposed for all affected lots as per standard practice.

Perth to Geraldton Rail Freight Line

A predictive noise model was constructed to determine the impact of noise generated by trains travelling along the Perth to Geraldton Rail Freight Line. The Acoustic Assessment considered train movements and duration of train passes in accordance with the requirements of SPP 5.4. In accordance with SPP 5.4, the Acoustic Assessment adjusts the train movements to a maximum of 1 per hour (24 per day). The model indicates that predicted noise levels would exceed the 'Noise Limits'.

To address potential noise impacts from the Perth to Geraldton Rail Freight Line, the Acoustic Assessment recommends standard noise mitigation measures to ensure compliance with SPP 5.4 requirements. These include either implementation of a buffer or construction of a physical barrier in conjunction with quiet house design standards and notifications on titles of affected lots. Implementation of a buffer is not practical in the context of residential development at urban densities and is therefore not proposed to be implemented at future planning stages.

A noise barrier combined with quiet house design packages is the preferred and proposed strategy for managing noise from the Perth to Geraldton Rail Freight Line. The noise barrier could be in the form of a noise wall or earthen bund, with the Acoustic Assessment modelling a 2.4m high noise wall at the eastern boundary of the DSP. Based on this strategy, resultant noise levels adjacent the eastern boundary are attenuated sufficiently to enable residential development. Quiet house designs (likely in the form of Packages A and B) and notifications on title are also proposed for all affected lots as per standard practice.

Ellenbrook Speedway

The Acoustic Assessment indicates that noise emissions from the Ellenbrook Speedway may have a limited impact on the south-eastern corner of the DSP. As outlined above, this area will also be affected by noise from the Perth to Geraldton Rail Freight Line which will be greater than any potential noise impact from Ellenbrook Speedway. Any noise attenuation measures to address noise from the Perth to Geraldton Rail Freight Line are therefore expected to sufficiently address speedway noise. The only management strategy recommended beyond those already required to address rail noise are notifications on titles of affected lots specifically referencing speedway noise.

5.6 Water Management

Stormwater and groundwater management strategies for the DSP are detailed in the accompanying DWMS (refer Appendix 5) in accordance with best practice drainage and nutrient management.

Preparation of the DWMS was guided by the following documents:

- *Better Urban Water Management (WAPC 2008);*
- *Water Resource Considerations when Controlling Groundwater Levels (DoW 2013);*
- *Decision process for stormwater management in Western Australia (DWER 2017); and*
- *North east corridor urban water management strategy (GHD 2007).*

The principles and objectives shown in Table 7 have been adopted for the DSP based on the above.

5.6.1 Groundwater Management

The DWMS proposes to utilise the unconfined aquifer as a means of stormwater disposal by infiltrating runoff via soakwells, drainage basins and swales. Groundwater levels are expected to rise from the increased infiltration associated with urban development however, this will be managed by the installation of a subsoil drainage system. Fill will be imported to provide clearance from the controlled groundwater level to roads and building pads.

The subsoil drains will be located within road reserves and beneath POS areas. The level at which these subsoil drains are installed – the Controlled Groundwater Level – will be set according to the Department of Water's *'Water resources considerations when controlling groundwater levels in urban development' (2013). As specified by the DoW, the CGL will be set with regard to:*

- A free-flowing drainage outlet;
- Infrastructure protection;
- Groundwater quality;
- Protection of water dependent ecosystems (WDEs); and
- Catchment and nearby land use constraints.

In relation to the protection of WDEs, groundwater modelling undertaken as part of the DWMS indicates that the proposed subsoil drains will not impact the hydrology of the Twin Swamps Nature Reserve. Subsoil flows will be treated in bioretention areas or living streams prior to discharging from the site.

5.6.2 Stormwater Management

Implementing the strategies outlined in the DWMS, the DSP proposes to effectively manage stormwater quantity and quality generated from minor and major events by incorporating best practice water sensitive urban design (WSUD) principles. These include:

- Protection of natural systems;
- Integration of stormwater treatment into the landscape to maximise the visual and recreational amenity of the development;
- Protection of water quality;
- Maintain peak flows to pre-development rates if discharging offsite; and
- Enhancing the natural amenity of the development.

Table 7: DWMS Principles and Objectives

Key Element	Principles	Objectives
Water Conservation	• No potable water should be used outside of homes and buildings with the use of water to be as efficient as possible.	• Meet the *State Water Plan* (Government of WA 2007) water consumption target of 100 kL/person/yr, including not more than 40-60 kL/person/yr scheme water. • Irrigation of public spaces to be by groundwater or an alternate water supply scheme.
Water Quantity	• Maintain the pre-development hydrologic regime and meet the ecological water requirements of the receiving environment. • Protection of property and infrastructure by the safe conveyance of excessive runoff from extreme events. This includes the protection of property and infrastructure within the DSP Area as well as downstream and so needs to consider the impact of peak discharge from the study area.	• Maintain ecological flows into important wetlands and Western Swamp Tortoise habitats. • Design stormwater management systems to provide serviceability, amenity and road safety during minor rainfall events. • Maintain the 1% annual exceedance probability (AEP) pre-development flood regime (flood level, peak flow rates and storage volumes). • Safely convey runoff from extreme events up to the 1% AEP event and ensure that the flood channel capacity of the receiving waterway is not exceeded by retaining or detaining the runoff from storm events where appropriate. • Protect people and property from flooding by constructing building habitable floor levels with appropriate minimum clearances above the 1% AEP flood level.
Water Quality	• Maintain surface water quality at pre-development levels and, if possible, improve the quality of water leaving the development area to maintain and restore ecological systems in the sub-catchment in which the development is located.	• Manage — retain and/or detain, and treat (if required) — stormwater runoff from constructed impervious surfaces generated by the first 15 mm of rainfall at-source as much as practical.
Groundwater Management	• Protect buildings and other infrastructure by providing adequate separation from maximum groundwater levels. • Maintain groundwater quality at pre-development levels and, if possible, improve the quality of water leaving the development area to maintain and restore ecological systems in the sub-catchment in which the development is located.	• Set the Controlled Groundwater Level (CGL) according to DWER policy and at a level to protect groundwater dependent ecosystems and infrastructure. These should be reviewed at local structure plan scale to protect specific environmental values and after the results of more detailed groundwater monitoring information is available. • Subsoil drainage to be laid at or above the CGL. • Nutrient export from the site will not be increased.

Stormwater management within the DSP will ensure adequate flood protection, protection of wetlands and protection of Western Swamp Tortoise habitats. This will be achieved by:

- Maintaining pre-development flow rates into wetlands and Western Swamp Tortoise habitats. Although all runoff eventually discharges into the Ellen Brook, care will be taken to ensure that flows that contribute to the Ellen Brook Nature Reserve in the predevelopment scenario do not bypass the Reserve;
- Managing or treating stormwater runoff from constructed impervious surfaces generated by the first 15 mm of rainfall at-source as much as practical. This is proposed to be achieved by soakwells, biotreatment areas in detention basins and living streams;
- Maintaining the 1% annual exceedance probability (AEP) pre-development flood regime via offline detention basins and inline within Sawpit Gully;
- Safely conveying runoff from extreme events up to the 1% AEP event and ensuring that the flood channel capacity of the receiving waterway is not exceeded by retaining or detaining the runoff from storm events. Sawpit Gully will be retained as appropriate and upgraded to a living stream and the northern drainage channel will be realigned; and
- Providing the appropriate clearances from habitable building floor levels to the 1% AEP flood level in accordance with the following:
  - 0.3 m clearance to the flood level in local detention basins;
  - 0.5 m to the flood level in Sawpit Gully and the northern creek.

The proposed post-development stormwater scenario is depicted at Figure 21 – 'Post-development Stormwater Management' and is summarised as follows:

- Twenty internal catchments will discharge directly into Sawpit Gully, the existing east-west creek line to the north of Sawpit Gully or directly offsite. Consistent with WSUD principles, post-development catchment boundaries were developed based on the existing catchments, drainage lines and discharge locations in order to mimic the pre-development hydrological regime as closely as possible;
- Thirteen detention basins dispersed across the drainage network and at discharge points to attenuate peak flows to pre-development rates. The locations of the detention basins are indicative only with their size and exact locations to be confirmed as part of the Local Water Management Strategies to be prepared as part of future local structure plans; amd
- The alignment of the existing east-west creek line north of Sawpit Gully within lot 15 will be modified in order to achieve a more efficient urban form. The creek realignment will be designed to retain the existing inflow and outflow points whilst ensuring that there is no increase in potential flood risk or impacts on environmental features.

5.6.3 Waterways and Wetlands

The DSP provides for the future retention of both primary waterways traversing the site (Sawpit Gully and the unnamed northern creekline) through the provision of a future MRS 'Parks and Recreation' reserve and two local drainage reserves. Whilst a highly disturbed portion of the unnamed northern creekline within lot 15 is shown on its current alignment, further investigations are planned to occur to determine whether it can be realigned to achieve a more efficient urban form. These further investigations will be undertaken as part of the Local Water Management Strategy that will accompany the local structure plan that deals with lot 15. Appropriate buffers for all waterways will be determined at the local structure plan stage and accommodated within the reserves.

Two conservation category wetlands and two resource enhancement wetlands are proposed to be retained and managed for conservation purposes within future reserves. This includes CCW UFIs #8926 and #16147 and REW UFIs #12283 and #12444. Further investigations are required into REW UFI # 16149 within lot 10 at the Local Water Management Strategy stage to determine whether it's retention within a future local reserve is warranted. Appropriate buffers for all wetlands will be determined at the local structure plan stage and accommodated within the reserves.

5.6.4 Non-potable Water for Irrigation

The District Water Management Strategy (DWMS) identifies water sources for irrigation of public open space and school sites. As an outcome of the district planning process, the DWMS specifies the following irrigation targets to be demonstrated at the local structure plan stage:

- 60% of public open space areas to be irrigated at an average of 6,750kL/ha/yr.
- 80-90% of the district open space to be irrigated at 10,000kL/ha/yr.
- 20% of school sites to be irrigated at 6,750kL/ha/yr.

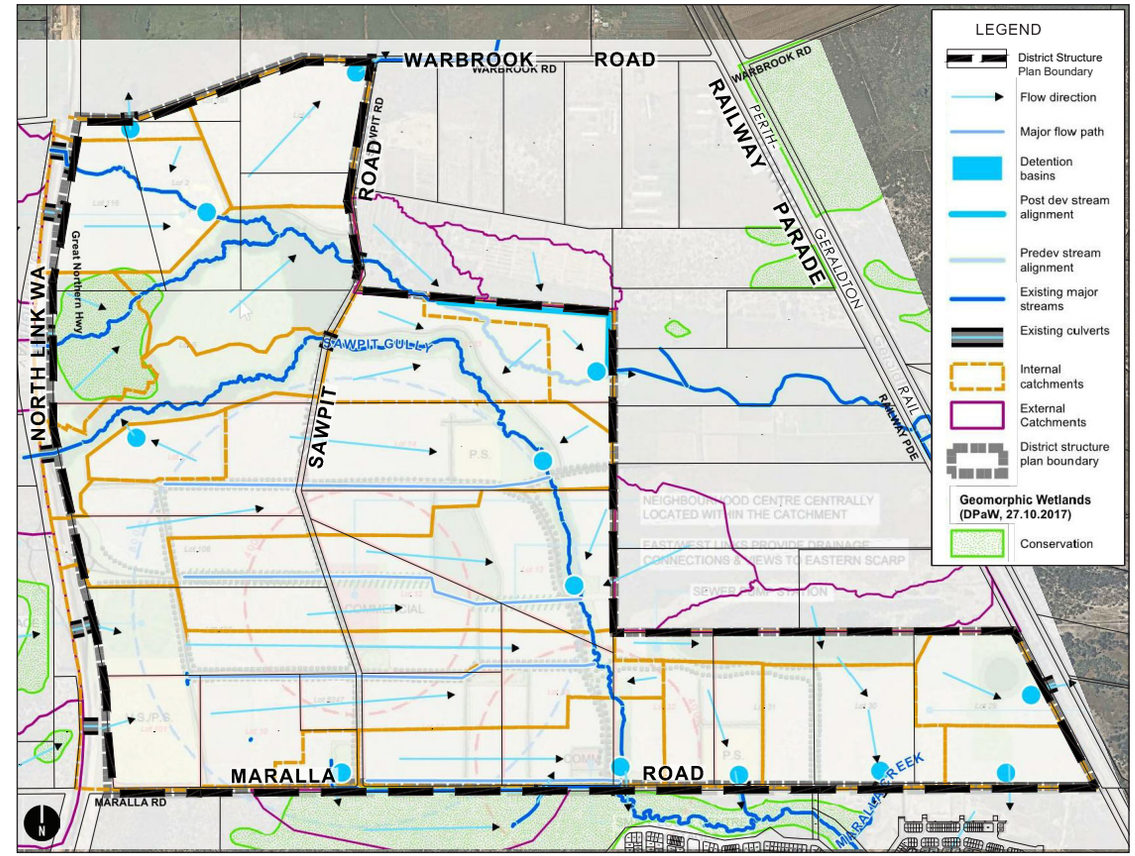


Figure 20: Post-development Stormwater Management
Source: RPS

5.7 Education and Community Facilities

5.7.1 High School

The DSP identifies one high school to serve the estimated number of households. Based on the estimated number of dwellings being 5,500, the provision of a high school is consistent with the ratio of one secondary school per four primary schools as outlined in *Liveable Neighbourhoods*. Further, part 3.4 of the Frameworks 'Community and social infrastructure' identifies one additional high school for the North Ellenbrook Urban Investigation area, which has been confirmed with the Department of Education.

The high school is co-located with the District Open Space in order to allow for shared use of the active sporting facilities which will include playing fields and hard courts. Co-location of the high school and DOS is an important consideration for the DSP and provides the following benefits:

- It minimises demand for non-potable water for irrigation. Shared use of playing fields by the high school and the community reduces the amount of turfed areas and therefore the amount of water needed for irrigation. Shared use of the district open space allows for more efficient use of infrastructure and, given the limited availability of non-potable water in this location, reducing the amount of turfed areas that need irrigation is a key objective of the DWMS;
- It allows for the more efficient use of land and avoids the need to reserve additional land that can otherwise be used for housing;
- It reduces ongoing costs by sharing the maintenance responsibilities of the playing fields between the DoE and City of Swan as compared to the DoE having to maintain the high school playing fields separate to the City of Swan maintaining the DOS.

Whilst a 10 hectare high school site is notionally shown on the DSP, it is expected that co-location of the high school with the district open space will enable a reduction in the size of the high school site to a minimum of 8 hectares in accordance with the draft *Operational Policy 2.4 – Planning for school sites.*

The location of the high school was extensively reviewed as part of the district planning process. The location shown on the DSP is informed by the following key considerations:

- In addition to catering for future North Ellenbrook residents, the proposed high school provides an important opportunity to alleviate potential future demand pressures on existing high schools to the south that currently service established residents within Ellenbrook, The Vines and Aveley. Preliminary investigations in this regard identified a preference for the school to be located on Maralla Road close to Dunnett Drive in order to service the southern catchment. Upon detailed analysis, this option was deemed undesirable for traffic impact reasons as it would have encouraged through traffic on an established network of local roads that have not been designed or planned to accommodate the additional traffic volumes. The DSP location close to the interchange with Tonkin Highway provides the next best accessibility for residents to the south via Tonkin Highway and the future planned bus connection.
- As outlined above, the district open space provides a logical interface with Tonkin Highway and the interchange in terms of managing potential noise and amenity issues for 'sensitive land uses'. Following from this principle, co-location of the high school and district open space is a key component of the planning for active open space and the subsequent ongoing maintenance.

- The location of the high school is central to the catchment, but sufficiently separated from the Neighbourhood Centre east of Sawpit Road so that potential cumulative traffic impacts and land use conflict can be suitably managed.
- The location of the high school provides for the most direct and efficient access for future residents within the western DSP area. Based on the western DSPs staging, it is likely that the western DSPs high school will not be delivered until the later stages of development, meaning that a large number of early residents within the western DSP will likely rely on the eastern DSPs high school for access to critical community infrastructure. The proposed location is the most accessible for those residents and avoids attracting additional traffic volumes into the eastern DSP internal network of roads.
- The district planning process identified likely early demand for the high school. The current location allows for early delivery of the high school (and district open space) with minimal infrastructure extension.
- The high school is located in a location that can be easily serviced via a circular bus route that connects with Ellenbrook Station. As discussed in section 5.3.3 above, it is anticipated that the bus connection will operate along Sawpit Road and then west over Tonkin Highway to connect into the western DSP. The high school is located within this planned route and can be easily serviced without expanding or altering the bus route.
- There are no other high-traffic generating land uses planned within the development precinct south of the interchange and west of Sawpit Road. The high school location provides for the effective separation and management of high school traffic enabling and encouraging the use of different routes and intersections than those that will service the planned Neighbourhood Centre and other primary schools.
- The high school site is not constrained by any environmental factors. There are no DBCA-mapped wetlands and the native vegetation in this location has been subject to significant historic disturbance and clearing. They are highly modified from their original composition and do not represent high-value Banksia woodland remnants as compared to other areas west of Tonkin Highway or south of Maralla Road.

Further refinement to the exact location of the high school site, its size and dimensions will occur as part of the local structure plan process. A concept design for the co-located high school and district open space will be a key element that informs the final location of these two important infrastructure items. This will necessitate further engagement with both the Local Government and the Department of Education.

Whilst a government high school is planned for the future residents of North Ellenbrook, other non-government secondary schools available to future residents in proximity include:

- Swan Valley Anglican Community School (6km);
- Ellenbrook Christian College (6.5km); and
- Holy Cross College (5km).

5.7.2 Primary Schools

The DSP identifies four primary school locations to be refined and confirmed at the local structure planning stages. The general principles that have informed the indicative primary school locations include:

- Frontage to a neighbourhood connector roads;
- The potential to accommodate road frontages to at least three sides;
- Distributed evenly through the DSP area to service 400m catchments; and
- Allowing for the timely delivery of school sites to match the staged delivery of the DSP.

Prior to the development of the first primary school within the DSP area, residents within the early stages can be accommodated by the existing primary school within Annie's Landing, approximately 500m to the south.

The location and distribution of primary schools is described under the following headings.

Local Structure Plan 1A

One of the two primary schools within Local Structure Plan 1A is expected to be the first school delivered in the DSP area.

Access to both schools is proposed via a neighbourhood connector road and access to at least three sides can be easily accommodated at the detailed design stage. Adequate separation is proposed from the Neighbourhood Centre and high school in order to minimise the potential for traffic conflict at peak periods.

Local Structure Plan 2

The primary school within the Local Structure Plan 2 precinct is expected to be either the second or third primary school delivered in the DSP area, depending on staging. With frontage to a neighbourhood connector road to at least one boundary, access to other road frontages will be demonstrated at the detailed design stage in accordance with *Liveable Neighbourhoods.*

Local Structure Plan 3

The primary school within Local Structure Plan 3 is expected to the final primary school delivered in the DSP area. It is expected to service the entire Local Structure Plan 3 catchment as well as a portion of the Local Structure Plan 1B catchment.

The school has good access to the road network via Maralla Road which is an integrator arterial road and can easily accommodate road frontage to a minimum of three sides. The function and safety along Maralla Road will need to be considered at the local structure planning stage when confirming the specific location of the primary school site.

Local Structure Plan 4

Local Structure Plan 4 will be the final local structure plan prepared for the DSP and is only anticipated to commence once Local Structure Plans 1 – 3 are significantly progressed and close to full build-out. By that time, primary school planning is expected to be fully resolved and no schools are planned within this precinct.

5.7.3 Community Facilities

The DSP is supported by a Community Facilities Strategy (refer Appendix 9) to plan and coordinate future community facilities for the projected population of North Ellenbrook (east). The Community Facilities Strategy (CFS) assesses the provision of planned and existing regional and district-level community infrastructure outside of the DSP to determine the level of accessibility for future residents. Based on the estimated number of dwellings for the DSP area (5,500 dwellings) the CFS also considers the provision of community facilities in accordance with the City of Swan's *'Standards of Provision: Open Space and Community Buildings'* as well as standard infrastructure that should be accommodated within the DSP.

The findings of the CFS are summarised at Table 8: 'Proposed North Ellenbrook (east) Community Facilities' below, which will coordinate the provision of community facilities for the DSP.

Table 9: 'Distribution of Community Facilities' provides indicative locations and justifies the rationale for the distribution of community infrastructure across the DSP.

Table 8: Proposed North Ellenbrook (East) Community Facilities

Facility	Existing Facility in Local Area	Proposed for DSP Area
District Level		
District Open Space	Ellenbrook District Open Space	1 x District Open Space
Multipurpose Hard Courts	Multiple hard courts distributed throughout Ellenbrook Local Area	1 x Multipurpose Hard Courts (group of 2 hard courts)
Community Centre	Three community centres throughout Ellenbrook	1 x district community centre
Neighbourhood Level		
Community Centre	Multiple neighbourhood level community centres throughout the Ellenbrook Local Area	2 - 3 x neighbourhood community centres
Open Space	Multiple open space through Ellenbrook Local Area	Neighbourhood and local open space to be provided at minimum 10% of gross subdivisible area in accordance with *Liveable Neighbourhoods*
Youth Spaces		
Skate Park	Ellenbrook Skate Park	1 x district or neighbourhood-level skate park
BMX Dirt Track Facility	Ellenbrook BMX track Bullsbrook BMX track	1 x BMX / Pump track

Table 9: Distribution of Community Facilities

Facility	Proposed Indicative Location	Comment
District Open Space	• Adjacent interchange and abutting Northlink WA; • Collocated with combined school site	• Refer to section 5.4.2 above for detailed description of DOS
Multipurpose Hardcourts	• Located within District Open Space	• Will allow for joint use by combined school site; • Strengthens the role of the DOS as a key node for active sporting activities; • Will enhance activation of DOS in evening hours; • Consistent with *Liveable Neighbourhoods* (Element 4, R18)
District Community Facility / Sporting Pavilion	• Located within District Open Space	• Will facilitate organised sport and provide formalised place to base community sporting clubs i.e. the users of the DOS; • The physical buildings should be designed to accommodate the sporting activities planned to occur.
Neighbourhood Community Centre	• 1 x within or adjoining the Neighbourhood Centre • 1 x adjacent local centre (if proposed) • 1 x within Local Structure Plan 4 adjacent parks and/or reserves	• Locating the community centre within, or adjacent, the planned activity centre (Neighbourhood Centre) will reinforce the Centres role as a community focal point; • Will diversify the range of services and facilities accessible within the activity centre; • Will promote multi-function trips; • Will be easily accessible at the intersection of key roads; • Consistent with *Liveable Neighbourhoods* (Element 4, General Principles) • Will diversify the range of services and facilities accessible within the activity centre; • Will promote multi-function trips; • Will be easily accessible at the intersection of key roads; • Consistent with *Liveable Neighbourhoods* (Element 4, General Principles); • Specific location to be confirmed at the local structure planning stage but indicatively adjacent parks and open space.
Skate Park	• Located within neighbourhood or local park	• Location to be confirmed at the local structure planning stages when neighbourhood and local parks are confirmed.
BMX Dirt Track	• Located within neighbourhood or local park	• Location to be confirmed at the local structure planning stages when neighbourhood and local parks are confirmed.

5.8 Activity Centres and Employment

Activity centres are important community focal points that serve as consolidated locations for retail, commercial, entertainment and community land uses. A consolidated location for these types of non-residential uses reduces the need for multiple purpose trips and provides an opportunity to integrate a range of activities to create vibrant places for people to shop, meet and recreate. Based on their role and function, activity centres provide an opportunity for increased density and population in immediate proximity to establish a sense of community and increase activity outside of normal business hours.

State Planning Policy 4.2 – Activity Centres for Perth and Peel (SPP 4.2) takes a hierarchical approach to planning for activity centres. Rather than prescribe maximum floor space caps through localised planning, SPP 4.2 advocates a more flexible approach based on a pre-defined hierarchy of activity centres. Whilst SPP 4.2 specifically identifies activity centres at a district level and above, smaller centres (neighbourhood and local) are not pre-defined and are instead, informed by more localised planning investigations.

An Economic, Retail and Employment Strategy (refer Appendix 2) has been prepared by retail consultant, Macroplan, to support and inform the DSP. The Economic, Retail and Employment Strategy includes a Retail Sustainability Assessment (RSA), the key findings and outcomes of which are summarised under the following sections.

5.8.1 Access to Existing Retail Facilities

From the first stage of development, the DSP area will have good access to a range of established activity centres to provide for daily, weekly and incidental shopping needs. These existing facilities are described as follows:

- The **Aveley Neighbourhood Centre** is located approximately 4km south of the DSP area and comprises a full-line supermarket and a range of other services including a pharmacy, newsagency, barber, café, bar and various restaurants. Prior to delivery of an activity centre within the DSP area, the Aveley Neighbourhood Centre is expected to accommodate the daily shopping needs of first stage residents.
- The **Ellenbrook Secondary Centre** is located approximately 5km to the south west and will be accessible to the DSP area. Identified as a secondary centre under SPP 4.2, Ellenbrook comprises approximately 36,700m² of commercial floorspace and is anchored by a discount department store and two full-line supermarkets. A $63 million expansion of Ellenbrook Central was approved in February 2019 which will see the range of services increase. Ellenbrook Central is anticipated to serve the daily and weekly shopping needs of future DSP residents, depending on travel behaviour.
- The strategic metropolitan centre of **Midland** is located approximately 17km from the DSP area, which includes the Midland Gate sub-regional shopping centre. As a strategic metropolitan centre, Midland provides a wide range of shopping amenities as well as bulky goods / showroom retailers;
- The **Morley** strategic metropolitan centre is located approximately 20 km south west of the DSP area and includes the Galleria regional shopping centre. The Galleria is anchored by a department store, two discount department stores and two full-line supermarkets. Morley provides a wide range of services in addition to typical commercial / retail including service industrial uses and car dealerships.

5.8.2 Neighbourhood Centre

Through an analysis of the DSPs anticipated trade area that included consideration of population trends and the socio-demographic profile within the region, the RSA determines that a Neighbourhood Centre of approximately 10,000m² of retail floorspace will be required to service the DSP population at full development. This is based on an estimated total number of dwellings of 5,500, an estimated household size of 3 persons and good access to established and developing higher order centres. Consistent with the functions, characteristics and performance targets for activity centres outlined at Table 3 of SPP 4.2, a Neighbourhood Centre is an appropriately sized activity centre to serve the estimated future population of North Ellenbrook.

Size and Composition

Development of the Neighbourhood Centre will be staged in order to match the provision of retail services with consumer demand. As more lots are developed and the population grows within the DSP area, additional stages of the Centre will be developed to ensure that the daily and weekly shopping needs of residents can be satisfied locally.

Assuming residential development commences in 2026 with the first residents in 2027, the RSA determines that 4,000 – 4,500m² of retail floor space could be supportable by 2038. This would comprise a 3,200m² full-line supermarket combined with 1,200 – 1,400m² of fresh food specialties and a range of non-food specialty stores. Prior to this time, first-stage residents are expected to access Ellenbrook Central and Aveley Neighbourhood Centre for their daily and weekly shopping needs.

As the DSP population grows, expansion of the Centre in 2043 to accommodate a small format discount department store and additional specialty floor space will likely be warranted up to a total of approximately 5,500m².

At full development of the DSP area, being approximately 5,500 dwellings, the Centre is capable of supporting up to 10,000m² of retail floor space. Total floor space is expected to comprise of mostly food, liquor and grocery (FLG) services based on the Centres role providing for the majority of daily and weekly shopping needs. Non-food floor space is expected to be considerably lower based on the general trend of consumers accessing these services at higher-order centres. In this regard, DSP residents are expected to utilise services and facilities at Ellenbrook Central, Midland Gate or the Galleria for higher-order retail needs. Based on this assumption in the RSA, the Neighbourhood Centre at full build-out is expected to comprise:

- Approximately 8,800m² of food retail (FLG and food catering); and
- Approximately 1,200 - 1,600m² of non-food retail (household goods, leisure, general retail and retail services).

Depending on whether a local centre is developed as part of the first stages adjacent Maralla Road, the potential floor space within the Neighbourhood Centre may be decreased proportionately to the size of the local centre. This is discussed in further detail under part 5.8.3 ‘Local Centre’.

Location

As the main activity centre for the DSP and the primary location for residents daily and weekly shopping needs, the Neighbourhood Centre is located centrally within the DSP to maximise the population catchment within a 1km radius. This maximises the accessibility of the Centre for residents by all forms of transport modes (pedestrians, cyclists and vehicles).

To enhance the viability of the Centre, the DSP identifies a location at the intersection of the two internal roads that are forecast to carry the highest traffic volumes. This promotes the presence and visibility of the Centre and creates exposure for passing traffic. Given that the majority of traffic movement to and from the DSP is expected to be made using these two roads, the location also provides convenient access for residents travelling to and from home. The location also provides easier access for regional traffic that may elect to access the Centre by virtue of its location abutting the integrator arterial road that will connect the DSP with the Tonkin Highway interchange. This further enhances the exposure and viability of the Centre.

Provision is made for a small portion of the Centre to be located on the opposite side of the key east-west road through the DSP that connects with the Tonkin Highway interchange. This assists to provide symmetry in the urban form of the Centre and enables creation of a smaller sub-precinct within the broader Centre. This sub-precinct could accommodate allied health and child care services or potentially car-based retail such as drive-thru fast food.

Future Processes

More detailed planning regarding the Neighbourhood Centre will be required at the local structure planning stage. The local structure plan is expected to address matters such as:

- Refine the composition and distribution of the Neighbourhood Centre in relation to the road network;
- Coordinate access to and from the road network;
- Confirm any other uses that are planned to occur within the Centre such as community facilities;
- Confirm the location of the Bus Transit Node and determine whether it will be integrated with the Neighbourhood Centre or located separately;
- Address any relevant provisions of *State Planning Policy 4.2 – Activity Centers for Perth and Peel;*
- Potentially require more detailed planning to coordinate development of the Neighbourhood Centre through a Local Development Plan.

5.8.3 Local Centre

The DSP foreshadows the potential for a small local centre adjacent Maralla Road to enhance future residents access to services and amenities. The viability and need for this local centre will depend on the development of other planned centres to the south within Ellenbrook specifically, the Annie's Landing Village Centre and the Broadway District Centre. Depending on the final form of these centres as well as other centres within the east and west DSP areas, a small local centre adjacent Maralla Road may be viable.

Should a local centre be proposed as part of the local structure plan for this area, further retail reporting will be required in accordance with *State Planning Policy 4.2 – Activity Centres for Perth and Peel* to support the proposed size and composition on the local centre.

Source: Lendlease

5.8.4 Employment

On overarching strategy of the WAPCs Perth and Peel@ 3.5 million suite of documents is to *'create employment opportunities that utilise local labour-force skills to increase employment self-sufficiency by attracting business that match the populations that live in the various sub-regions."* This reduces the need to travel and the demand on transport infrastructure and enhances people's quality of life by reducing commute times.

Based on 2008 data, *'Directions 2031 and beyond'* (2010) identified an employment self-sufficiency level for the north-east sub-region at 63%. This was predicted to increase to 75% by the year 2031. By March 2018, the updated strategic planning for the north-east sub-region in the form of the Frameworks, identified an employment self-sufficiency level of 80% based on 2011 data. The Frameworks expected this to increase to 85.8% by the year 2050. This level of employment self-sufficiency is reasonably high when compared to the north-west sub-region (49% in 2011) and the south-metropolitan and peel sub-region (59% in 2001) as outlined at Table 4: 'Employment self-sufficiency by sub-region 2011-2050' of *Perth and Peel@ 3.5 million*. Given the large tracts of employment land identified in the north-east sub-region, the Frameworks expects that employment self-sufficiency will improve to 2050.

Using the Framework's employment self-sufficiency target of 85% and the Framework's assumption that 50% of all residents will be in the workforce, the DSP's Economic, Retail and Employment Strategy sets out the following employment self-sufficiency scenario for North Ellenbrook:

- An estimated total of 5,500 dwellings will accommodate a population of 16,550 people;
- Of the estimated 16,550 people, 8,275 of those will be in the workforce;
- Of the 8,275 people in the workforce, 7,034 residents will ideally work somewhere in the north-east sub-region, with 1,241 residents working outside the sub-region.

The Economic, Retail and Employment Strategy demonstrates that North Ellenbrook will have good access to jobs in the north-east sub-region with an expected high degree of employment self-sufficiency. The employment opportunities for North Ellenbrook as outlined in the Economic, Retail and Employment Strategy are summarised in the following sections.

Local Employment Opportunities

Development of the Neighbourhood Centre as proposed by this DSP will contribute to employment opportunities both directly and indirectly. It is expected to create jobs for the construction and related industries during the construction phases as well as ongoing jobs once completed. As outlined in the Economic, Retail and Employment Strategy, retail components of activity centres typically employ approximately 40 workers per 1,000m² of gross floor area. Based on its planned size of 10,000m², the Centre is predicted to generate approximately 400 ongoing jobs.

In addition to retail jobs within activity centres, the Economic, Retail and Employment Strategy forecasts the following types and numbers of local jobs within North Ellenbrook:

- 246 education-related jobs (schools and childcare);
- 101 health related jobs (retirement, aged care, allied health);
- 70 service and convenience-related jobs; and
- 364 other urban employment jobs (emergency, transport, human services).

In combining the above job figures with anticipated levels of home-based employment, North Ellenbrook is forecast to create approximately 1,600 local jobs towards achieving employment self-sufficiency.

Employment Opportunities within the Sub-region

Existing and higher-order activity centres within the sub-region continue to expand and upgrade. Midland Gate Shopping Centre recently underwent a major expansion which was completed in March 2019 whilst other businesses continue to establish in the Midland Strategic Metropolitan Centre. The Ellenbrook Secondary Centre recently announced a $63 million expansion which would create further employment opportunities in close proximity of the DSP area and encourage further investment in the local area.

Due to its proximity immediately north of the DSP area, the Bullsbrook Freight and Industrial Area will provide a significant source of local jobs in the medium to long term. The DSPs future population is ideally located to service the employment needs of the Bullsbrook Freight and Industrial Area which are expected to include logistics, general industrial, light industrial, service commercial and business park uses. The Economic, Retail and Employment Strategy that supports the DSP estimates that the Bullsbrook Freight and Industrial Area will support more than 50,000 jobs once developed that will include transport, manufacturing, construction, wholesale and retail sector jobs. These job sectors will demand skills that are expected to match the population demographic of North Ellenbrook.

North Ellenbrook is strategically located within close proximity of other existing and planned employment nodes within the north-east corridor including:

- South Bullsbrook Industrial Precinct (zoned);
- Muchea Industrial Park
- Malaga Light Industrial;
- Hazelmere Industrial; and
- Wangara Light Industrial / Service Commercial.

In holistically considering the development of employment land within the north-east sub-region, the Economic, Retail and Employment Strategy forecasts that an additional 1,070 jobs per annum will be created up to the year 2046. At this rate of jobs growth, by 2046 there would be an additional 27,120 jobs within the industrial estates in the north-east sub-region. This is based on a projected average development rate of 30 hectares per annum for industrial land take-up.

As outlined in the Economic, Retail and Employment Strategy, the job sectors of accommodation and food services, health care and social assistance, mining, public administration and safety and construction are forecast to be the highest growth sectors to the year 2022. Whilst this only represents a short term forecast, Macroplan considers that these trends will continue in the medium to longer terms. These job typologies are considered to be suitable to accommodate the anticipated demographic profile of North Ellenbrook residents, being comprised largely of traditional households, who earn average incomes and will be attracted to North Ellenbrook by the relative affordability of housing and lifestyle on offer.

As a key conclusion of the Economic, Retail and Employment Strategy, Macroplan identify that a fundamental economic growth challenge for the north-east sub-region will be to ensure that there is a sufficient local workforce to meet the employment demand from businesses investing in the Bullsbrook Freight and Industrial Area. The challenge is therefore not to create jobs for residents in the sub-region rather, to ensure that an adequate resident population can be accommodated close to employment land. North Ellenbrook is strategically placed to not only provide urban land to service employment land in Bullsbrook, but other employment growth areas such as the Muchea Industrial Park.

Achieving Employment Self-Sufficiency Targets

As outlined above, based on the anticipated workforce of the DSP area and the employment self-sufficiency targets outlined under the Frameworks, 7,034 North Ellenbrook residents will ideally work in the north-east sub-region. The Economic, Retail and Employment Strategy demonstrates that these employment opportunities can be accommodated as follows:

- 1,601 workers within the North Ellenbrook area itself (population-driven employment);
- 828 workers within other activity centres in the sub-region (i.e. Midland and Morley etc);
- 2,778 workers within existing and planned industrial centres;
- 1,241 construction workers;
- 255 other workers (i.e. transport, maintenance etc); and
- 331 fly-in / fly-out workers.

5.9 Infrastructure Coordination, Servicing and Staging

Infrastructure coordination, servicing provision and staging have been considered for the DSP area and are summarised in an Engineering and Servicing Report, prepared by Cossill & Webley and appended to this report (refer Appendix 4). The Engineering and Servicing Report confirms that there are no engineering impediments to development of the DSP area. A summary of the key engineering considerations is provided in the following sections.

5.9.1 Water Supply

The DSP area is located within the Water Corporation's licensed area for provision of a potable water supply service. The Ellenbrook Reservoir (WC water storage tank) is located to the west of Tonkin Highway and is fed by the Gnangara groundwater bore scheme.

The Water Corporation has advised that the DSP can likely be serviced with water from the Ellenbrook storage tank and that extending the water distribution main eastwards to service the DSP will require traversing Bush Forever areas. Capital funding for the new reservoir outlet and associated distribution mains is currently not on the Water Corporations capital investment program. In liaison with the Water Corporation, the proponents will need to further investigate the infrastructure alignment and resolve funding of any water headworks to enable development of the land prior to the 'lifting of Urban Deferment' process.

5.9.2 Waste Water

The DSP area falls within the Water Corporation licensed area for operating sewerage services.

The Water Corporation has recently undertaken conceptual wastewater planning for North Ellenbrook and the wider West Bullsbrook Industrial area which identifies the DSP within the Bullsbrook Sewer District. This wastewater planning allows for wastewater from both the east and west DSPs to be pumped from North Ellenbrook southwards into the Ellenbrook (Barrambie Way) Main transfer Waste Water Pump Station (WWPS). This solution will require the construction of a 900mm diameter gravity sewer from the Barrambie Way WWPS northwards to a suitable high point to accept pumped flows from future pump station within North Ellenbrook.

Capital funding for the sewer extension is currently not on the Water Corporation's 5-year capital program. Should development proceed ahead of Water Corporation funding being allocated for the works, the proponent may elect to fully fund the extension of the necessary headworks infrastructure and WWPS.

An internal sewer catchment plan has been prepared based on the planned staging for the DSP and is included as part of the Engineering and Servicing Report. This plan reflects a standard approach to wastewater planning including use of a reticulated gravity sewer to direct flows to a wastewater pumping station. The likely flows for this catchment shall be continually refined as part of future reporting in consultation with the Water Corporation.

5.9.3 Power

A 22kV high voltage overhead power line is currently located in both Maralla Road and Sawpit Road. The Western Power Network Capacity Mapping indicates a forecast capacity in the DSP area of 25 to 30MVA through to 2026.

It is envisaged that the local network shall be incrementally extended from the existing power lines, with the required switch stations and transformers installed to meet individual site requirements. Further refinement to determine power demands and load shall be determined as part of future stages of planning and any additional reinforcement of the power network shall be installed by the developer as required.

5.9.4 Telecommunications

The DSP area is within NBN's fixed line footprint and can be serviced with optic fibre in accordance with the roll-out scheme for greenfield development.

As standard practice, developers of new residential estates have the option to pay NBN or an alternate service provider for provision of a high speed broadband network. Under both scenarios, the developer will install pit and pipe infrastructure that can accommodate a future high speed broadband network.

5.9.5 Gas

Atco Gas has advised that the existing high pressure gas network to the south of Maralla Road (in Ellenbrook) will have capacity to service the DSP area via an extension to the existing network. As is standard, gas reticulation will be supplied and funded by Atco Gas.

5.9.6 Siteworks and Earthworks

Early investigations have been undertaken with regards to siteworks and earthworks for the DSP area. Siteworks shall typically comprise clearing of existing vegetation, as required, and the existing ground level earthworked to facilitate future development. The extent of the site works will be dictated by the density and nature of the development and, consistent with current practice, the earthworks strategy shall generally provide for the creation of level lots.

In support of the progression of planning over the DSP area, a preliminary earthworks plan will be prepared and provide an indication of the conceptual design levels as part of future stages of planning. It is anticipated that, based on preliminary investigations, a 'cut to fill' approach to balance levels across the DSP area will be applied, in addition to some importation of clean sand fill material.

Strategies to minimise the importation of fill will be implemented and include optimising the subsoil, sewer and drainage networks.

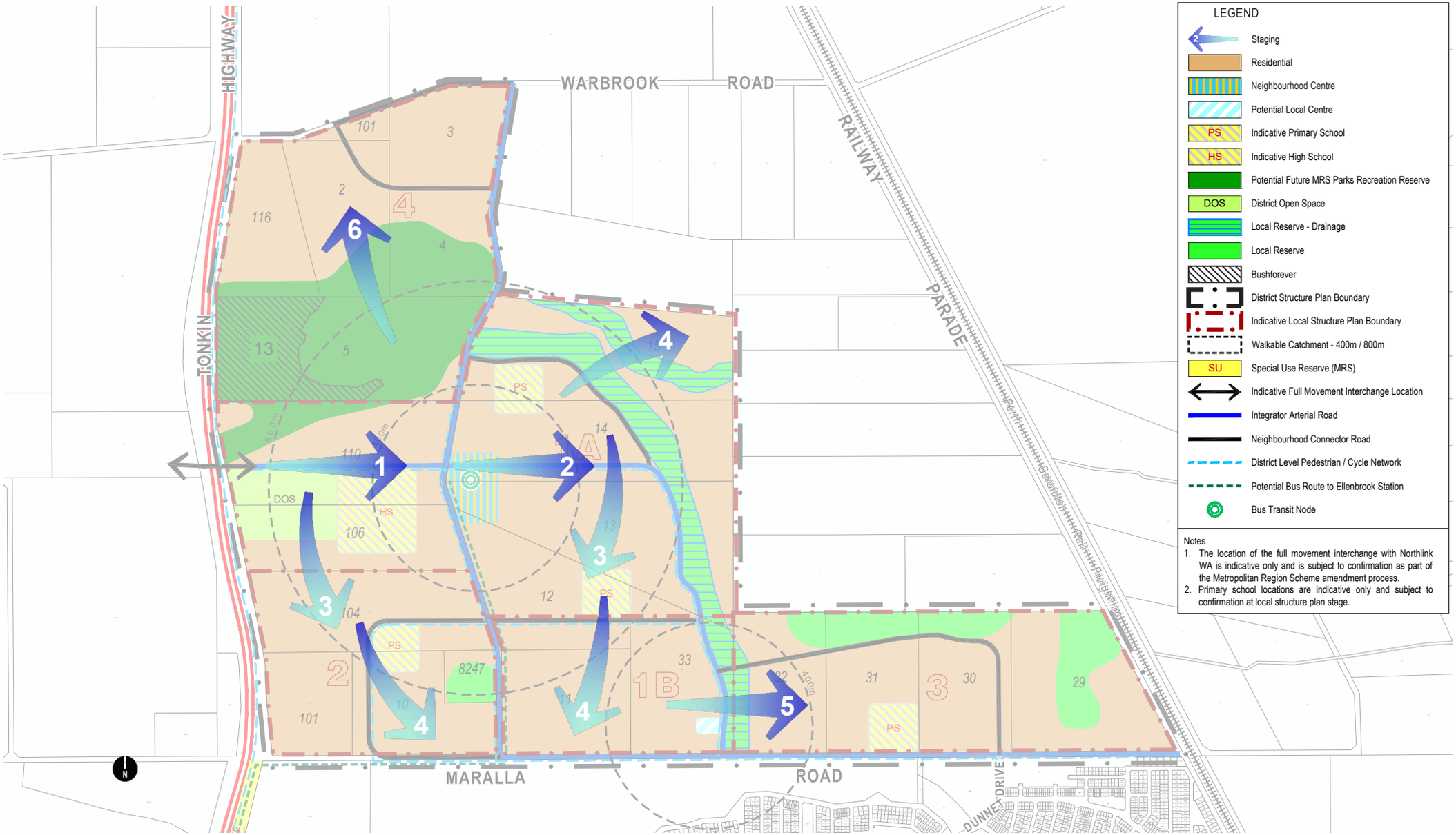


Figure 21: Indicative Staging Plan

5.9.7 Staging

Staging of the subdivision and development of the DSP area will be linked to the interchange. The interchange is required to be operational from inception to provide efficient regional road access for first stage residents. As such, the first stage of development will occur closest to the interchange with subsequent stages extending out. The intended staging approach is visually depicted at Figure 21 – 'Indicative Staging Plan'. Subdivision is expected to occur in thirty to fifty lot stages commencing at lot 110 and then moving south in an anti-clockwise direction.


COMMUNITY CENTRE

6.0 DEVELOPMENT CONTRIBUTIONS

6.0 | DEVELOPMENT CONTRIBUTIONS

A Development Contribution Plan will likely be required to fund local development and community infrastructure. This will need to be confirmed at the local structure plan stage once the appropriate level of detail can be confirmed. Development Contribution Plans will be established through amendments to LPS 17, consistent with *State Planning Policy 3.6 – Infrastructure Contributions.*

As the proponent for the DSP, Lendlease intend on pre-funding the necessary development and community infrastructure required to service their development parcels. Where shared funding is identified as necessary, pre-funded infrastructure would be treated as works in kind with Lendlease to be reimbursed through future landowner contributions via the respective Development Contribution Plan. This avoids any onus on the local government to fund development and community infrastructure that may be required before sufficient funds have been collected through a Development Contribution Plan.

Roads and Intersections

Any shared funding and associated cost apportionment methodology that may be required to upgrade and establish roads and intersections will be informed by future traffic modelling at the local structure plan stage. Informing this modelling will be the broader mesoscopic model currently under preparation by MRWA in conjunction with the DPLH and City Swan. Cost apportionment will be determined in accordance with *State Planning Policy 3.6 – Infrastructure Contributions.*

District Open Space

As a district-level community infrastructure item, there is the need for shared funding of the DOS through a future DCP. Whilst the land component of the DOS may be provided by a landowner (current or future) towards satisfying their 10% POS requirement, development of the DOS to ultimate standard will be funded through a DCP.

Notwithstanding the above, based on the current ownership structure of the DSP and the location of the DOS, it is expected that both the land component and development costs associated with the DOS will be funded through a DCP, consistent with *State Planning Policy 3.6 – Infrastructure Contributions.*

Neighbourhood and Local Parks

Depending on the ownership structure at the local structure planning stages and the calculation of POS credits in accordance with *Liveable Neighbourhoods,* a DCP may be required for funding neighbourhood and local POS where it is clear that one or more landowners are disproportionately contributing to the 10% POS requirement. Any necessary DCPs at the local level will be prepared in accordance with *State Planning Policy 3.6 – Infrastructure Contributions.*

Community Infrastructure

The Community Facilities Strategy (refer Appendix 9) identifies the need for three neighbourhood-level community centres. These will serve a local catchment within the individual local structure plan areas. It is expected that funding of these facilities will be via a local DCP prepared in accordance with *State Planning Policy 3.6 – Infrastructure Contributions.*