



Whitby Local Structure Plan
Shire of Serpentine-Jarrahdale
July 2012

robertsday



SHIRE OF SERPENTINE-JARRAHDALE
WHITBY LOCAL STRUCTURE PLAN
JULY 2012

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RECORD OF AMENDMENTS MADE TO THE AGREED STRUCTURE PLAN

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APPENDICES (Separately Bound)

Environmental Assessment and Justification Report (Cardno)
Integrated Landscape Management Strategy (Cardno and Emerge)
Traffic Report (Transcore)
Commercial Activity Strategy (Taktics 4)
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PART 1: STATUTORY SECTION

1.0 STRUCTURE PLAN AREA

This Part applies to the Whitby Local Structure Plan (LSP) and shall apply to that portion of Precinct A of the Mundijong Whitby District Structure Plan (DSP), being all land contained within the inner edge of the red line shown on the LSP (Figure 1).

2.0 STRUCTURE PLAN CONTENT

This Structure Plan comprises the:

- Statutory section (Part 1)
- Explanatory section (Part 2 and Part 3)

3.0 INTERPRETATION

The words and expressions used in this LSP shall have the respective meanings given to them in the Shire of Serpentine Jarrahdale Town Planning Scheme No.2 (the Scheme).

4.0 RELATIONSHIP WITH THE SCHEME

In accordance with clause 5.18 of the Scheme:

- a. The provisions, standards and requirements specified under Part 1 of this Structure Plan shall have the same force and effect as if it were a provision, standard or requirement of the Scheme. Parts 2 and 3 of this LSP are for explanatory purposes to provide a descriptive analysis of the LSP.
- b. In the event of there being any inconsistencies or conflict between the provisions, standards or requirements of the Scheme and the provisions, standards or requirements of this LSP, then the provisions, standards or requirements of the Scheme will prevail to the extent of any inconsistency.

5.0 OPERATION DATE

In accordance with sub-clause 5.18.6 of the Scheme, this LSP shall come into operation when it is adopted by the Council pursuant to sub-clause 5.18.3.15 of the Scheme.

6.0 ZONES, RESERVES AND RESIDENTIAL DENSITY CODES

The LSP delineates and depicts the zones, reserves and residential density codes applicable to the LSP area according to the legend thereon.

The zones, reserves and residential density codes designated under this LSP apply to the land within it as if the zones, reserves and residential density codes were incorporated in the Scheme.

All provisions, standards and requirements applicable to the zones, reserves and residential density codes in the Scheme shall apply, unless specific provision is made to the contrary in this LSP.

7.0 PROVISIONS

7.1 Subdivision and development shall generally be in accordance with the LSP or any variations as approved by the Shire of Serpentine-Jarrahdale and the Western Australian Planning Commission.

7.2 Detailed Area Plans (DAPs) shall be prepared for the local activity nodes; for lots with an area less than 350m²; for Larger Residential lots; for the three school sites; for the technical school (TAFE) site; for all lots adjoining Public Open Space; and for any additional lots as identified in the Development Principles notes on the LSP. Information detailed in a DAP may include, but is not limited to:

- Building envelopes;
- Setbacks;
- Building orientation;
- Vehicle and pedestrian access arrangements;
- Retention of vegetation;
- Fencing;
- Noise attenuation
- Additional Land Uses (for lots within Local Activity Nodes)
- Development Provisions

7.3 Council may waive the requirement to advertise a DAP pursuant to Clause 5.18.5 where the land subject of the DAP is in single ownership and the adjoining land is in the same ownership.

7.4 Development proposals that comply with the provisions of this LSP or an approved DAP are exempt from obtaining Planning Approval under Clause 5.1.2 of the Scheme. Separate planning approval obtained through the lodgement of a Development Application shall only be required if variations to the approved DAP are proposed.

7.5 An Activity Centre Structure Plan (ACSP) shall be prepared for the District Centre, generally consistent with the area identified on the LSP and allocated a Town Centre zoning under the LSP. Information detailed in the ACSP may include, but is not limited to, those matters to be included in DAPs, and those matters required by WAPC policy.

7.6 Residential Density

The statutory Local Structure Plan (Figure 1) identifies broad residential density ranges that apply to specific areas within the Structure Plan. Lot-specific residential densities, generally in accordance with the defined residential density ranges, are to be subsequently assigned in accordance with a Residential Density Code Plan approved by the Western Australian Planning Commission.

A Residential Density Code Plan is to be submitted at the time of application for subdivision approval to the Western Australian Planning Commission, and shall indicate the Residential Density Coding applicable to each lot within the subdivision and shall be generally consistent with the residential density ranges identified in the Structure Plan.

The Residential Density Code Plan is to include a summary of the proposed dwelling yield of the subdivision.

Determination of the Residential Density Code Plan shall be undertaken at the time of determination of the subdivision application by the Western Australian Planning Commission. The approved Residential Density Code Plan shall then form part of the Structure Plan and shall be used for the determination of future applications for development or subdivision. Variations to the Residential Density Code Plan will require further approval of the Western Australian Planning Commission.

Residential Density Code Plans are not required if the Western Australian Planning Commission considers that the subdivision is for one or more of the following reason(s):-

- i. the amalgamation of lots;
- ii. consolidation of land for 'superlot' purposes to facilitate land assembly for future development;
- iii. the purpose of facilitating the provision of access, services or infrastructure;
- iv. land which by virtue of its zoning or reservation under the Structure Plan cannot be developed for residential purposes; or
- v. any other reason as agreed by the Western Australian Planning Commission

The Shire of Serpentine-Jarrahdale shall maintain an up-to-date plan identifying residential densities within the Local Structure Plan area.

- 7.7 The implementation of the LSP will be facilitated through the development and subdivision approvals which shall generally conform to the LSP. Applications shall generally comply with the following Character Statement and Development Principles:

7.7.1 Character Statement

The development and subdivision of the LSP area will be undertaken over an extended timeframe during which time it will evolve as a significant community, commercial and civic focus in the Shire of Serpentine Jarrahdale. Whilst cognisant of the land's urban zoning which will facilitate the development of the area as a modern and contemporary neighbourhood it is equally important that the site's character and rural history is captured and reflected or interpreted in the future development of the Precinct.

As such, development of the LSP area will be cognisant of the design principles laid out in the DSP, as articulated in Part 2 Section 5.2.2 of the LSP, the strategic vision articulated by the Shire for the locality and relevant planning and design considerations.

7.7.2 Community Design Principles

- The LSP is intended as a guide for future urban development with the objective of generally identifying appropriate locations for housing types and densities whilst permitting flexibility to ensure the delivery of a diverse range of lot sizes;
- The neighbourhood structure should be sufficiently robust to facilitate diversity of land use which is flexible and adaptable to change.

7.7.3 Activity Centre Principles

- The District Centre precinct is the identified activity centre and is envisaged to be a highly functional mixed use precinct comprising transit facilities; district and local retailing, mixed use development (including residential) within a high quality public domain;
- The District Centre precinct offers the opportunity for development in accordance with main street principles;
- The District Centre precinct will be subject to the preparation of an Activity Centre Structure Plan to determine design content including allocation of uses, final design layout, community and civic uses, retail floor space, transit provision, parking and general development standards, in accordance with WAPC policy;
- The District Centre precinct is reliant on the adjacent rail crossing as depicted in the DSP and LSP, and is subject to change in commercial floorspace area should this not be provided
- Four local activity nodes are identified on the LSP where mixed use development comprising residential, retail and/or civic uses will be permitted, subject to the preparation and approval of a Detailed Area Plan.

7.7.4 Housing Diversity (Lot Layout) Principles

- Final residential densities will be determined at subdivision application stage.
- The design of housing should draw upon the natural setting, rural history and urban context of Whitby to provide a unique residential character for the development.
- Design should provide opportunities for passive surveillance, community engagement and a mix of lot sizes which promotes diversity, walkability and supports public transport use

7.7.5 Biodiversity and Resource Efficiency Principles

- Development and lot layout is to be oriented to maximise opportunities for energy efficient house design including passive solar design
- Development is to respect existing landforms and where practicable provide opportunities to retain the natural topography
- Design and implementation is to retain vegetation of local and regional significance where practicable

7.7.6 Water Cycle Management Principles

- Subdivision and development plans are required to provide adequate road and verge widths to accommodate the service alignments of a possible Third Pipe system

7.8 Council may require the preparation of Design Guidelines to guide subdivision and development within the LSP.

7.8.1 Design Guidelines shall have regard to:

- the Character Statement and development principles articulated in part 7.7 above,
- the design principles of the DSP, and
- relevant planning and design considerations

7.9 Public Open Space shall be distributed generally in accordance with the LSP, having regard for a variety of needs in Public Open Space, including active and passive recreation, drainage, and bushland reservation.

7.10 Where a residential lot is created within an extractive industry buffer, a notification may be required on the title of that lot.

8.0 INVESTIGATIONS AND MANAGEMENT PLANS

8.1 The following investigations and management plans are required prior to development (as identified in the District Structure Plan) and are addressed in the Integrated Landscape Management Strategy submitted as an Appendix to the Local Structure Plan:

- a Vegetation Management Plan
- a Wetland Management Strategy
- a Flora and Fauna Management Plan
- a Landscape and Vegetation Master Plan
- a Foreshore Management Plan

8.2 The following investigations and management plans shall be undertaken as a condition of subdivision approval:

- Landscape Management Plan – specific and detailed measures for the integrated management of matters outlined in the Integrated Landscape Management Strategy
- Urban Water Management Plans
- Acoustic Assessment and Management Plan (for selected areas)

8.3 Developer Contributions will likely be payable as part of any subdivision or development within the Structure Plan area. Specific details regarding district infrastructure and works will be set out within an approved Development Contribution Plan.

Community Design Principles

- The LSP is intended as a guide for future urban development with the objective of generally identifying appropriate locations for housing types and densities whilst permitting flexibility to ensure the delivery of a diverse range of lot sizes;
- The neighbourhood structure should be sufficiently robust to facilitate diversity of land use (mixed use development) which is flexible and adaptable to change.

Activity Centre Principles

- The District Centre precinct is the identified activity centre and is envisaged to be a highly functional mixed use precinct comprising transit facilities; district and local retailing, mixed use development (including residential) within a high quality public domain;
- The District Centre will be subject to the preparation of a Activity Centre Structure Plan to determine design content including allocation of uses, final design layout, community and civic uses, retail floor space, transit provision, parking and general development standards, in accordance with WAPC policy;
- The District Centre precinct offers the opportunity for development in accordance with main street principles;
- The District Centre precinct is reliant on the adjacent rail crossing as depicted in the DSP and LSP, and is subject to change in commercial floorspace area should this not be provided
- Local activity nodes are identified on the LSP where mixed use development comprising residential, retail and/or civic uses will be permitted, subject to the preparation and approval of a Area Specific Plan.

Biodiversity and Resource Efficiency Principles

- Development and lot layout is to be oriented to maximise opportunities for energy efficient house design including passive solar design
- Development is to respect existing landforms and where practicable provide opportunities to retain the natural topography
- Design and implementation is to retain vegetation of local and regional significance where practicable

Housing Diversity (Lot Layout) Principles

Final residential densities will be determined at subdivision application stage; however will generally comply with the lot sizes and densities as identified on the LSP;

- Larger Residential Lots (Indicative density: R5-R10) 1000m² - 2500m²
- Residential Lots (Indicative density: R15-R30) 250m² - 700m²
- Local Activity Node Lots (Indicative density: R20-R50) 150m² - 500m²

Residential Density Code Plans are to be prepared, allocating density codes for individual lots subject of a subdivision application. Approved subdivision applications which identify residential coding generally consistent with the principles outlined in the LSP shall be deemed to be an approved modification to the LSP.

Legend

- Larger Residential (R5-R10)
- Residential (R15-R30)
- Local Activity Nodes (R20-R50)
- Public Purpose
- Indicative Open Space
- Manjedal Brook Reserve
- Bush Forever
- District Centre
- 50m buffer to CCW
- Manjedal Brook - Top of Bank
- Manjedal Brook - Top of Bank (30m buffer)
- Subject Land
- Neighbourhood Connector A
- Other Neighbourhood Connectors
- Major Access Street
- District Centre Precinct

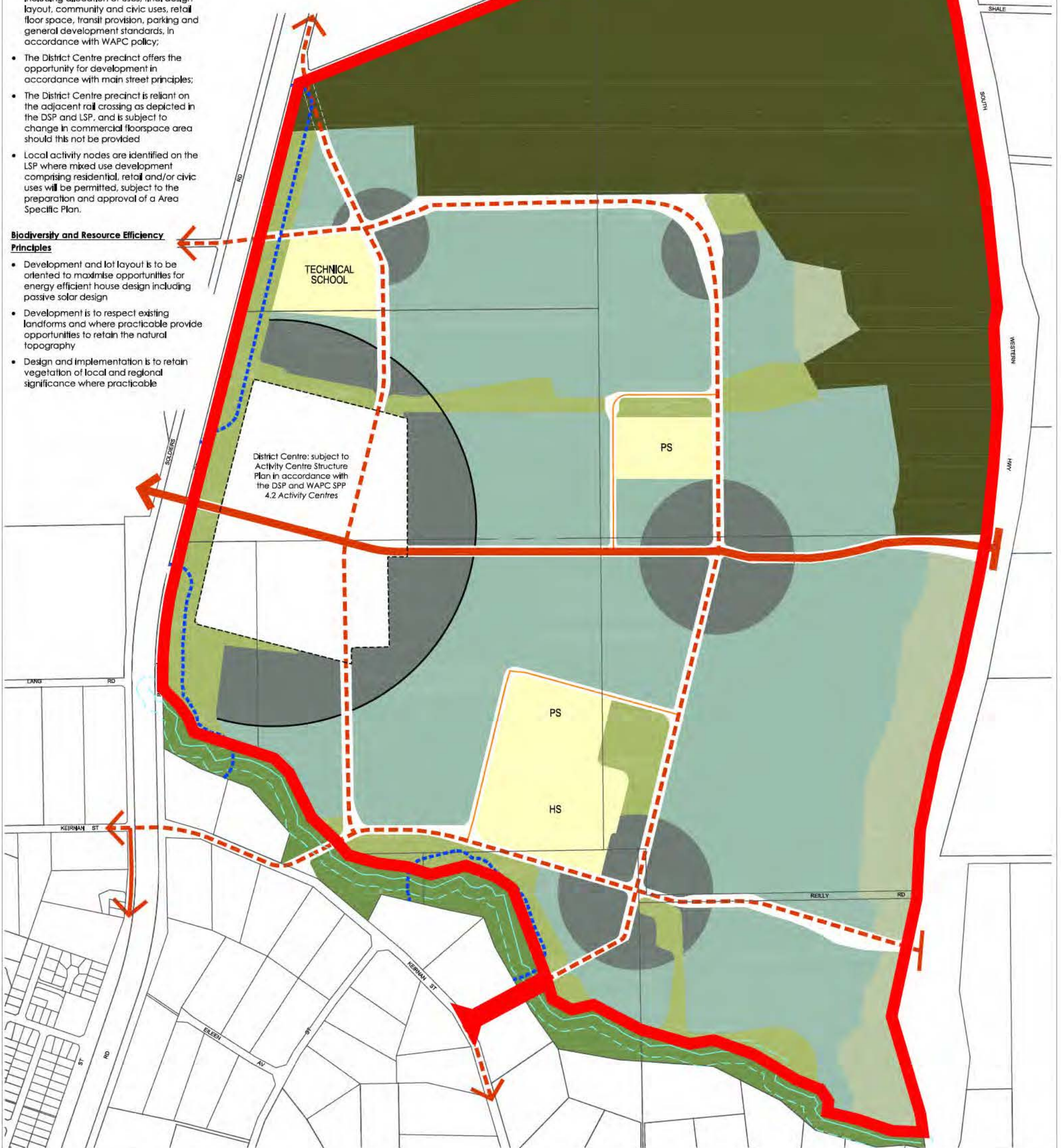


Figure 1: Statutory Local Structure Plan

DISCLAIMER: ISSUED FOR DESIGN INTENT ONLY. ALL AREAS AND DIMENSIONS ARE SUBJECT TO DETAIL DESIGN AND SURVEY.

0 100 200 300 400 500 metres
SCALE 1:5000
SHEET A1

REFERENCE NUMBER: URB WIT
DRAWING NUMBER: RD1 005
ISSUE: A



PART 2: EXPLANATORY SECTION

1.0 INTRODUCTION AND SITE LOCATION

This Local Structure Plan (LSP) has been prepared to guide the subdivision and development of land contained within Precinct A of the Mundijong Whitby District Structure Plan (the subject site).

The subject site is located within the South Eastern Metropolitan Corridor of Perth, in the Shire of Serpentine-Jarrahdale (the Shire) approximately 48 kilometres south-east of the Perth central business district, as shown in Figure 2. The subject site is located to the north-east of the existing Mundijong townsite, bound by South Western Highway to the east, Soldiers Road and the rail line to the west, Norman Road to the north and Manjedal Brook to the south and is located within the Mundijong-Whitby District Structure Plan area.

The Local Structure Plan aims to create a residential neighbourhood in line with the Shire's vision for the area, as set out in the Mundijong Whitby District Structure Plan (DSP). Accordingly, the LSP provides for the following key components:

- A diverse range of residential lot sizes, including larger lots buffering the South West Highway and Bush Forever site 354; smaller cottage lots and medium density sites adjacent to areas of Local Open Space, the District Centre and other local activity nodes; and traditional housing lots.
- Allowance for a future passenger rail station adjacent to the District Centre, within the existing rail corridor, and an at-grade crossing to facilitate direct access from the west to the District Centre and South West Highway.
- Access points from the LSP area to adjoining areas have been provided generally consistent with the DSP. A second connection is proposed across Manjedal Brook and provides a second east west connector within the DSP area. This second crossing is considered necessary to enable early stages of development to progress, which would otherwise be constrained by the rail crossing and infrastructure limitations
- Areas of the northern foreshore of Manjedal Brook identified as local open space.
- A number of linear open space areas which will function as multiple use corridors accommodating both open space and water management functions and provide pedestrian and cycling connections throughout the area.
- Open space areas adjacent to the railway corridor primarily to cater for wetland and noise buffers.
- Retention of existing stands of locally significant vegetation in areas of local open space.
- Allowance for a potential future TAFE site, located adjacent to the district centre.
- A co-located primary school and high school and a second primary school. Both school locations are adjacent to areas of local open space which will facilitate joint use of sporting ovals and facilities.

This report provides a descriptive analysis of the LSP, including site description, the existing statutory planning framework, opportunities and constraints, a description of the Local Structure Plan and the proposed implementation.

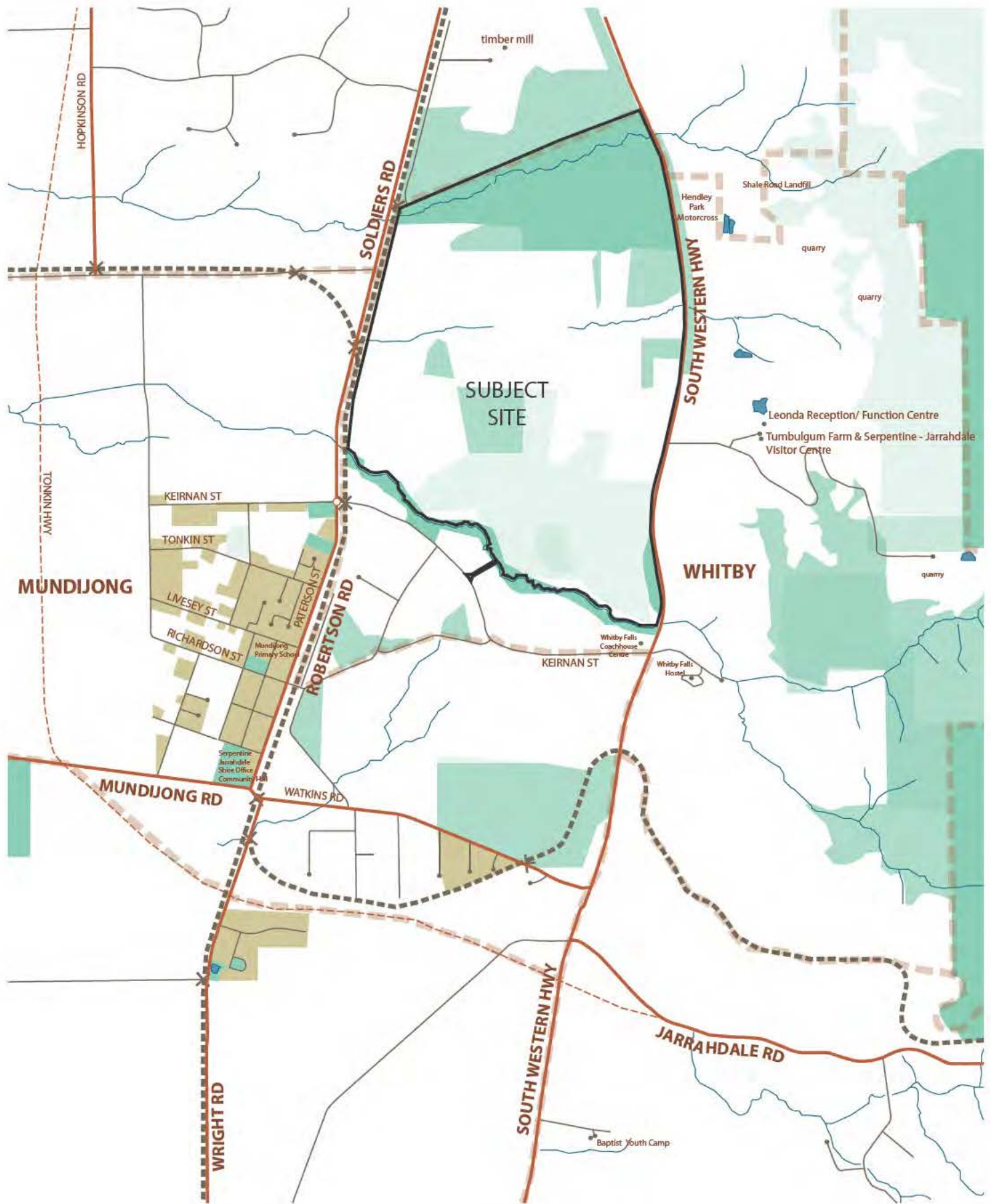


Figure 2: Location Plan

2.0 THE SITE - EXISTING ENVIRONMENT AND CONTEXT

2.1 The Subject Site – Precinct A of the Mundijong Whitby District Structure Plan

The land comprises 10 lots listed in Table 1 and depicted in Figure 3. The site has a total area of approximately 504.33 ha. Of this total approximately 94.81ha are reserved for Parks and Recreation and a further 41.7ha is Urban Deferred (future Parks and Recreation, as part of a negotiated planning solution), leaving a balance of 367.82ha of Urban Zoned land.

Table 1: Subject Land Title Details

Lot Number	Vol	Folio	Area ha
22	1247	409	72.72
23	1162	717	93.51
24	1168	861	83.81
25	1611	845	71.05
26	1247	409	61.47
27	1611	845	11.68
29	1247	409	63.45
45	1611	846	0.52
302	1609	179	32.06
399	1611	844	14.06
Total			504.33

2.2 Existing and Surrounding Land Uses

Historically the subject site has been used for agricultural purposes, which includes sheep grazing, horse agistment and the production of plantation timber. There are two existing dwellings on site and associated rural outbuildings.

During the 1990's a significant portion of the subject site was converted to farm forestry blue gum plantations (specifically the southern and central portion of Lot 24, the majority of Lots 27, 302 and 399 and the majority of Lot 25). Generally there is a 10 – 15 year rotation from planting to harvest.

The naturally vegetated areas of the site are located to the north of the precinct within Bush Forever site 354 and within two small areas of remnant vegetation identified in the Shire's draft Local Biodiversity Strategy.

The Department of Mines and Petroleum (DMP) and Geological Survey of Western Australia currently identify strategic titanium-zircon resource as occurring over the majority of the subject site (Hassan 2009). The potential extraction of this resource was considered as a part of the lifting of the 'Urban Deferred' zoning. Extraction of the sands is not economically viable, and is subject of considerable community opposition. The resource is not of sufficient importance to be included in WAPC's Statement of Planning Policy 2.4 Basic Raw Materials. It was deemed that urban development should proceed through the lifting of the deferment.

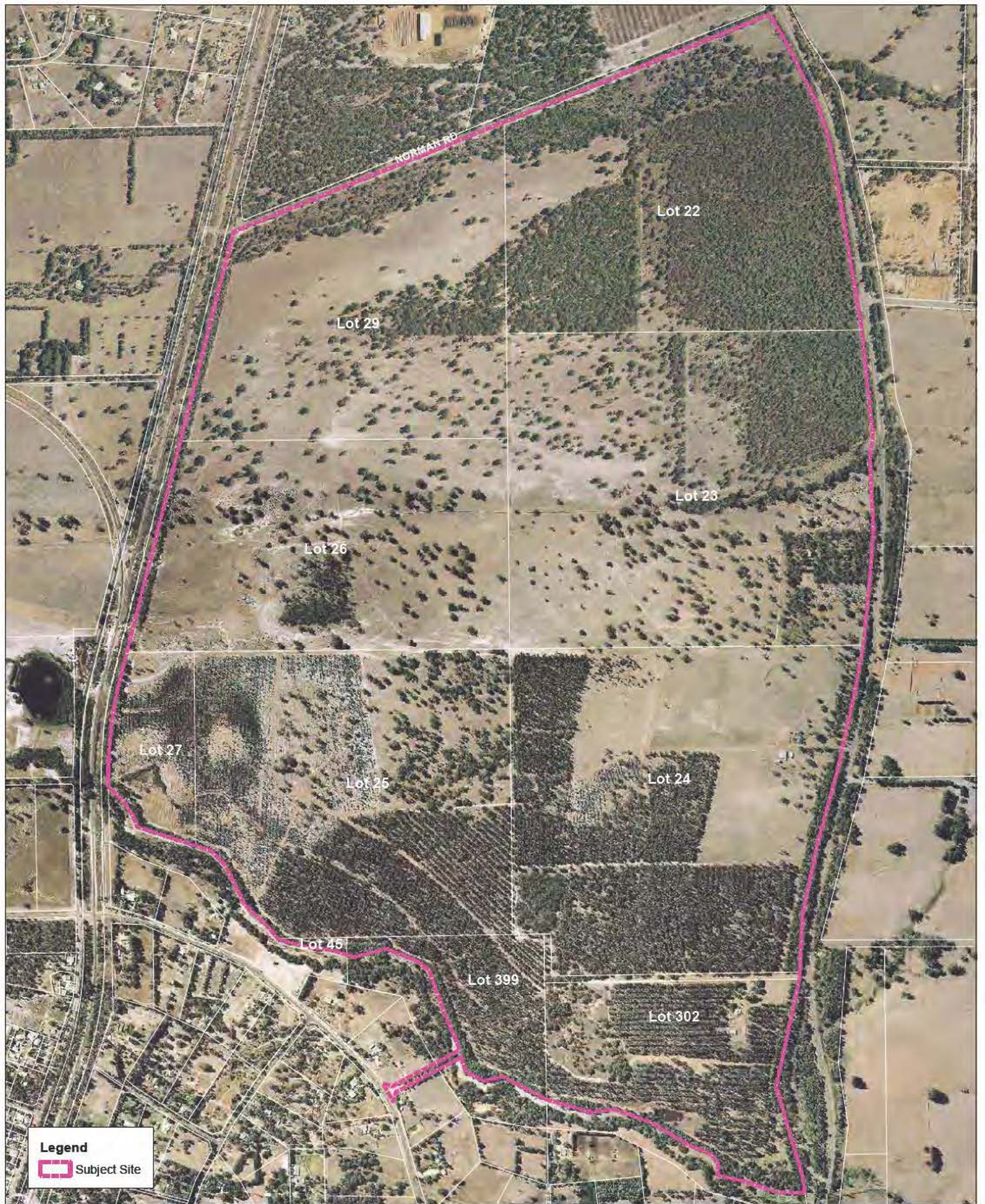


Figure 3: Existing Cadastre

To the north, the land is zoned 'Rural' under the MRS and is currently utilised for a variety of purposes including conservation (including Bush Forever site 361, adjacent to Norman Road), agriculture, timber treatment and prefabricated cement production. The land is identified as the future Cardup industrial area.



Figure 4: Plantation Vegetation on Site

Directly adjacent to the west of the subject site is the Perth to Bunbury rail line on which passenger and freight trains travel between Bunbury and Perth. This is a significant constraint to the subject site. Further west of the rail line the land comprises rural farmland which is zoned for urban development and is also subject to the DSP.

To the immediate east of the subject site is the South Western Highway, which regularly carries a range of vehicles including buses and trucks between Perth and the south-west. Further east of the subject site the land includes the South Cardup Landfill, Hanson's Hard Rock Quarry, WA Blue Metal Hard Rock Quarry and a motor-cross track. Land to the east in the vicinity of Reilly Road is reserved for public purposes (hospital) but remains undeveloped.

The area south of the subject site is zoned "Public Open Space" which aligns with Manjedal Brook, which forms the southern boundary of the subject site. Further south, on the opposite side of Manjedal Brook is an existing rural residential area forming Precinct B of the DSP and to the west is existing rural land forming Precinct G of the DSP.

2.3 Existing Environment

The Shire of Serpentine-Jarrahdale is recognised for its diversity of species, uniqueness and range of landscapes. The subject site encapsulates a variety of the landscapes found within the Shire.

Cardno was commissioned to undertake a range of investigations including desktop and site specific environmental investigations, to support the planning and future development of the subject site, and particularly for the development of this Local Structure Plan. The environmental investigations that were conducted include the following:

- Preliminary Acid Sulfate Soils Assessment;
- Level 2 Flora and Vegetation Survey;
- Level 1 and 2 Fauna Survey;
- Pre-development Hydrological Monitoring;
- Preliminary Site Investigations (Contamination); and
- Acoustic Assessment.

The above investigations have been summarised below, however more detailed information and outcomes of the investigations are provided in the Environmental Assessment and Justification Report (Cardno 2010a). The Environmental Assessment and Justification Report (Cardno 2010a) outlines the results of the desktop and site specific environmental investigations, detailing the environmental values and attributes of the subject site as well as how these have been accommodated within the LSP.

2.3.1 Site Topography, Geology, Landforms and Soils

Soils and Landforms

The subject site is located on the eastern edge of the Swan Coastal Plain, which forms the central portion of the Perth basin. The Perth basin extends from the Darling Fault in the east to the continental slope west of Rottnest Island, and from the Murchison River in the north and the Southern Ocean in the south (Seddon, 2004).

The Swan Coastal Plain is generally flat and is approximately 20 – 30 kilometres wide, consisting of a series of geomorphic entities running parallel to the coastline. The youngest and most western of these geographic entities is the Quindalup Dunes, followed by the Spearwood Dunes and at the most eastern extent the Bassendean Dunes. The Pinjarra Plain which is fluvatile in origin extends from the eastern side of the Bassendean Dunes to the western edge of the Darling Scarp, which joins the Ridge Hill Shelf and forms the denuded slope of the Darling Fault (Beard 1990, Seddon 2004). The subject site is situated primarily within the Ridge Hill Shelf, with the south-western portion found within the Bassendean Dune and Sandplain System (van Gool 1990).



Figure 5: Looking West across the Site

Landform and soil mapping undertaken by Churchward and MacArthur (1980) indicates that the subject site is found on two soil associations. The majority of the subject site is comprised of the Forrestdale Unit which is described as the laterised foothills of the Darling Scarp, dominated by gravelly and sandy soils. The north-western portion of the subject site is characteristic of the Guildford Unit and is described as a flat plain with yellow duplex soils (Churchward and MacArthur 1980).

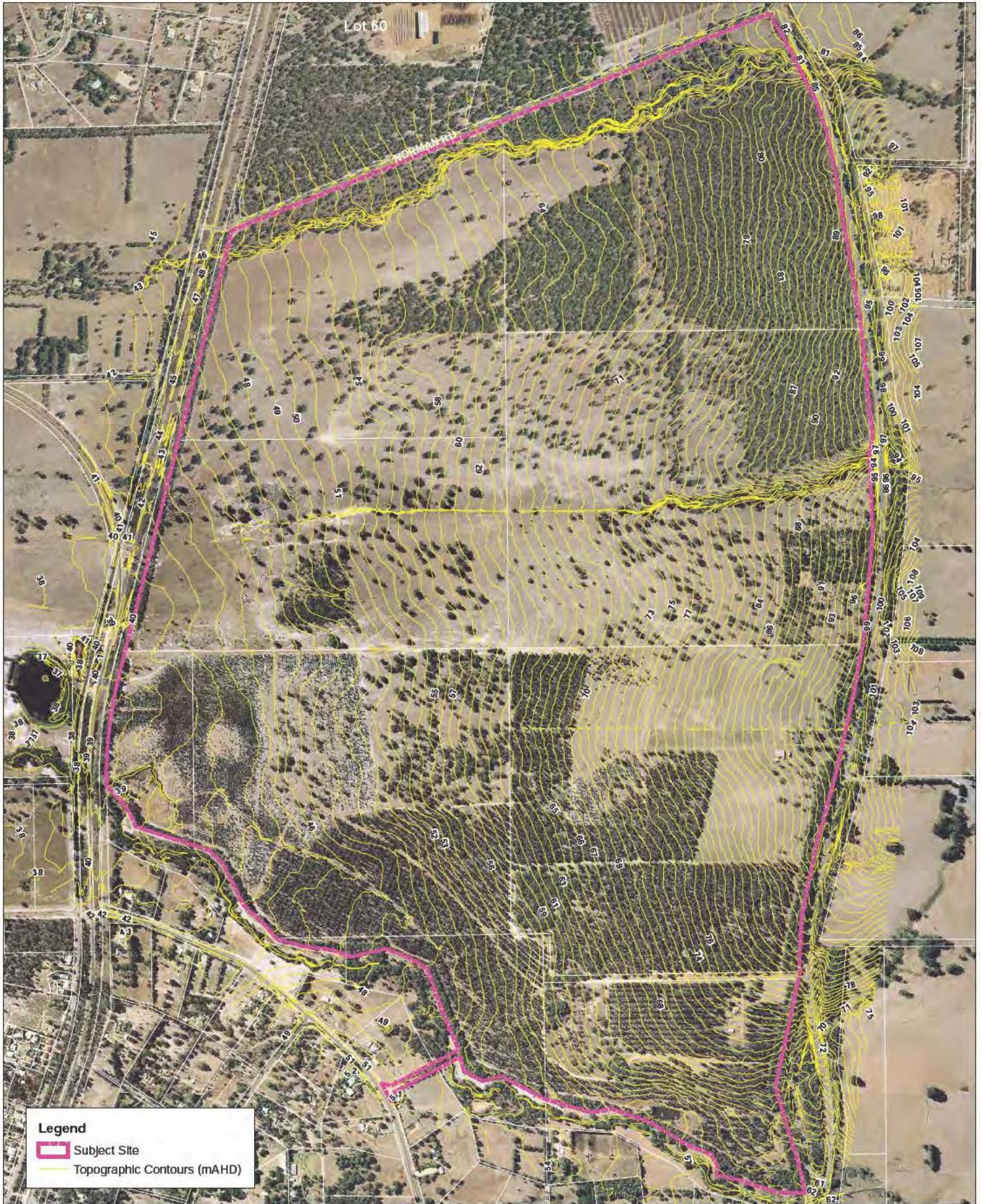
Geology

The Perth Metropolitan Region 1: 50,000 Environmental Geology Series, Serpentine (Part Sheets 2033 I and 2133 IV) indicates that the subject site is largely comprised of 'Gravelly Sandy Clay' (C_{sg}), with 'Sandy Clay' (C_s) in the western portion of the subject site, 'Sand' (S_{12}) in the south-eastern corner, 'Sand' (S_8) in the south western corner and 'Clayey Sandy Silt' (M_{sc1}) along Manjedal Brook.

A number of soil bores were installed as a part of the Acid Sulfate Soil (ASS) investigations undertaken for the subject site, in which the soils and geology observed were consistent with that described above.

Topography

The topography of the subject site is generally sloping with a western aspect. The natural surface height ranges from 40 metres Australian Height Datum (AHD) in the lowest elevated portions of the subject site (western boundary) to 96m AHD along the eastern boundary of the subject site. The topographical contours are shown in Figure 6.



Legend

- Subject Site
- Topographic Contours (mASL)

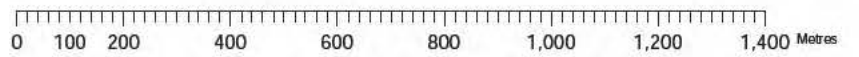


Figure 6: Topographical Contours



2.3.2 Acid Sulfate Soils (ASS)

Acid Sulfate Soils (ASS) is the name commonly given to naturally occurring soils and sediment containing iron sulphide (iron pyrite) materials. In their natural state ASS are generally present in waterlogged anoxic conditions and do not present a risk to the environment. ASS can present issues when they are oxidised, producing sulphuric acid, which can impart a range of impacts on the surrounding environment, infrastructure and human health.

A preliminary ASS investigation was undertaken by Cardno (Cardno 2010a) for the subject site. The investigation found that the risk of ASS occurring within the subject site was low, with no areas within three metres of the ground surface identified as containing Actual or Potential ASS. However, it is possible that isolated areas of ASS could occur in the south-western area of the subject site, less than three metres below ground surface. This is shown in Figure 7. ASS may be present deeper within the soil profile for the remainder of the subject site, however would be greater than three metres below ground surface and is unlikely to be disturbed by shallow site works.

2.3.3 Hydrology

Groundwater

The subject site is not located within an area that is covered by the Perth Groundwater Atlas (DoW 2007), however groundwater information has been gathered from previous investigations undertaken by Iluka Resources (URS 2001) and recent hydrological investigations completed by Cardno (Cardno 2006; Cardno 2007 and Cardno 2008), and is provided in the Environmental Assessment and Justification Report (Cardno 2010a).

The subject site overlies three aquifer systems, a superficial formation, the Leederville Formation and the Cattamarra Coal Measures.

Based on the information collected, the superficial water elevations are between 0 and 25 metres below the ground surface, with the groundwater closest to the surface in the south-west portion of the subject site. Groundwater flow was determined to be generally westward, with some deviation towards Manjedal Brook in the southern portion of the subject site. It was found that seasonal fluctuations within the superficial formation varied between two and four metres and that these fluctuations were a result of direct rainfall recharge of the aquifer.

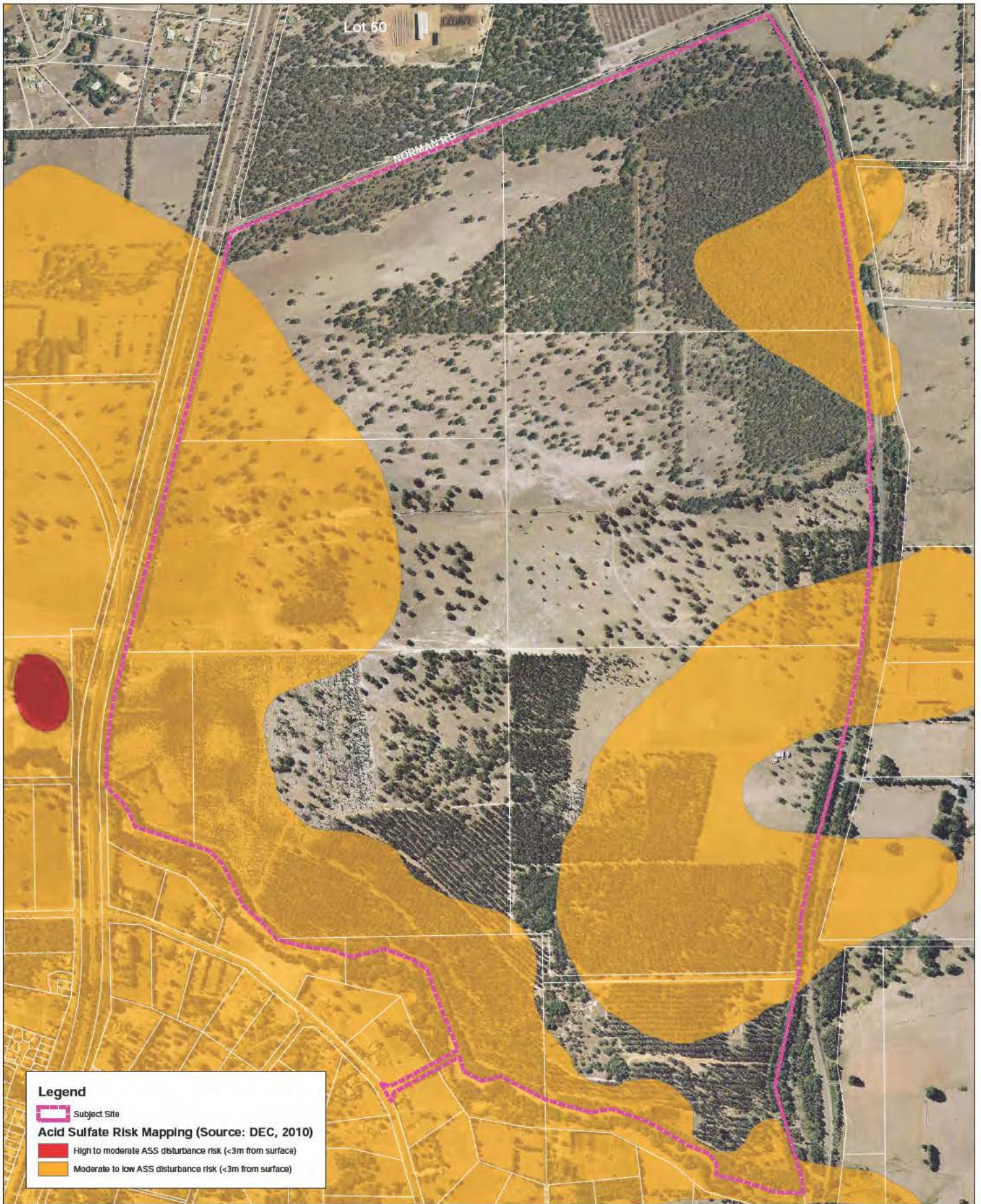


Figure 7: Acid Sulfate Soils

Surface Water

The subject site has three major surface water features, mapped in Figure 9 and outlined below:

- Manjedal Brook is a streamline located outside the subject site, adjacent to the southern boundary. Manjedal Brook has a well defined flow path which is likely to carry surface run-off and have a role in groundwater recharge.
- An unnamed waterway in the central portion of the subject site is a minor ephemeral streamline (“Creek 1”). This water way is less defined than Manjedal Brook, with the primary well-defined portion of the waterway along the eastern boundary of the subject site. The lower reaches of this waterway have been substantially altered, and now reflects an agricultural drain.
- A further unnamed waterway along the northern portion of the subject site, within the bushland in this portion of the site (“Creek 2”). This waterway has a well defined flow path, which like Manjedal Brook is likely to carry surface run-off and have a role in groundwater recharge.

Manjedal Brook and the northern waterway (“Creek 2”) retain ecological functions and biodiversity values, while the central waterway (“Creek 1”) has been significantly altered outside of Bush Forever.

Site 354, and retains little to no ecological values and predominantly provides a hydrological conveyance function through the subject site.



Figure 8: Gully on Site (“Creek 1”)

2.3.4 Biodiversity Assets

Flora and Vegetation

Vegetation complex mapping undertaken by Hedde et. al. (1986), which uses a combination of landform, soil and rainfall parameters, indicates that the subject site is primarily within the Forrestfield Complex with a small portion in the north-west corner within the Guildford Complex. These two complexes are described below:

- Forrestfield Complex – “Vegetation ranges from open forest of *Corymbia calophylla* – *Eucalyptus wandoo* – *Eucalyptus marginata* to open forest of *Eucalyptus marginata* – *Corymbia calophylla* – *Allocasuarina fraseriana* – *Banksia* spp. Fringing woodland of *Eucalyptus rudis* in the gullies that dissect this landform”.
- Guildford Complex – “a mixture of open forest to tall open forest of *Corymbia calophylla* – *Eucalyptus wandoo* – *Eucalyptus marginata* and woodland of *Eucalyptus wandoo* (with rare occurrences of *Eucalyptus lane-poolei*). Minor components include *Eucalyptus rudis* and *Melaleuca raphiophylla*”.

A detailed flora and vegetation survey was undertaken by Cardno in accordance with the Environmental Protection Authority’s (EPA’s) Guidance Statement No. 51 Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia (EPA 2004) for the subject site in 2005 and 2009. The most recent included three site visits on 24th April 2009 and again on the 20th and 22nd October 2009 by two experienced botanists to identify the presence of Declared Rare Flora (DRF), Priority Flora (PF) and/or Threatened Ecological Communities (TEC). The 2009 survey also included a survey of the rail reserve adjacent to the western boundary of the subject site.

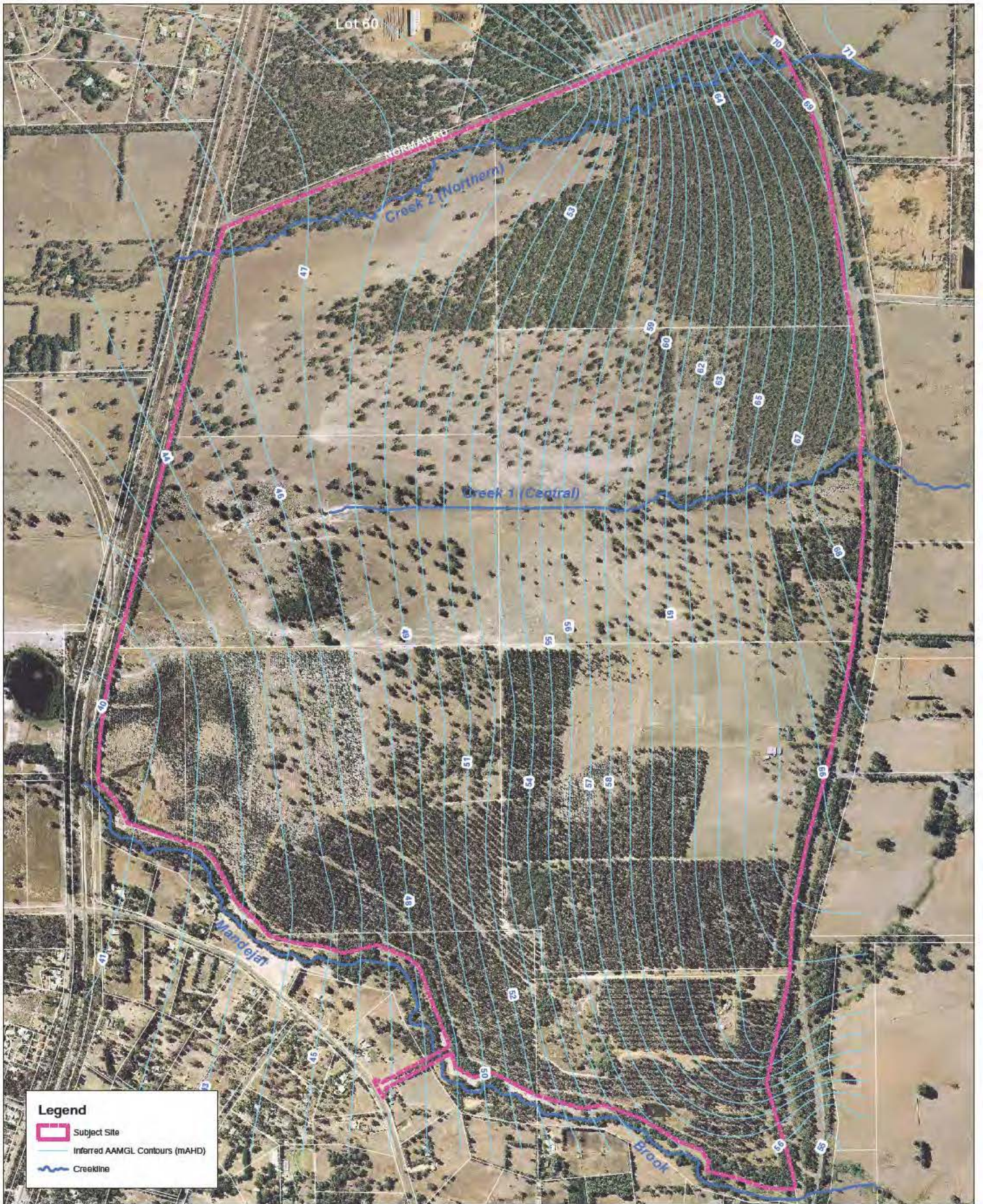


Figure 9: Surface Water Features

0 100 200 400 600 800 1,000 1,200 1,400 Metres



The results of these surveys identified eleven different local plant communities across the subject site. These plant communities are described in the Environmental Assessment and Justification Report (Cardno 2010a).

Significant Flora

Species of flora acquire DRF or PF conservation status where populations are restricted geographically or threatened by local processes.

The most recent survey in October 2009 found that a number of DRF and PF species were found within the subject site. These species were found within the Bush Forever Site in the north of the subject site (354) and in the Bush Forever Site adjacent to the western boundary of the subject site (350), but outside the LSP area.



Figure 10: Bush Forever Site No 354

Threatened Ecological Communities (TECs)

Threatened Ecological Communities (TECs) and Priority Ecological Communities (PECs) are generally described as vegetation communities that are assemblages of species that occur together in a particular type of habitat that is generally restricted by range and/or extent. They are the sum of species within an ecosystem and, as a whole, provide many of the processes which support a specific ecosystem.

Of those plant communities described by Cardno, three are considered to correspond with a floristic community type (FCT) that is listed as a TEC at either the federal or state level, as outlined in the Environmental Assessment and Justification Report (Cardno 2010a). These are restricted to Bush Forever Site 354 in the north of the subject site and Bush Forever 350, adjacent to the western boundary of the subject site. The TECs are:

- FCT 3a - *Corymbia calophylla*- *Kingia australis* woodlands on heavy soils of the Swan Coastal Plain (state and federally listed)
- Potentially FCT 3b - '*Corymbia calophylla* - *Eucalyptus marginata* woodlands on sandy clay soils of the southern Swan Coastal Plain', however was only able to be broadly identified as FCT 3 (state listed)
- FCT 3c - *Corymbia calophylla*-*Xanthorrhoea preissii* woodlands and shrublands, Swan Coastal Plain (state and federally listed)
- FCT 21c - Low lying *Banksia attenuata* woodlands or shrublands (state listed)

Environmental Sensitive Areas (ESAs)

Environmentally Sensitive Areas (ESAs) are areas prescribed under the Environmental Protection (Clearing of Native Vegetation) Regulations 2004. These areas have been identified in order to protect the native vegetation values of areas surrounding significant, threatened or scheduled ecosystems or communities.

A search of the Department of Environment and Conservation (DEC) Native Vegetation Mapping database revealed that a third of the subject site is covered by ESAs. The majority of the mapped ESAs within the subject site cover an area that is comprised of cleared paddocks with little to no ecological or biodiversity values. The presence of ESAs relates to a number of TECs and/or DRF that occur within the Bush Forever Sites found within the northern portion of the subject site and adjacent to the western boundary of the subject site.

Significant Natural Areas

The subject site contains Bush Forever Site 354, which is located in the north-eastern portion of the subject site, occupying about one-third of the subject site. Bush Forever 350 (Byford to Serpentine Rail/Road Reserve) occurs adjacent to the subject site, along the western boundary and extends along the railway reserve from Byford to Serpentine. Both these Bush Forever Sites (350 and 354) contain regionally significant vegetation, TECs, DRF and PF.

Bush Forever Site 354 contains remnant vegetation characteristic of the Forrestfield Complex. Approximately 17.5 per cent of the pre-1750 clearing extent of the Forrestfield Vegetation Complex remains, with 1.73 per cent in secure tenure (EPA 2006). The flora and vegetation surveys conducted by Cardno indicate that Bush Forever Site 354 contains FCT 3c, through the central and eastern portion, while FCT 3b - 'Corymbia calophylla - Eucalyptus marginata woodlands on sandy clay soils of the southern Swan Coastal Plain' may be present, however was only able to be broadly identified as FCT 3 due to no strong relationship to any of the three sub-groups being identified (Cardno 2010).

Bush Forever Site 350 contains remnant vegetation characteristic of the Guildford Complex, of which there is only approximately 5 per cent of the pre-1750 clearing extent of the Guildford vegetation complex remaining, with 0.2 per cent remaining in secure tenure (EPA 2006). This Bush Forever Site also contains the FCT 3a, FCT 3c and FCT 21c in the portion adjacent to the subject site.

In addition, two areas of remnant vegetation within the subject site have been identified within the Shire of Serpentine-Jarrahdale Local Biodiversity Strategy as Local Natural Areas (Ironbark Environmental 2009). These are located in the central west and central south-east portion of the subject site and have been identified as the Forrestfield vegetation complex, of which four per cent of the original extent is currently protected within the Shire of Serpentine-Jarrahdale. The vegetation in these areas was described as Open woodland of Eucalyptus marginata subsp. marginata over Xanthorrhoea preissii and Xanthorrhoea gracilis over pasture grasses on flats with grey loamy sands in the Flora and Vegetation Survey Report (Cardno 2010c).

Fauna

A level 1 Fauna Survey was undertaken in April 2010 in accordance with EPA Guidance Statement No. 56 Terrestrial Fauna Surveys in Environmental Impact Assessment in Western Australia to update and supplement a previous fauna survey completed in October 2005 (Harewood 2010). Furthermore, a habitat assessment for Graceful Sun-Moth and a Level 2 Targeted Fauna Survey for Chuditch and Black Cockatoos, were undertaken in accordance with EPA Guidance Statement No. 56 Terrestrial Fauna Surveys in Environmental Impact Assessment in Western Australia.

During the October 2005 and April 2010 fauna surveys 65 species were observed, caught or evidence of their presence was identified during the 59 survey hours completed for the subject site. Of these species observed, five are considered to hold conservation significance which are listed below:

- Carnaby's Black Cockatoo (federal and state);
- Forest Red-tailed Black Cockatoo (federal and state);
- Baudin's Black Cockatoo (federal and state);
- Rainbow Bee Eater (migratory - federal and state); and
- Southern Brown Bandicoot (state).

The fauna investigations conducted for the subject site found that the majority of valuable fauna habitat is located within the Bush Forever Site 354, which will be retained in accordance with the negotiated planning solution outcome. The paddock trees located throughout the remainder of subject site provide potential foraging and breeding habitat for the three black cockatoo species. This is further considered in Section 4.3 of this report and the Environmental Assessment and Justification Report (Cardno 2010a).

2.3.5 Wetlands

The DEC maintains the Geomorphic Wetlands of the Swan Coastal Plain database which identifies wetland areas and categorises individual wetlands into specific management categories. A review of the dataset indicates that two wetlands occur within the subject site. These are described below in Table 2.

Table 2: Wetland areas present within subject site

Unique Feature Identifier Number	Wetland Type	Management Category
15591	Palusplain	Multiple Use
15014	Sumpland	Multiple Use

In addition to the wetlands mapped within the subject site, four Conservation Category Wetlands (CCWs) number of wetlands are mapped adjacent to the subject site, outside of the subject site boundaries and are listed in Table 3 below. Two are located along the western boundary of the subject site within the rail reserve, and two are located along the southern boundary associated with Manjedal Brook.

Table 3: Wetland areas adjacent to the subject site

Unique Feature Identifier Number	Wetland Type	Management Category
15462	Palusplain	Conservation
15463	Palusplain	Conservation
15445	Palusplain	Conservation
15446	Palusplain	Conservation

The wetlands within and adjacent to the subject site are shown in Figure 12.

2.3.6 Potential Site Contamination

A Preliminary Site Investigation (Cardno 2010d) was undertaken by Cardno to assess the subject site for potential contamination arising from previous land uses that could affect the development of the subject site for residential purposes (Cardno 2010d). The investigation included a desktop review of environmental attributes and historical information, interviews with past and present landowners and a visual site inspection.

A search of the Contaminated Sites Database and Register, which holds information on known, previously or potentially contaminated sites within Western Australia, indicated that the subject site is not listed.

No underground storage tanks (UST) were identified within the subject site, either currently or historically. A number of above ground storage tanks (AST) were identified within the subject site, however these were only present within the vicinity of the residences on Lot 23, 24 and 302. A water tank, containing water was observed on Lot 27.

Information obtained during the site visit and desktop investigation indicated that a number of potential risk areas for contamination occur within the subject site. These are predominantly associated with existing residences and working sheds, particularly through the central portion of the subject site. Any potential soil contamination impacts are expected to be minor and localised and associated with the activities described above.

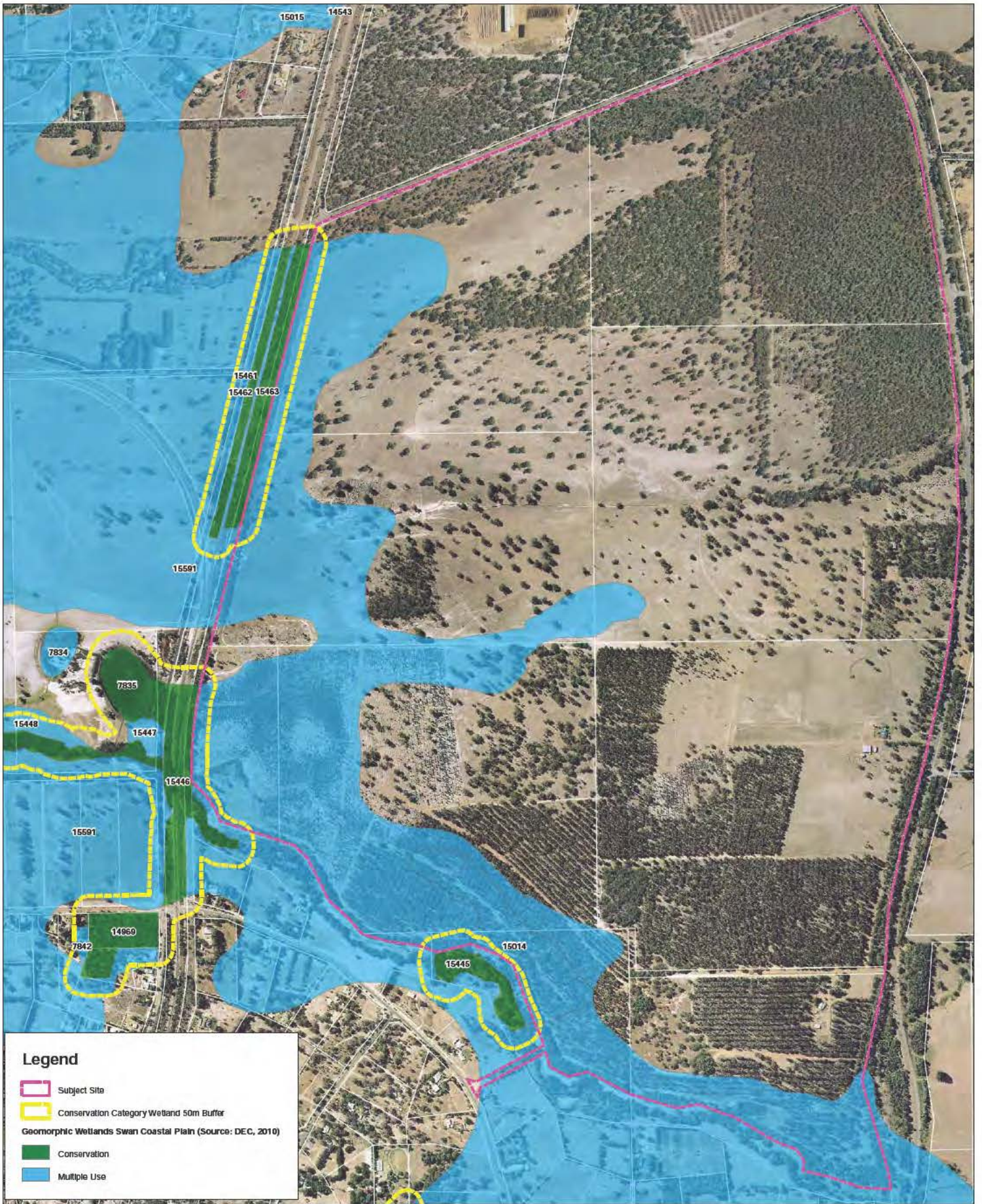
2.3.7 Visual Amenity and View Corridors

The Shire of Serpentine-Jarrahdale encompasses a broad variety of landscapes, from the Darling Plateau, to the Darling Scarp and the Swan Coastal Plain, from natural, rural/agricultural and townscapes.

The subject site is found generally on the foothills of the Darling Scarp and the eastern most portion of the Swan Coastal Plain. Elevation is highest along the central eastern boundary adjacent to the South Western Highway and lowest along the western boundary adjacent to the rail line, and is gently sloping to the west. It is characterised by cleared paddocks, interspaced with trees of differing sizes and species. In the southern portion of the subject site, the area is dominated by a Blue Gum plantation which has regularly spaced tree lines, and the size of the plantation has expanded and retracted over time in



Figure 11: View across the site, looking east towards Darling Scarp



line with the growth cycle of the Blue Gums. The northern portion of the subject site is dominated by a large uncleared reserve (Bush Forever Site 354), containing an incised creekline adjacent to the northern boundary of the subject site and an incised creekline in the central portion of the subject site.

The key locations from which views of the subject site and the landscape it supports can be gained are from South Western Highway, Soldiers Road and Norman Road.

In general, the gentle undulating nature of the subject site and presence of vegetation along all boundaries of the property means the subject site is not directly viewed until well within the boundaries of the subject site.

2.3.8 Heritage

Indigenous

An online search for relevant Aboriginal heritage information was undertaken using the Department of Indigenous Affairs (DIA) Aboriginal Inquiry System that incorporates both the heritage site register and the heritage survey database (DIA 2009). The Aboriginal Heritage Site Register is maintained pursuant to Section 38 of the Aboriginal Heritage Act 1972 (AHA) and contains information on over 22,000 listed Aboriginal sites throughout Western Australia (DIA 2008).

The subject site contains no registered Aboriginal Heritage sites. Historically an ethnographic and archaeological survey was completed for the subject site, as a part of investigations for the South-East Corridor Structure Plan in 1995 (DIA 2010). This investigation was undertaken to support the urban development of the Mundijong and Byford areas and included consultation and field and desktop investigations, with the data collected considered as having good spatial accuracy (DIA 2010).

Non-indigenous

In order to determine the actual or potential presence of places or features of non-indigenous heritage significance within the subject site, a review of readily available information at a federal, state and local government level was undertaken to determine if there were any of the following within the subject site:

- World Heritage List;
- National Heritage List;
- Commonwealth Heritage List;
- Register of the National Estate; and
- State Register of Heritage Places
- Sites listed in the Shire of Serpentine-Jarrahdale Municipal Heritage Inventory List

Investigations involved searches of online databases and revealed that there were no listed heritage places within the subject site. One heritage site is listed directly to the south of the subject site, Whitby Falls Coach House.

3.0 EXISTING STATUTORY PLANNING FRAMEWORK

3.1 Metropolitan Region Scheme

The site is partly zoned 'Urban' and partly zoned 'Urban Deferred' under the Metropolitan Region Scheme (MRS). Bush Forever (BF) site 354 is located in the northern portion of the LSP area. This area is reserved under the MRS for Parks and Recreation. At a future date the 'Urban Deferred' area will also be Reserved as Parks and Recreation as it also forms part of BF site 354 and reflects the outcome of the negotiated planning solution reached in 2006 as shown in Figure 13.

3.2 Shire of Serpentine Jarrahdale Town Planning Scheme No. 2

The site is zoned 'Urban Development' and 'Rural' under the Shire of Serpentine Jarrahdale Town Planning Scheme No. 2 (TPS 2), The Rural zoned land reflects the Urban Deferred land in the MRS which will ultimately be reserved for Parks and Recreation under the MRS. Refer to Figure 14.

TPS 2 states that:

The purpose of the Urban Development zone is to provide for the orderly planning of large areas of land in a locally integrated manner and within a regional context, whilst retaining flexibility to review planning with changing circumstances.

Pursuant to clause 5.18 and Appendix 15 of TPS 2, a local structure plan for the whole or part of a precinct within the Whitby Development Area is required to be prepared, advertised and adopted by the Shire and the WAPC prior to the subdivision of the land. The Whitby LSP forms the whole of Whitby Development Area and Precinct A of the Mundijong-Whitby DSP.

A local structure plan is required to comply with the relevant provisions of the DSP, which are discussed below. The zones proposed in the LSP have been designed to align with existing zones under TPS 2, where appropriate. This includes the zones recently added to TPS 2 on the gazettal of Town Planning Scheme Amendment No 171.

3.3 State Strategies & Policies

3.3.1 State Sustainability Strategy

The State Sustainability Strategy provides an overarching framework for the State Government to respond to the sustainability agenda. The Strategy identifies the following six broad goals and a further 42 strategy areas intended to fulfil these goals and to guide Government action towards achieving its vision for a sustainable Western Australia:

- Sustainability and governance
- Contributing to global sustainability
- Sustainable natural resource management
- Sustainability and settlements
- Sustainability and community
- Sustainability and business

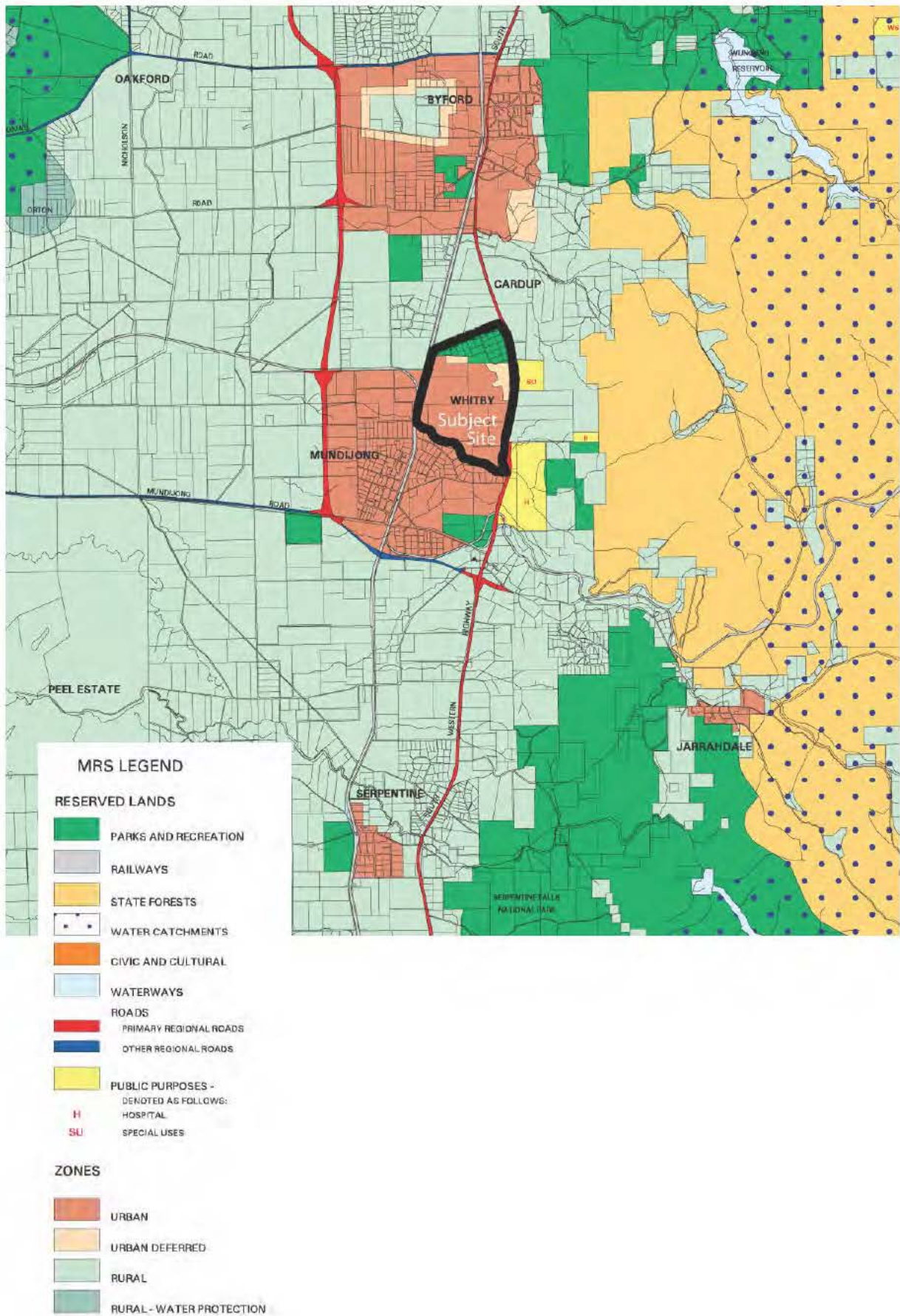


Figure 13: Metropolitan Region Scheme Zoning

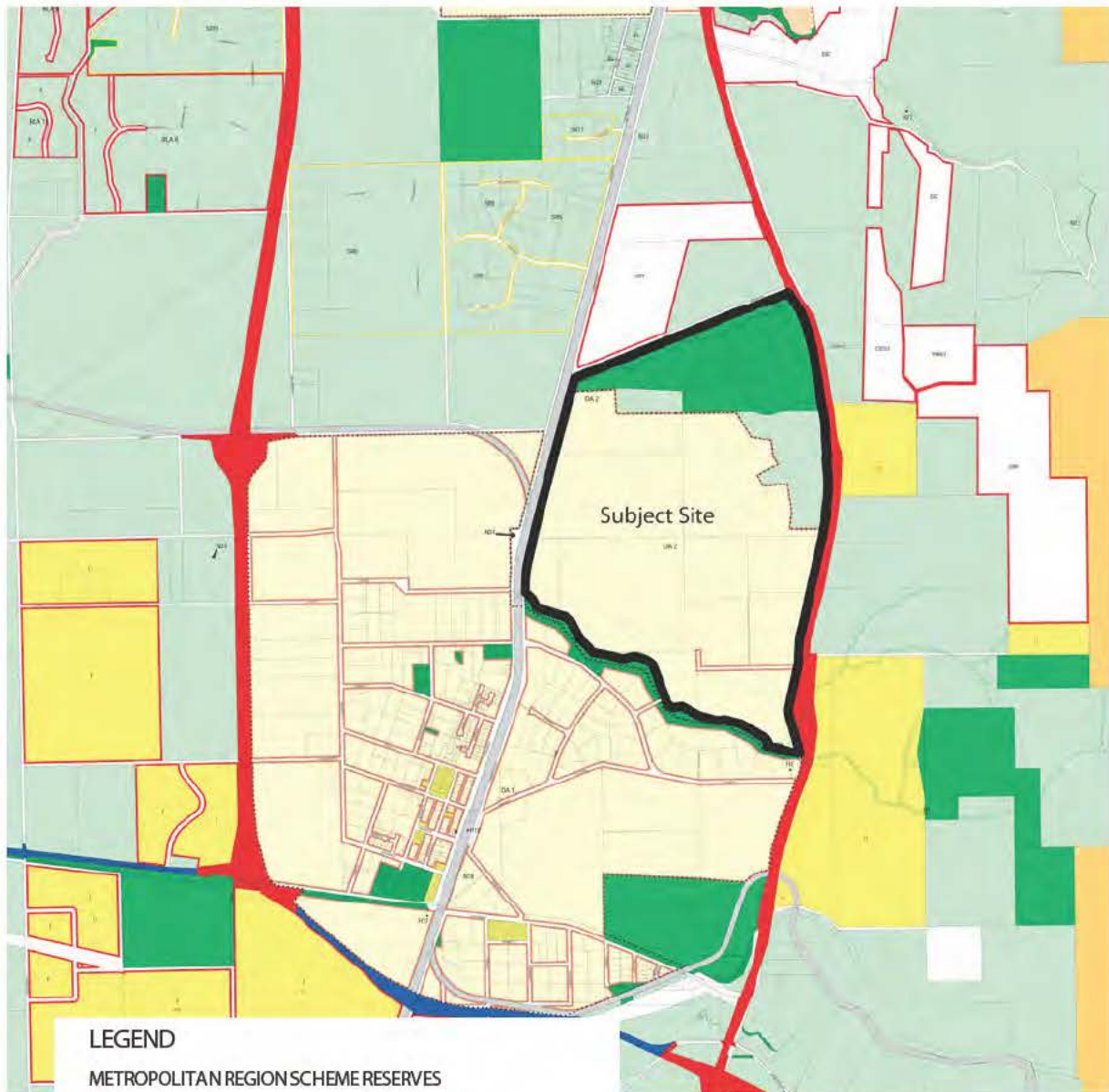


Figure 14: Town Planning Scheme Zoning

The policy objectives of the State Sustainability Strategy are incorporated into the planning system through State and Local Government policy and formally applied through planning decisions. The role of sustainability – economic, environmental and social – is fundamental to the planning for Whitby and is intrinsically embodied in the content of this Local Structure Plan.

3.3.2 State Planning Strategy

The State Planning Strategy (1997) was prepared by the WAPC as a whole of Government approach to guide sustainable land use planning throughout the State until 2029.

The Strategy is aimed at developing a land use planning system to help the State achieve a number of key goals. These include generating wealth, conserving and enhancing the environment and building vibrant and safe communities for the enjoyment of this and subsequent generations of Western Australians. The Strategy was last audited in 2000-2001.

The Local Structure Plan for Whitby is consistent with the goals and objectives of the State Planning Strategy.

3.3.3 Directions 2031 and Beyond – Spatial Framework for Perth

Directions 2031 and Beyond – Spatial Framework for Perth is the State Government’s primary planning strategy providing spatial and policy guidance on the location and quality of urban growth, commercial / activity centres, transport systems, infrastructure and environmental quality in the face of continued population growth.

The vision for the Perth and Peel regions is to live in a world class liveable city that is green, vibrant, more compact and accessible, with unique sense of place.

The framework identifies five strategic themes to help shape future growth – a liveable city, a prosperous city, an accessible city, a sustainable city, a responsible city.

Under the connected city scenario it is estimated that by 2031 the population of the South East Metropolitan sub region will have grown to 228,000, representing a 34% increase on current population levels. Based on this growth estimate the area will need to accommodate an additional 35,000 dwellings. The document recognises the future urban development of the Mundijong Whitby area. Reference is made to a future district centre in the Mundijong area and that the extension of the Armadale passenger rail service may be considered in order to support growth in Mundijong.

A 500 ha area of Mundijong immediately west of the Tonkin Highway reservation has been identified for possible future industrial development or intermodal freight terminal. This land is considered strategically important to support the future growth of the Byford and Mundijong areas.

3.3.4 Liveable Neighbourhoods

Liveable Neighbourhoods Edition 3 (LN 3) was prepared by the WAPC to implement the objectives of the State Planning Strategy. As an operational policy of the WAPC, LN 3 guides the design and assessment of structure plans (regional, district and local), subdivision and development for new urban areas. Its aims include promoting:

- the design of walkable neighbourhoods;
- places that offer community and a sense of place;
- mixed uses and active streets;
- accessible and sustainable parks;
- energy efficient design; and
- a variety of lot sizes and housing types.

The key initiatives of LN 3 are covered under eight design elements:

- Community Design
- Movement Network
- Lot Layout
- Public Parkland
- Urban Water Management
- Utilities
- Activity Centres and Employment
- Schools

The implementation of each of these elements and the fulfilment of the overall principles of LN 3 will be fundamental to ensuring that development of Whitby and the wider metropolitan region occurs in a thoughtful and sustainable manner. Application of the LN principles is therefore relevant to all levels of planning for Whitby, from local structure planning through to detailed lot and building design.

3.3.5 South-East Corridor Structure Plan (South of Armadale)

The South-East Corridor Structure Plan for the area south of Armadale was released in 1996 to ensure a comprehensive approach to planning and development in the southern part of the South-East Corridor and to guide more detailed local planning for the area. The plan identified the Mundijong Whitby area as future urban, and provided the basis for the land being zoned 'Urban' in the MRS.

3.3.6 State Planning Policy 2.1: Peel-Harvey Coastal Plain Catchment Policy

This policy specifies requirements in terms of sewer connection, drainage and retention of vegetation, which are required to be incorporated in the Town Planning Scheme.

3.3.7 State Planning Policy 2.9: Water Resources, and Better Urban Water Management Framework

Implementation of State Planning Policy 2.9: Water Resources is a requirement of the State Water Strategy for Western Australia. The Better Urban Water Management Framework provides guidance on the implementation. The Framework is designed to facilitate better management and use of urban water resources by ensuring an appropriate level of consideration is given to the total water cycle at each stage of planning in land development. The document intends to assist regional, district and local land use planning, as well as subdivision and development phases of the planning process.

3.3.8 State Planning Policy 3.0: Urban Growth and Settlement

The key objective of State Planning Policy 3 “Urban Growth and Settlement” is to facilitate sustainable patterns of urban growth and settlements with a focus on:

- the need to build on existing communities and their associated services and infrastructure;
- to provide for a wide variety of housing, employment, recreation facilities and open space;
- to ensure developments respond to climate, environment, heritage and community values and constraints;
- to promote a reduction in energy, water and travel demand and provides choice and availability of housing in all new developments; and
- to ensure the efficient, economic and timely provision of infrastructure and services.

The LSP has been configured to respond to each of the above.

3.3.9 State Planning Policy 3.1: Residential Design Codes

SPP3.1 provides local governments, the community and the development industry with a comprehensive tool for the control of the built form and density of residential development throughout Western Australia.

The Residential Design Codes are intended to cover all requirements for planning control purposes and to minimise the need for Shires to introduce separate planning policies or variations to these matters. SPP3.1 has been in place since the 1980’s with a number of revisions having been undertaken, the most recent being in 2009.

The LSP will identify residential density ranges in order to meet policy requirements.

3.3.10 State Planning Policy 4.2: Activity Centres for Perth and Peel

The purpose of Activity Centres Policy is to provide a broad regional planning framework to co-ordinate the location and development of retail and commercial activities in the metropolitan region. It is mainly concerned with the location, distribution, land use mix, diversity and intensity of activity, and broad design criteria for the development of a hierarchical network of activity centres at the regional and district level. The policy identifies Mundijong as an emerging District Centre. The provisions of this policy are reflected in the LSP.

3.3.11 State Planning Policy 5.4: Road and Rail Transport Noise and Freight Considerations in Land Use Planning

This policy aims to minimise the adverse impacts of transport noise, without placing undue restrictions on residential development. The policy establishes acceptable criteria for noise levels and identifies mitigation measures. The LSP has been designed having regard to these criteria in order to minimise potential exposure to transport noise.

3.4 Shire of Serpentine Jarrahdale Strategies & Policies

3.4.1 Mundijong Whitby District Structure Plan

The subject site forms the Precinct A area of the Mundijong Whitby District Structure Plan. The DSP was prepared by the Shire of Serpentine Jarrahdale to provide overall guidance to the structure, vision and objectives identified for the area. The DSP is designed to establish the overall development theme and address major district wide issues in order to facilitate efficient and coordinated development in a manner that delivers the objectives and vision identified. The DSP was adopted by the Shire subject to modifications in October 2010.

The Vision for the DSP is “A contemporary, connected place reflecting the community’s rural character, green values and vibrant village feel.”

Nine objectives were identified in the DSP comprising:

- i. Biodiversity: Protect and enhance significant natural areas and their buffers;
- ii. Landscape protection: Preserve the existing rural, leafy green character of the structure plan area;
- iii. Water Resources: Protect and enhance wetlands, waterways and catchments through appropriate management;
- iv. Water Resources: Maximise the efficient use and reuse of water by conserving water;
- v. Urban Form: Create a distinctive and responsive built form that enhances the sense of place, community identity and character;
- vi. Movement Networks: Reduce reliance on vehicles by creating a pedestrian-oriented community and alternative modes of transport;
- vii. Climate Responsive Design: Reduce consumption of non-renewable resources;
- viii. Economic Prosperity: Create a strong local employment base; and
- ix. Community Wellbeing: Create a vibrant and attractive place that offers a range of lifestyle choices and a liveable environment.

The DSP has been adopted by the Shire, and endorsed by the WAPC. The DSP identifies the following key components for the Whitby precinct:

- Residential development over the majority of the urban portion of the site.
- A district scale centre in the western portion of the precinct adjacent to the rail corridor.
- Two urban rail extension options.
- Two Multiple Use corridors reflecting the existing Manjedal Brook and an existing drainage line.
- Two primary schools and one high school.
- A potential future TAFE site located adjacent to the district centre.
- District roads providing for north-south and east-west movement across the precinct.
- One access point across the existing rail corridor connecting Precinct A with Precinct G; one

- access point across the Manjedal Brook; two access points to South West Highway and one access point to the north to connect with Norman Road and the future Cardup Industrial area.
- Reflection of the exiting Parks and Recreation reserve and Bush Forever site 354.

3.4.2 Development Contributions

Clause 5.19 of TPS 2 and the DSP provide for the preparation of a Development Contribution Plan for the DSP area. Such a plan typically includes cost sharing arrangements for district level infrastructure such as arterial roads, public open space and associated facilities, including administration costs.

The Shire plans to prepare two Development Contribution Plans (DCPs) for the DSP, one will cover conventional development infrastructure and one will cover community infrastructure identified in the Shire's recently adopted Community Facilities and Services Plan. These DCPs are yet to be prepared and formally implemented. Once finalised, the DCPs are expected to be implemented by way of an Amendment to TPS 2. In the absence of an endorsed DCP, clause 5.19.1.5 of TPS 2 provides for the Shire to reach negotiated agreements with developers in respect to contributions as part of the local structure planning process.

3.4.3 Local Planning Policies and Strategies

The following local planning policies (identified in the DSP) have been adopted by the Shire and are required to be considered in the proposed Local Structure Plan for Precinct A - Whitby.

Local Planning Policy No.6: Water Sensitive Design

Local Planning Policy No.6 is intended to assist in enhancing the beneficial uses of all watercourses and wetlands in the Shire. The key objectives of LPP No 6 are to assist the Shire's consideration of structure plans and guide the Shire's advice to the Western Australian Planning Commission regarding fulfilment of subdivision conditions.

Local Planning Policy No.8: Landscape Protection

Local Planning Policy No.8 targets areas of high landscape value and aims to maintain the integrity of significant landscape areas and features. A small portion of the north eastern corner of the DSP Area is designated as Landscape Protection.

The continued relevance of LPP No 8 on urban zoned land has been questioned as part of the DSP process.

Local Planning Policy No.9: Multiple Use Trails

Local Planning Policy No.9 aims to conserve and expand upon the numerous multiple use trails through the Shire area, including those located within the Mundijong/Whitby DSP area.

The continued relevance of LPP No 9 on urban zoned land has been questioned as part of the DSP process.

Local Planning Policy No.22: Water Sensitive Urban Design

Local Planning Policy No.22 is intended to aid in achieving total water cycle management outcomes consistent with State Planning Policy 2.9: Water Resources. LPP No 22 applies to the planning and development approvals process to achieve land and water planning consistent with the intended outcomes for the Peel-Harvey catchment and to ensure that land use planning decisions are compatible.

Local Planning Policy No.26: Biodiversity Planning

Local Planning Policy No.26 seeks to recognise biodiversity conservation as a relevant planning consideration in statutory decision making while also identifying and protecting natural areas and valuable ecosystems in the Shire.

Local Planning Policy No.29: Mundijong/Whitby Planning Framework

Local Planning Policy No.29 seeks to guide the orderly and proper planning of the Mundijong/Whitby Urban Development Area. LPP No 29 outlines the requirements for preparing District and Local Structure Plans for the Development Area and what specific information is to be addressed.

Local Planning Policy No.30: Mineral Sands Extraction

Local Planning Policy No. 30 seeks to establish a framework for the consideration of proposals to extract mineral sand resources within the Shire. Mineral sand resources are located within the Mundijong-Whitby District Structure Plan. LPP No 30 assumes a general presumption against the extraction of mineral sands resources unless a proposal can demonstrate that there would be net social, environmental and economic benefits.

Local Planning Policy No 63: Draft Integrated Landuse and Transport Planning Policy

Local Planning Policy No 63, currently a draft policy, aims to ensure transport considerations are sufficiently accounted for integrated into land use planning. Based on regional traffic modelling, any new development should indicate how it will achieve a modal split of 28% non-motorised trips.

Shire of Serpentine-Jarrahdale Activity Centres Strategy - Draft Employment Framework

The Draft Employment Framework is one of five key documents that when combined will provide the basis for the Shire's final Activity Centre Strategy. The Employment Framework study objectives were to develop an employment framework that will guide and encourage employment generation within the Activity Centre, set employment targets and develop a framework for the Shire in evaluating Structure Plans and Subdivision Applications.

Serpentine-Jarrahdale Shire Community Facilities & Services Plan

The Serpentine-Jarrahdale Shire Community Facilities & Services Plan 2020 was prepared by CCS Strategic Management in association with Geografia in July 2008 with a goal to provide more in-depth discussion of the needs, outcomes and strategies that face the Shire. The document includes an outline of various growth scenarios, services demands and needs, implementation strategies and cost recovery mechanisms.

Notably it provides a comprehensive overview of the Mundijong/Whitby/Mardella area and details the current supply shortages of services, as well as solutions for providing those services in high demand.

4.0 ENVIRONMENTAL CONSIDERATIONS

The environmental values and attributes associated with the subject site, as discussed in section 2.0, have been considered both spatially within the LSP and in terms of required future management requirements, which are outlined below and in detail in the Environmental Assessment and Justification Report (Cardno 2010a).

4.1 Landform and Topography

Consideration of the landform and topography within the subject site has been provided through a variety of mechanisms, including:

- The placement of lots of differing sizes across the subject site, particularly in those areas where incline is greatest to provide flexibility with building envelopes and orientation;
- Aligning the roads and servicing corridors to minimise cut and fill; and
- Placement of public open space to accommodate different landform and topographic features.

4.2 Acid Sulfate Soils (ASS)

The results of the preliminary ASS investigation indicate that ASS are not likely to be present within the subject site, and if present are likely to be restricted predominantly in both extent and severity to the south-west corner of the subject site, where soil and groundwater conditions indicate ASS may be present below three metres. If any ASS is present, they are unlikely to be impacted by shallow site works (less than three metres below ground surface).

An Acid Sulfate Soil Management Framework has been provided in the Preliminary Acid Sulfate Soil Assessment and Management Strategy (Cardno 2010b), which is an appendix to the Environmental Assessment and Justification Report (Cardno 2010a).

4.3 Biodiversity Assets

Flora and vegetation

Bush Forever Site 354 contains the majority of the flora and vegetation values outlined in section 2.3.4 and the Environmental Assessment and Justification Report (Cardno 2010a). This area has been fully retained within the LSP, in keeping with the Negotiated Planning Solution (NPS) reached in 2006. A planned interface between the development and Bush Forever Site 354 has been provided to reduce the potential for impacts on the vegetation. This will be best treated through the following:

- A hard interface, in the form of a neighbourhood connector road. The road will be aligned within a wider road reserve to allow the road to meander amongst the trees, to retain these trees as well as provide an adequate separation distance.
- Stormwater management and drainage within the subject site draining away from the Bush Forever Site, towards the south and west of the subject site and has been accommodated through the placement of roads and public open space.
- Adequate separation between the vegetation and development has been provided in line with 'Planning for Bush Fire Protection Guidelines Edition 2' (WAPC 2010), in order to address potential bush fire risk.

As a part of subdivision and detailed development the following will be provided, as a part of implementing the principles outlined in the Integrated Landscape Management Strategy (Cardno and Emerge 2010):

- Dual use footpath to encourage people to walk on the pathway, reducing potential impacts on the vegetation as well as encourage a connection between the community with the natural assets of the subject site and surrounding area.
- Permeable fencing to control access and still enable passive surveillance of the Bush Forever Site.

This is further discussed in the Integrated Landscape Management Strategy (Cardno and Emerge 2010).

Significant Natural Areas

As mentioned above, Bush Forever Site 354 has been fully retained in line with a NPS, with a hard interface in the form of a road provided to reduce potential impacts from development

Furthermore, the two areas of remnant vegetation within the subject site, which were identified in the Shire of Serpentine-Jarrahdale Local Biodiversity Strategy as Local Natural Areas have been retained. The vegetation in these two locations were described as being in a 'Degraded' condition in the Flora and Vegetation Survey Report (Cardno 2010c), however the design of the Local Structure Plan has provided for the majority of these two areas to be retained through the strategic placement of Public Open Space (POS). These two areas will be managed in accordance with the Integrated Landscape Management Strategy (Cardno and Emerge 2010).



Figure 15: Locally Significant Vegetation near proposed District Centre

Fauna

The majority of the fauna values for threatened and non-threatened fauna species have been protected through the retention of Bush Forever Site 354 in the northern portion of the subject site. In addition, large trees will be retained wherever possible within the development area as subdivision proceeds.

Linkages between the primary areas of habitat have been provided by the strategic location of public open space throughout the development and retention of existing habitat areas, linking the Bush Forever Sites with each other and also with Manjedal Brook. In addition, landscaping to be undertaken within the subject site as development proceeds will further link the different POS and natural areas.

Within the LSP area, Cardno and the project team have undertaken a number of technical investigations to understand and accommodate the potential occurrence and distribution of Matters of National Environmental Significance (MNES) including Black Cockatoo species, as listed under the federal Environmental Protection and Biodiversity Conservation Act 1999 (EPBC Act). The formulation of the LSP, particularly the detailed plan, has been undertaken in such a manner that impacts on MNES (arising from future development consistent with the LSP) can be avoided, minimised and managed to the highest degree possible, and with all core habitat and occurrences of all MNES protected under the LSP.

MNES as defined under the EPBC Act have been comprehensively considered as a part of the formulation of the LSP and are not considered a fundamental or significant constraint to the implementation of the LSP and future development. This is further detailed in the Environmental Assessment and Justification Report (Cardno 2010a) and Integrated Landscape Management Strategy (Cardno and Emerge 2010). The LSP is not binding with regard to the specific form and detailed design of future development. There may be a future requirement for referral under the EPBC Act; however this will be dependent upon the eventual form of development, the extent to which future development is consistent with the LSP and the degree to which trees are able to be retained.

4.4 Watercourses

The northern streamline has been fully retained within the LSP as a part of Bush Forever Site 354.

A central creekline, "Creek 1", is less defined than Manjedal Brook and the northern waterway however the well-defined portion (incised creekline) along the eastern boundary has been fully retained within Bush Forever Site 354 and through the location of POS to incorporate the waterway. Furthermore, a multiple use corridor, in the form of linear POS, has been provided in the areas in which an agricultural drain is present, to retain the conveyancing ability of the waterway, and to also provide for the enhancement of linkages across the subject site. The intended treatment of these areas has been outlined in the Integrated Landscape Management Strategy (Cardno and Emerge 2010).

Manjedal Brook, forming the southern boundary of the subject site will be retained, through the inclusion of a foreshore reserve. The management of the foreshore will be in line with River Restoration Manual (WRC 2002) and more detail is provided in the Integrated Landscape Management Strategy (Cardno and Emerge 2010). The designation of the foreshore reserve has been provided to retain the riparian vegetation and to accommodate the 100 year flood events and required drainage retention basins for these events.

4.5 Wetlands

The Multiple Use Wetlands mapped over the majority of the subject site do not require specific management, as they contain no or few ecological functions and can be managed through water sensitive urban design and the urban water management framework.

A 50 metre buffer has been provided between the Conservation Category Wetlands located adjacent to the western boundary of the subject site, within the rail line reserve, and development. A 50 metre buffer, as a part of the foreshore reserve, is also provided for the Conservation Category Wetland found adjacent to the southern boundary of the subject site. It is intended that these buffers will be managed in accordance with the Integrated Landscape Management Strategy (Cardno and Emerge 2010), with a hard interface in the form of a road and/or dual use path provided between the wetland and development.

4.6 Existing and Surrounding Land Uses

The Perth to Bunbury rail line is located adjacent to the western boundary of the subject site, while South Western Highway is located adjacent to the eastern boundary of the subject site. The potential noise impacts of the rail line and South Western Highway have been considered in the context of the State Planning Policy 5.4 Road and Rail Transport Noise and Freight Considerations in Land Use Planning (WAPC, 2009b), and through an acoustic assessment undertaken to determine the potential noise impacts from surrounding land uses and mitigation measures, if required (refer Figure 16). This assessment is further discussed in the Environmental Assessment and Justification Report (Cardno 2010a). The outcomes of this assessment show that through a variety of planning and mitigation measures, noise impacts can be adequately managed. These measures include:

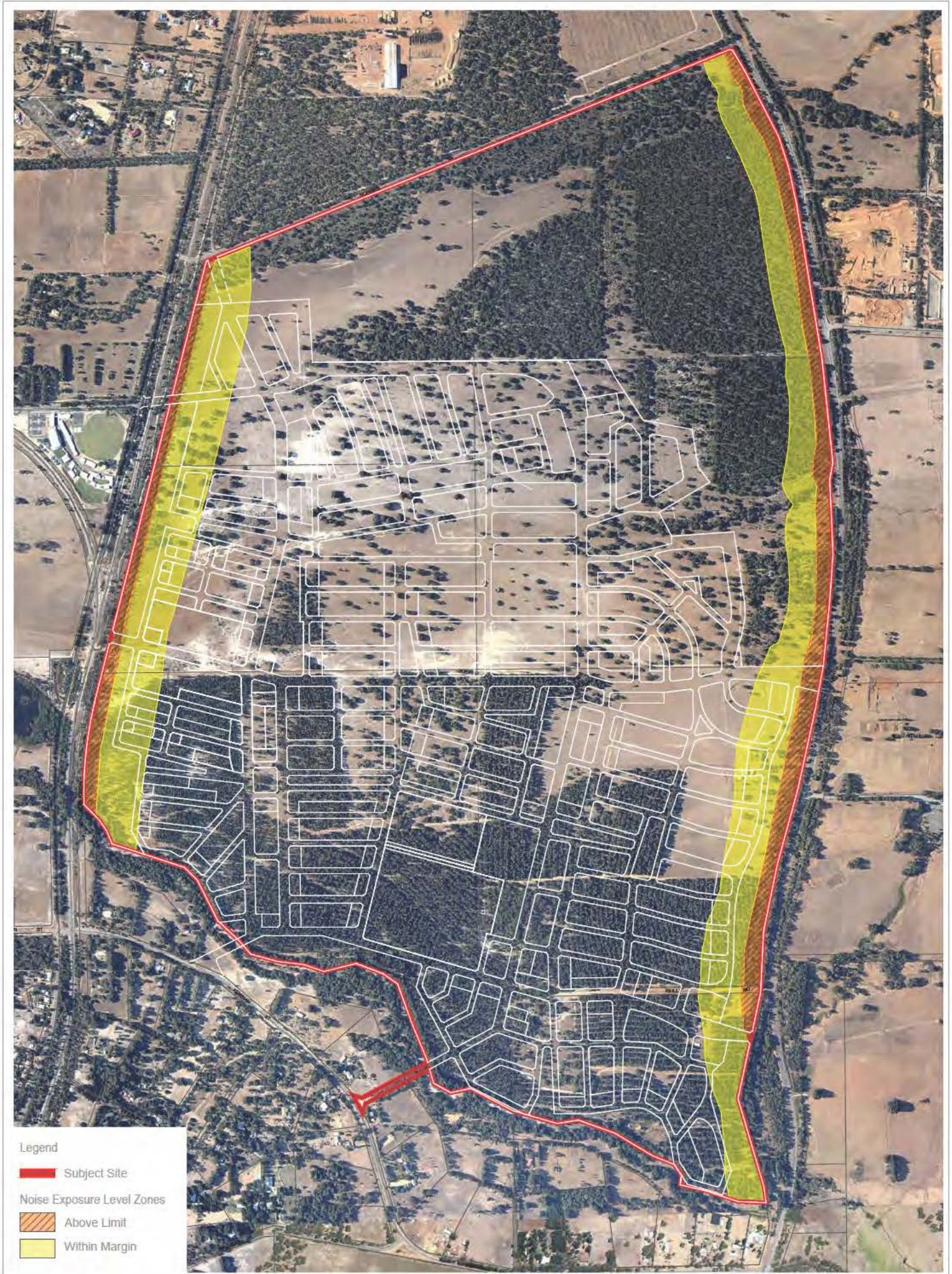
- Providing separation in the form of larger lots along the eastern boundary of the subject site and through the strategic placement of public open space along the western and south-western boundary;
- The provision of a bund and/or acoustic fence where necessary;
- A 50 metre buffer associated with the conservation category wetlands, with a hard-road interface to increase separation between development and the rail line;
- Mixed land uses and higher density type development within the district centre, to provide separation between residential development and the noise source; and
- Quiet house design where necessary.

As mentioned in the Section 2 above and the Environmental Assessment and Justification Report (Cardno 2010a), a number of other land uses are adjacent to the northern and eastern boundary of the subject site and these include:

- South Cardup Landfill;
- Motor Cross Park
- Hanson Hardrock quarry;
- WA Blue Metal Hard Rock Quarry; and
- Timber Treatment Facility

Guidance for the Assessment of Environmental Factors Separation Distances between Industrial and Sensitive Land Uses No. 3 (EPA 2005) provides recommended generic separation distances between sensitive land uses (such as residential development, schools, hospitals, motels etc.) and a number of different industrial land uses, in order to avoid potential conflicts between these land uses. These separation distances tend to be conservative, in order to accommodate variability between areas and the intensity of land uses.

The retention of Bush Forever Site 354 within the Local Structure Plan and the location of larger lots along the eastern boundary of the subject site have adequately accommodated the required and recommended separation distances for these land uses.



4.7 Visual Amenity and View Corridors

The visual amenity and view corridors within the subject site have been considered in the context of the current landscape within the Mundijong town centre, but also in consideration of the future District Structure Plan area and proposed land uses. As discussed in section 2.3.7, the main view corridors within the subject site are along “Creek 1”, or through the areas in which vegetation is no longer present along South Western Highway and Soldiers Road. These view corridors will be maintained, and are likely to be enhanced through:

- The retention Bush Forever Site 354 and the planted and remnant vegetation present along the boundaries of the subject site, maintaining the current natural ‘leafy green’ viewscape.
- Strategic retention of Blue Gum stands throughout the southern portion of the subject site; and
- The creation of a corridor of public open space in line with “Creek 1”, providing a viewscape of open spaces, residential dwellings, and in the foreground either the Darling Scarp (when looking east) or agricultural and residential land (when looking west).

This is further discussed in the Environmental Assessment and Justification Report (Cardno 2010a).

4.8 Urban Water Management

4.8.1 District Water Management Strategy

The Mundijong-Whitby District Water Management Strategy (DWMS) was prepared on behalf of the Shire by GHD in 2010. The DWMS was prepared to provide guidance to the overall approach for water management within the district structure planning area. The DWMS aimed to:

- Define land area requirements for conveyance of flood flows and protection of infrastructure;
- Propose a drainage strategy for local conditions which incorporates WSUD practises that could be implemented;
- Describe criteria for water quantity and water quality;
- Outline the technical framework for the assessments conducted (i.e. hydrology and hydraulics);
- Define an implementation plan for the overall water management strategy; and
- Recommend monitoring programs for pre and post-development scenarios.

The DWMS provided baseline recommendations for the entire district structure planning area, and acknowledges that further site-specific investigations should be undertaken to refine the approaches outlined in the DWMS. The principles and detailed assessments of stormwater runoff conveyance and detention in the DWMS provide key inputs to the development of the LWMS. These have been used to guide the more detailed hydrological and hydraulic assessment of the LSP, and have been considered when developing the proposed approach for managing water within the Whitby LWMS.

4.8.2 Local Water Management Strategy

The LWMS is a key supportive document for the LSP. The development of the LWMS has been undertaken with the intention of providing a structure within which subsequent development can occur consistent with a 'total water cycle management' approach. It is also intended to provide overall guidance to the general stormwater management principles for the area and to guide future Urban Water Management Plans (UWMPs) that will support subdivision approval.

The LWMS for the LSP has been developed to:

- Provide a broad level stormwater management framework to support future urban development;
- Incorporate appropriate best management practices into the drainage systems that address the environmental and stormwater management issues identified;
- Minimise development construction costs, which will help to reduce land costs for future home owners;
- Minimise ongoing operation and maintenance costs for land owners and Shire of Serpentine-Jarrahdale (SSJ);
- Develop a water conservation strategy for the area that will accommodate existing groundwater allocation constraints for the area; and
- Gain support from the Department of Water (DoW) and SSJ for the proposed method to manage stormwater within the Whitby LSP area and potential impacts on downstream areas.

A number of broad level studies that include the LSP area provide a regional environmental context for the LWMS. These have been reviewed in order to provide suitable background information for the Whitby LSP area and provide an indication of the issues requiring further investigation. Further, a number of site-specific investigations into various aspects of the subject site have recently been conducted as a part of the LSP preparation process, and these have all informed the development of the LWMS.

The LWMS has determined appropriate Stormwater Management, Groundwater Management and Water Conservation design criteria based on overarching documents, requirements of the SSJ, DoW and similar developments in the district. The most relevant document is the Mundijong-Whitby DWMS (GHD, 2010) which was approved by DoW in 2010. Other Guidance documents include Better Urban Water Management (WAPC, 2008), and the Stormwater Management Manual for Western Australia (DoW, 2007). The criteria provided in the Mundijong-Whitby DWMS has guided the criteria proposed for the LWMS.

The overall stormwater management approach for the LSP is to maintain the existing (pre-development) hydrology by providing detention storage at a sub-catchment scale throughout the development. This will result in approximately thirty flood storage areas spread across the development, incorporated into POS areas. These are located in a manner which considers the vegetation values of the site and aims to avoid further clearing of native vegetation where ever practical. The LWMS document provides the location and size of all retention and detention storage areas. The flood storage areas will flow to the next downstream sub-catchment, and eventually into either Manjedal Brook or "Creek 1" (which flows through the centre of the site) prior to eventual discharge (combined with upstream flows) beneath the railway and Soldiers Road. Flows within Manjedal Brook and "Creek 1" will be maintained by providing adequate flood corridors, based on flows detailed in the Mundijong-Whitby DWMS.

The environmental values of Manjedal Brook will be maintained by ensuring that no detention storage is located beyond the LSP site boundaries, and by ensuring that no modification to the Brook or immediately adjacent riparian vegetation occurs. Clearance to flood levels within Manjedal Brook will be achieved by localised import of fill upstream (and to the north) of Manjedal Brook.

The values of “Creek 1” are limited to the upstream portion of the site, and this area is not proposed to be developed. The mid and downstream portions of “Creek 1” are extremely degraded, and the flows will be conveyed within POS areas that will also accommodate localised sub-catchment scale detention requirements.

The overall result from the above approaches will be that the predevelopment hydrology leaving the site will be maintained, and the peak flows within the streamlines entering and adjacent to the site will be maintained to those specified in the Mundijong-Whitby DWMS.

The exception to the above approach will be the requirement to retain and treat minor flows up to the 1 year 1 hour Average Recurrence Interval (ARI) at source or as close to source as possible. This will see slightly more runoff retained and infiltrated within the development than currently occurs, but it will facilitate treatment of the majority of storm events. The stormwater treatment areas will be provided within POS areas but prior to and separate from the flood storage (detention) areas.

Stormwater flows will be distributed to retention and detention storage areas via a conventional piped drainage network, designed to accommodate the 5 year ARI storm event. For major stormwater flows greater than the 5 year ARI storm event, stormwater will be conveyed via overland flows within the road reserve.

Demands on potable water will be considered, and criteria to minimise the use of scheme water within the development are proposed in the LWMS. These include:

- Ensure the efficient use of all water resources in newly developing urban form; and
- Consumption target for potable water of 100kL/person/year for residential areas with no more than 60kL/person/year from scheme water supplies.

The preferred strategy to maintain groundwater levels throughout the subject site is through localised recharge from drainage infrastructure that encourages lot scale and localised infiltration. It is not envisaged that groundwater controls will be required to actively lower groundwater. However, some controls may be required to ensure that localised rises do not occur within areas filled above natural surface. As a contingency, criteria for subsoil drains (e.g. clearance to finished floor level) are therefore proposed within the LWMS.

The Whitby LWMS provides a framework that future landowners can follow to assist in establishing stormwater management methods that have been based upon site-specific investigations and are consistent with relevant State and Local Government policies. The responsibility for working within the framework established within the LWMS rests with the individual landowners, although it is anticipated that future UWMPs will be developed in consultation with the SSJ, DoW and in consideration of other relevant policies and documents as well as the LWMS.

4.8.3 Wastewater Re-Use Management Plan

The Department of Water provides a draft approval framework for the use of non-drinking water (NDW). This framework provides a staged approach to the investigation of re-use of NDW to supplement drinking water. Four stages are outlined in the process: option evaluation and concept design; preliminary design; detailed design; and implementation. Progress beyond this first stage is dependent on a number of factors, however as part of the ongoing development over the life of the site, the feasibility of options for NDW will be periodically evaluated.

In consideration of the future potential to implement a recycled water supply across the development (if and when it becomes available), engineering advice is that the Water Corporation has an established alignment for the 'purple pipe' on the 2.1m alignment on the opposite side of the road to water supply, should the service be introduced in the future. Provision can be made within road reserves to ensure this alignment is adequately protected to allow for retrofitting of this infrastructure should it become viable.

5.0 DESIGN CONSIDERATIONS

5.1 Design Background

5.1.1 Whitby Vision

For many years, the local community and the Shire have held a consistent aspiration that urban growth within the Shire ought to reflect a “village feel”, and avoid the characteristics of suburban sprawl. This is an aspiration shared by the proponent.

The formulation of the LSP has paid close consideration to pursuing this objective, both in recognising village or “south west town” attributes in the design of its structure, as well as principles to be acknowledged in the progressive detailing of the plan in subsequent planning stages.

In pursuing this end, the LSP has responded to two overarching objectives:

- the reflection of the pattern of traditional street layouts found in south west towns, and
- the application of a diversity of character elements throughout the plan, informed by the principles of the transect, and evidenced in precedent found in village settlements.

5.1.2 Traditional Layouts

In analysing the traditional layout patterns of south west WA towns, a key characteristic of their design is their consistently regular street grid. Some towns exhibit an unchanging orthogonal grid, whilst other are distorted only by the presence and intersection of major features (such as rail, highway or river), and the occasional response to grade, boundaries by the rotation of grid orientation. The layout patterns in Figure 17 (Margaret River, York and Pinjarra) are typical examples of responsive town grids that have inspired the structuring of the LSP in order to achieve a degree of authenticity in design.

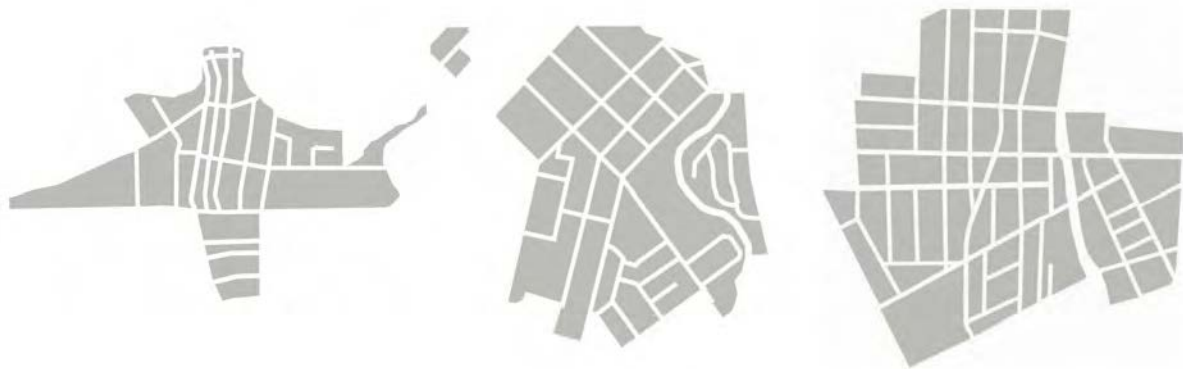


Figure 17: Layout of Traditional South West Towns, (l-r) Margaret River, Pinjarra and York

The overarching design of the LSP echoes the design of traditional towns. It establishes:

- a traditional town centre (District Centre), with minor centres
- a discernable edge to the ‘town’
- the potential for establishing a grid of street blocks, some on rotated axes in response to context,
- a structure of parkways and drainage/waterways dissecting the grid.

5.1.3 The Transect

Previous urban development (in the Shire, and elsewhere in the Metropolitan Area) which has failed to achieve a traditional village character, is often typified by a homogeneity of street, building and public domain types. From a village perspective, the lack of urban diversity is compounded by an absence of tree cover leading to landscapes typified by austere rooflines rather than treelines.

The concept of the Transect presents a method to introduce diversity and suggest village authenticity in urban form.

The Transect is an idea which arises from ecology, especially the notion of a sequence of environments based on their place in the landscape. The concept of the Transect has been applied to planning and design by the late George Seddon, and more recently by Andres Duany. However, instead of mapping the transition of natural environments, the planning transect maps the progression of living environments. The urban Transect acknowledges the progression of 'typologies' starting from wilderness/natural areas and finishing at the town centre. It is fundamentally an 'organising principle', and is a useful tool to assist different parts of villages and towns to achieve a 'sense of place' and authenticity. Aspects of the transect are evident in old Mundijong, as well as other towns in the Shire.

The planning transect, depicted in Figure 18, extends from the natural environment through different human habitats via increasing density and immersive urban character. Like its natural counterparts, the human response to each transect element is internally coherent. For example, streets and landscaping in the "Natural Transect" (or "T1") may be unsealed, unkerbed, paths may be constructed to protect the environment from uncontrolled pedestrian access, and landscaping is essentially selected on purely ecological principles in terms of species and function. The corresponding streets and landscaping in the "Town Centre" ("T5") condition completely favour human requirements; streets are highly engineered, parking is prevalent, footpath design and construction favours pedestrian numbers and the needs for socialisation, and landscaping is selected in terms of its functional capacity to provide, for example, abundant shade and relief for pedestrians. Intervening typologies likewise require intervening qualities of execution.

This method assists to:

- allocate resources logically,
- create legible and safer traffic environments,
- encourage housing diversity,
- foster economic diversity,
- maximise lifestyle opportunities, and
- encourage landscape diversity.

The transect is consistent with, and provides additional organising logic to, the Community Design structuring principles described in Liveable Neighbourhoods, as well as elements dealing with Movement, Open Space, Lot Design and Activity Centres. It is noted however, that many principles of the transect will find their expression in the design at subsequent, detailed levels of planning (e.g., local road designs, lot configurations, materials, engineering standards)



Figure 18: The Transect

5.2 Community Design

The preparation of the Whitby LSP has been undertaken during a time of significant planning review in Western Australia. During the design phase the LSP has been cognisant of the increased design expectations of the WAPC's maturing Liveable Neighbourhoods policy document (LN 3) and more recently the significant strategic changes contained within the WAPC's Directions 2031 and Beyond which provides a strategic blueprint for the future development of Perth.

The essence has been to progress a structure which meets the objectives of LN 3 of developing sustainable communities, where balancing urban and environmental sustainability outcomes have been a primary objective whilst also needing to respond to what is a new paradigm in increased residential densities as proclaimed in Directions 2031.

The need to respond and reflect these aspirations have presented additional challenges within the Whitby context, where the site has a substantial area of Bush Forever, is located on the urban fringe and, whilst recognizing the need to move towards increased densities, this is to be achieved against a local expectation to reflect and retain an element of the rural character in the planning and urban design of the locality.

A sympathetic design approach which acknowledges the site's existing character, overlaid with a traditional design approach to neighbourhood structuring has formed the basis for the preparation of the Whitby LSP.

5.2.1 Sense of Place and Identity

The subject site consists of several key characteristics which differentiates the site from surrounding areas of Mundijong-Whitby and provides the site with its unique identity:

- (i) Approximately 20% of the site comprises high quality and well preserved bushland which has been recognized with the land's inclusion in Bush Forever (site 354);
- (ii) The site has a crossfall of 50 to 60 metres from east to west, providing substantial views both internal to the site and external to the Swan Coastal Plan;
- (iii) There are stands of significant trees throughout the site;
- (iv) Several Conservation Category Wetlands (CCWs) around the perimeter of the site, and;
- (v) The Manjedal Brook flows along the site's southern boundary.

These five key natural elements are both recognized and celebrated in the LSP, ensuring that Whitby will have an identity that differentiates the locality from surrounding development. Four of the seven proposed entry roads to the site leverage off the sites character, providing entrances in each case through areas of natural beauty. Two entries benefit from the amenity of the Bush Forever site in accordance with the DSP and two entries traverse the Manjedal Brook.

These entrances into the site reinforce the authentic sense of place, delivered through both the preservation and celebration of the land's natural character. The entrance roads allow residents to be reminded of the significance of the natural bush and appreciating the benefits of living among these features.

Similarly the retention of significant areas of vegetation within public open space and road reserves, guided by relevant planning considerations and Australian Standard AS4970 (Protection of Trees in Development), the aspect afforded to residents by the terrain and the protection of the natural wetlands consolidates and reinforces a sense of place which derives from the combination of the natural features.

5.2.2 District Structure Plan Planning Principles

The Whitby Mundijong DSP identified planning principles which local structure plans are to take in to consideration in design. The design of the LSP has been based on incorporating these principles where practicable.

In respect of the natural environment, the LSP has been designed to engage with the Bush Forever bushland, protect locally significant vegetation and where possible retain trees throughout the LSP area in the public realm, to reflect the rural character of Mundijong. At the LSP level of planning, the ability to deliver green power initiatives is limited, however energy conservation measures such as passive solar design have been considered in the LSP design. Similarly, provision is being made to manage the water cycle including provision being made to accommodate future infrastructure within road reserves, and the retention where practicable of the natural topography of the land.

Design of the built environment in the LSP will be supplemented where necessary with Detailed Area Plans, Design Guidelines and an Activity Centre Structure Plan to provide detailed design guidance to enhance the character of the proposed development. An Activity Centre Structure Plan will also ensure delivery of a robust district centre which provides for a mix of uses, and an ability to respond to changing demands of the locality as the catchment matures. An interconnected movement network with a well identified neighbourhood structure ensures direct access to a range of facilities and services serving the local and district community. The neighbourhood structure also provides for a range of dwellings and housing choice, while the location of the multiple-use corridors is generally consistent with the DSP.

The LSP is conducive to economic growth, with the District Centre likely to be the focus of economic activity in the DSP area. The robust design ensures the retail element of the centre can be complemented by higher order economic activity as the centre and the area it serves mature. The LSP provides for the efficient delivery of community services and infrastructure, subject to partnership with relevant state and local government authorities. It is anticipated that communications infrastructure will be delivered through other programmes, such as the National Broadband Network, however the LSP will be conducive to the provision of such infrastructure.

In respect of the future community, the design of the LSP, with a range of housing, a focus on walkable neighbourhoods, and an emphasis on the public realm seeks to provide maximum opportunities for community interaction and integration. The public realm is also the medium through which the character of the community will be reflected and reinforced. Promoting activity in public places is also highly conducive to the development of a safe and friendly social environment. The educational facilities proposed can be tailored to specific issues, such as agricultural or environmental activities, subject to the partnership of the Department of Education.

The vision of the LSP cannot become a reality without collaboration with the Shire, working closely with the landowner. The development of the LSP has been based on close collaboration with officers at the Shire and other relevant government agencies, and its effective implementation will similarly rely on the continuation of this partnership. A collaborative approach will result in improved outcomes for landowners, the Shire the locality and the district, ensuring the creation of a vibrant and robust community.

5.2.3 Site Context Analysis – A Design Response

Figure 19 comprises a Site Context Analysis which highlights the site's features and attributes which have been outlined in 5.2.1 above.

The area of vegetation with the most significant environmental value, particularly in terms of fauna habitat and vegetation condition, have been preserved and protected through the retention of the Bush Forever site, whilst significant trees and remnant vegetation have also been incorporated into areas of public open space. The CCWs have also been acknowledged and afforded additional protection through the provision of 50m buffers. Furthermore, in addition to retaining areas of natural vegetation, in the southern areas of the LSP public open space has also been used to retain portions of the blue gum plantation in recognition that the plantation is part of the physical character of the site, provides an immediate maturity to future landscaping and provides an important backdrop and skyline to future residences and neighbourhoods.

The Bush Forever site has been incorporated into the design. Although development will be set back to allow for adequate fire separation and a 'hard' edge interface, local activity nodes will be situated adjacent to the Bush Forever site to focus activity at the interface, and to maximise the amenity derived from the bushland, ensuring it will remain a highly valued community asset.

The Manjedal Brook is also recognized as a key natural feature. Within the site, public open space has been designed to complement the brook. The provision of perimeter roads ensures a 'hard' edge between the Brook and residential development. Similarly, public open space or a road provides an edge to the 50m buffer associated with the CCWs.

A further key element and feature within the site's context is the existing drainage channel and the need to augment this with a means of ensuring an appropriate long term drainage regime. This has been facilitated through the provision of linear open space where the drainage function is accommodated by being integrated into the open space.

Along the site's western boundary is the railway and along the eastern boundary is the South West Highway, both of which require a design response to address noise impacts. In both cases, noise mitigation has comprised separation distances: on the western boundary through the combination of CCW buffers, public open space and road reserves and on the eastern boundary through the provision of additional depth in larger (special residential) lots. The retention of vegetation will also retain rural character of the site from South West Highway.

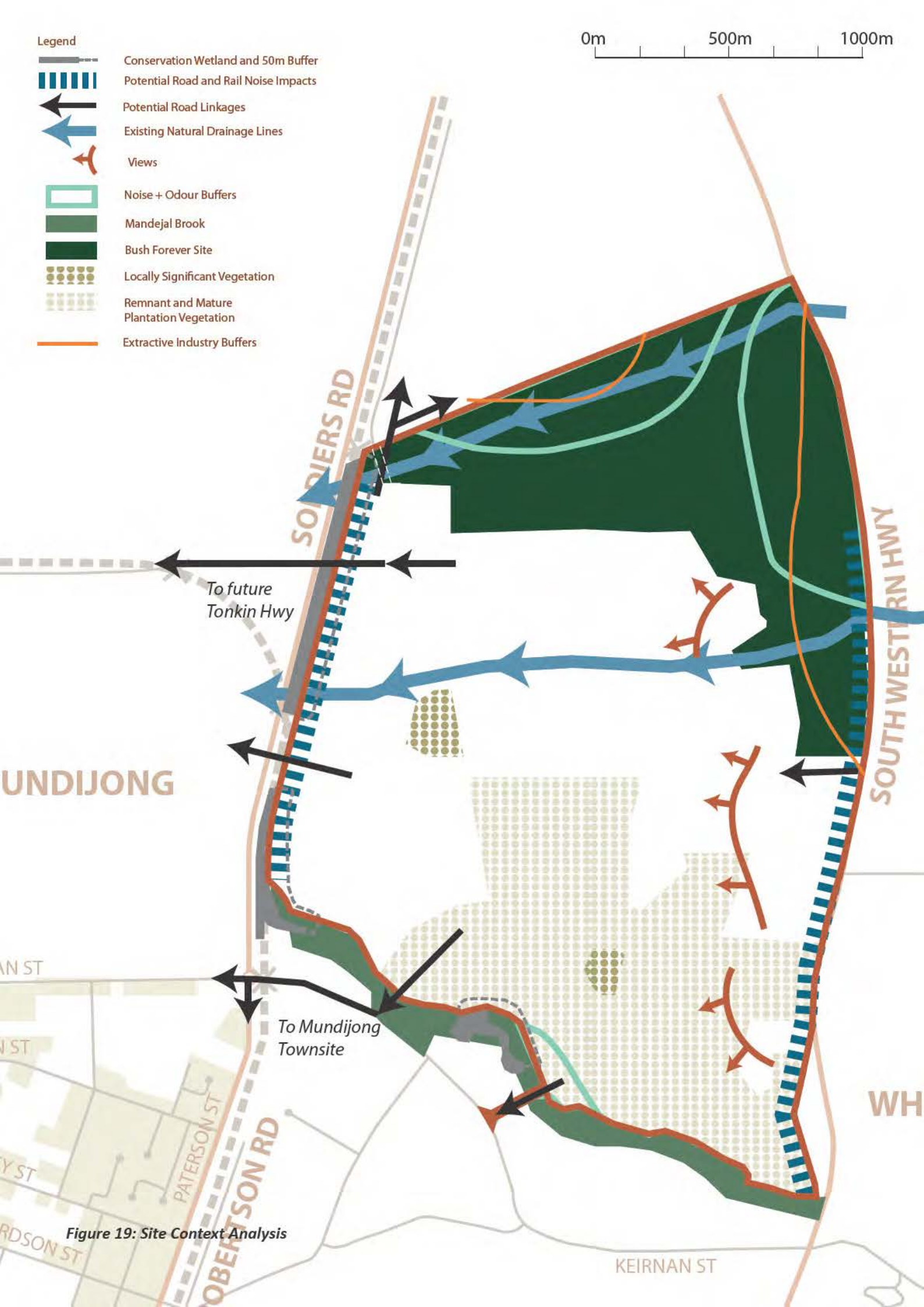


Figure 19: Site Context Analysis

As part of the context analysis, recognition and provision needed to be made to the respective elements contained within the Mundijong Whitby DSP. These are addressed in section 5.2.2 above. Two overarching themes are identified in the DSP – “maintaining the natural context” and “planning for a way of life”. Both of these themes derive from the existing rural character and lifestyle of the area whilst recognizing the benefits of living in a contemporary urban settlement.

The DSP does however acknowledge that to an extent this is conflicting and identifies ways in which these themes can be achieved.

With respect to the Whitby LSP area these include the following which have been reflected in the LSP design:

- Proposing a new District Centre to develop over time in the north-east of the DSP (i.e. Whitby).
- Creating neighbourhood centres and community hubs connected by natural links that reflect a rural character.
- Providing residential densities that are higher at the centres and lower in the outer areas consistent with traditional village design and as a transition to surrounding rural areas.
- Ensuring the provision of area specific design guidelines for various precincts, which have regard for the articulated Character Statement, to ensure that the historical character of Mundijong/Whitby is maintained.



Figure 20: Central Area of the Site, looking West

5.2.4 Land Use Distribution Rationale

The LSP is based on a series of interconnected neighbourhoods which surround the District Centre. There are four neighbourhoods each with a local activity node at its centre, as depicted in Figure 21. The District Centre is the key activity node within the LSP area and will accommodate a range of retail, commercial, mixed use and higher density residential land uses. Figure 22 depicts a layout concept for the district centre.

The surrounding neighbourhoods will be predominantly residential in character with higher densities within the local activity nodes at the centre of each neighbourhood and adjacent to areas of local open space. These nodes relate to areas of heightened amenity and activity such as the co-located High School and Primary School; the main boulevard near the northern Primary School; a site in the north east underpinned by a key vantage point opposite Bush Forever Site 354; and a site in the north west corner at the intersection of the two main north-south and east-west roads.

Each of these local activity nodes presents opportunities for small mixed use development, comprising retail, mixed use or civic local points.

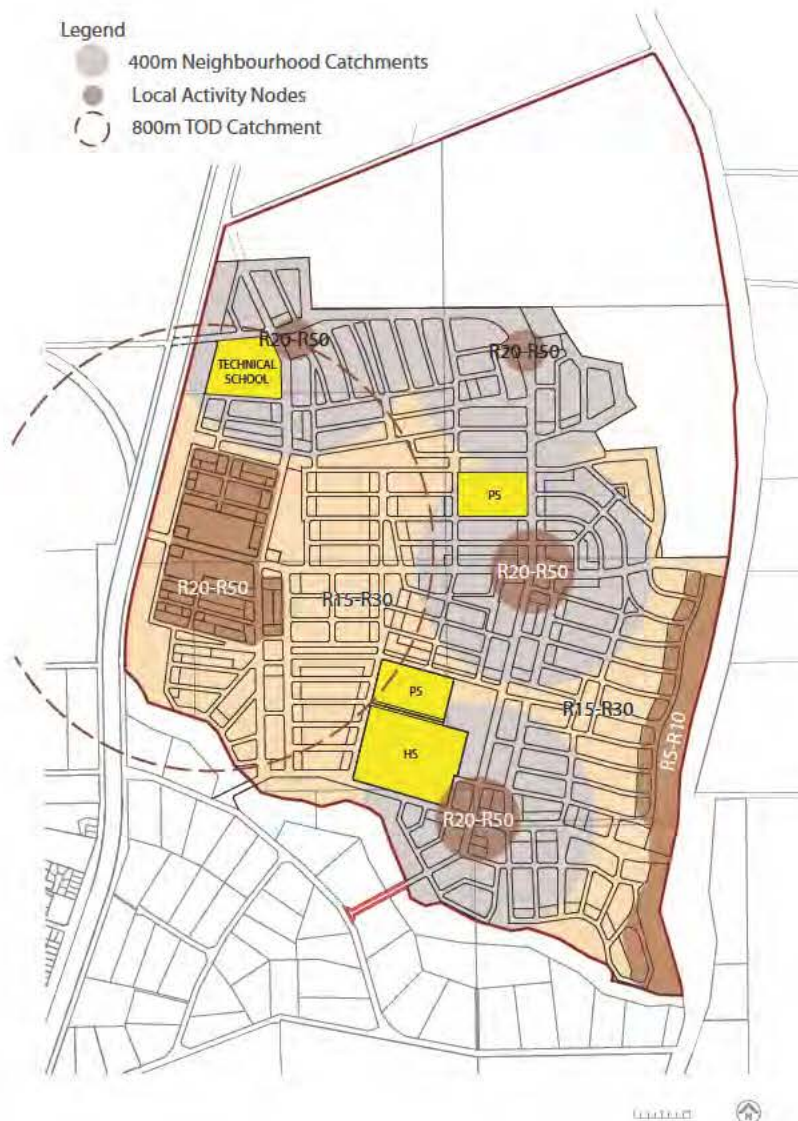


Figure 21: Neighbourhood Structure



Figure 22: District Centre: Layout Concept

The land use distribution and rationale reflects the Liveable Neighbourhoods principle of interconnected neighbourhood centres surrounded by cells of residential development within a convenient 400m walking distance.

5.2.5 Design Objectives

The overarching design philosophy of the LSP is to create a contained urban settlement of a scale and density that optimises a balanced approach to combining a diversity of housing; options for legible movement throughout the locality comprising walking, cycling and vehicles; opportunities for both active and passive recreation; a district centre that facilitates mixed use, commercial and civic needs and the optimization of landscape features that respects and connects with the site's past to provide a distinct character and identity for the locality.

5.2.6 Density Targets

The Mundijong Whitby DSP refers to density targets establishing a framework for higher densities located near centres and public transport centres whilst lower densities are located at the margins. The LSP has been designed to retain and celebrate the rural character of Mundijong, and to maximise retention of mature vegetation. Achievement of density targets was therefore considered in the context of delivering these outcomes.

In establishing an appropriate density target the DSP refers to Directions 2031 and the target of 15 dwellings per gross hectare. The DSP provides further guidance in this regard by providing a long term, ultimate population for the Mundijong Whitby area of 30,000 – 40,000 people and with reference to this population range establishes a dwelling range for each precinct.

For the Whitby area (Precinct A) the DSP establishes a target range of between 3339 dwellings (population 30,000) and 4452 dwellings (population 40,000).

The Whitby LSP has been configured to provide for a range of densities and lot sizes, providing residential densities ranging from R5 at the perimeter where larger lots are utilized to address noise from South West Highway to R50 around the District Centre. Higher density residential development is provided for within the District Centre. Approximately 3750 dwellings are proposed, which sits at the mid-point of the density target range establishment by the DSP (i.e. for a population of 35,000).

The density target and resultant yield (in the order of 3750 dwellings) reflects the objectives of both the DSP and Directions 2031 of increasing residential densities, to meet a future population target in the order of 35,000 people for Mundijong-Whitby. This is achieved despite several constraints imposed on the LSP area including land (and therefore yield) affected by road and rail noise; buffer requirements associated with external CCWs; land requirements to address the Bush Forever interface; drainage and POS requirements; and a District Centre site, TAFE campus and High School that will serve the wider Mundijong Whitby locality.

The range of densities and overall dwelling yield proposed are also reflective of other imperatives. The LSP will retain rural character through the provision of a variety of lot sizes, retention of mature vegetation providing an attractive, natural backdrop to development, and through the street layouts proposed. Similarly, the LSP proposes development appropriate to the surrounding context and established patterns of development in the locality. It is also vital that the development proposed in the LSP meets market expectations to ensure the vision articulated in the LSP is realised.

5.2.7 Crime Prevention

The district road layout presented by the LSP seeks to reinforce personal safety, as well as perceptions of safety and reduce opportunities for crime. This is to be achieved by providing streets and urban open spaces that are adjacent to housing and actively used facilities. Public spaces will be surveilled from adjacent buildings to promote community engagement in the activities of the street.

The LSP recognises and incorporates CPTED principles, particularly in relation to surveillance and use of activity nodes, multiple use corridors and public open space areas.

Residential housing frames all forms of open space in the LSP, being located opposite small parks, along the edges of the linear spaces and around the larger active open space areas. In addition school sites are configured for buildings to front the surrounding streets with the playing fields framed by housing.

5.2.8 Designing for Better Health

The DSP promotes a spatial framework for better health and well-being for the community.

The subdivisional road network proposed in the LSP in combination with areas of local open space will provide for legible, safe and attractive pedestrian routes throughout the LSP area ensuring strong connections exist between key points of interest and need. Strong, safe and direct links are provided to the schools through the open space network, whilst the road network ensures pedestrian routes provide direct links within the LSP area.

5.2.9 Housing Diversity

The neighbourhood structure and density codes proposed in the LSP will facilitate a range of housing types ensuring diversity in housing product, as depicted in Figure 23.

Larger residential lots are located along the eastern boundary of the site. Whilst the lots are provided as a means of mitigating noise from South West Highway, they will also facilitate the retention of rural character at the perimeter of the site.

The more traditional form of single residential housing is facilitated through conventional lots, ranging in density from R15 to R30, which form the majority of the content of the neighbourhood structuring. Higher residential densities are provided around the centres (District Centre and the local activity nodes), along the main boulevards and adjacent to areas of high amenity such as open space and Manjedal Brook – in each of these localities the diversity in housing density ranges from R20 to R50. Allowance has also been made for higher density residential within the District Centre.



Figure 23: Priority Density Areas

5.2.10 Townscape Character and Streetscape

The DSP identifies several factors that influence the character of Mundijong Whitby including:

- Landscape influences.
- Street characteristics.
- Existing built form character.

The LSP reflects these factors particularly the landscape influences and street characteristics.

As outlined in Section 5.2.1 the Whitby site has significant landscape characteristics which have strongly influenced the LSP and which through their retention preserve the landscape character. The inclusion of significant bushland in Bush Forever site 354, the retention of remnant trees and vegetation within the public open space network and road layout, and the acknowledgement of the CCWs and Manjedal Brook combine to reflect the landscape character of the locality.

Similarly the street character has been influenced by the traditional street grid existing in Mundijong and will be further enhanced through the provision of street trees as outlined in the Integrated Landscape Management Strategy (Cardno and Emerge 2010).

The existing built form character of Mundijong provides the opportunity to create an architectural style guide that reflects this character through contemporary interpretation. The 'style' will be explored and implemented through the preparation of design guidelines and the Detailed Area Plans which have regard for the articulated Character Statement, as part of the subdivision design process, where considered appropriate.



Figure 24: Plantation Pines in Albany as an attractive backdrop to development

5.2.11 Energy Efficiency

The district road framework provides strong east-west and north-south connections with neighbourhood connectors distributed evenly through the LSP area.

The LSP maximises the benefits of this orientation and connects local roads with a corresponding east-west and north-south street layout. This road layout optimises the number of lots with good solar access and will facilitate the siting and design of dwellings that benefit from solar efficiency and in turn minimise non-renewable energy use. This will be complemented by guidance in Detailed Area Plans to promote energy efficient principles. Solar orientation is further detailed in Section 5.5.6 and Figure 34. The LSP also proposes higher densities adjacent to nodes connected by strong linkages via a linear open space plan, encouraging residents to walk to nearby facilities and services and reducing dependence on cars.

5.2.12 Community Gardens

Community Gardens is a new element previously not required in the preparation of an LSP and has not been considered during this broad design stage of structure planning. It is however an initiative that could be investigated as part of future community development associated with the establishment of community programs.

5.2.13 Emergency Management

The subject site is located in an area which has the potential to be subject to bush fires, primarily due to the presence of Bush Forever Site 354 in the northern portion of the subject site. In line with the Planning for Bush Fire Protection Guidelines Edition 2, consideration has been given to the type of vegetation, slope of the landscape, hazard reduction zones (low fuel areas) and the interface between the bush fire prone area and residential development.

An assessment of Bush Forever Site 354 indicates this area would be considered a Class A Forest in which the fire hazard is considered extreme. Slope is generally only considered a factor for determining the separation distance when the fire risk is down slope of the built form, whereas in the case of Whitby, the majority of vegetation is upslope of proposed built form.

Planning for Bush Fire Protection Guidelines Edition 2 states that, under Australian Standard (AS) 3959, the minimum required separation distance of 100 metres (between development and areas of 'Extreme' fire risk) can be reduced by increasing the construction standards. Therefore, it is acceptable that the fire risk can be managed through a 40 metre minimum separation distance (30 metre road reserve and/or areas of public open space and 10 metre lot setback) given the management of the separation zone and the potential to increase the building standards in this area. This will ensure that no specific fire management actions are required within Bush Forever Site 354 as all management measures will be accommodated within the hazard separation zone

The road reserve provides continuous access to Bush Forever Site 354 in the case of a fire, with hydrants to be provided at regular intervals along the southern portion of the road reserve. The majority of the hazard separation zone (road reserve) will be developed and maintained in accordance with the Integrated Landscape Management Strategy (Cardno and Emerge 2010), with management of the hazard separation zone (road reserve) to become the responsibility of the Shire of Serpentine-Jarrahdale.

This is further explored in the Environmental Assessment and Justification Report (Cardno 2010a) and Integrated Landscape Management Strategy (Cardno and Emerge 2010).

The proposed movement network provides a number of connection points directly or indirectly to the regional roads such as South Western Highway and Tonkin Highway. Adequate spare capacity is provided for at the proposed access points for the LSP area. In light of this, and given the interconnected street pattern proposed, it is expected that vehicles would be able to utilise one or more of the proposed access points to exit the LSP area during emergencies. Similarly, emergency vehicles can access the LSP area using one or more of the proposed access points in an emergency.

5.3 Movement Network

In order to achieve good accessibility and permeability, the LSP is proposed to be served by two access intersections on South Western Highway (SWH) to the east, two access intersections from west through the proposed railway crossings at Bishop Road and the main east west spine road, one access point to the north through a connection with Norman Road and two access points to the south through Kiernan Street.

The main LSP access point is the northern proposed access intersection on SWH. The number and locations of the access intersections on SWH have been confirmed by Main Roads WA.

The proposed railway crossings to the west side of the LSP area would be at grade railway crossings controlled by boom gates.

It is acknowledged that the number of railway crossings in this vicinity would need to be rationalised. According to the DSP, the existing railway crossing at Norman Road would be removed and replaced by the new crossings at Bishop Road and main east west spine road.

5.3.1 Traffic Volumes

For the purpose of this study a traditional four-stage modelling was adopted to estimate the future traffic for the LSP. In order to establish the future traffic patterns and volumes more accurately, a broader study area, which entails the proposed Whitby-Mundijong District Structure Plan (DSP), Byford Structure Plan and the proposed Cardup business park were modelled by the EMME 3 transport modelling software.

According to the modelling results the projected traffic volumes on main east-west spine road is estimated to be about 5,000 to 6,000vpd, which would increase to about 14,600vpd at the District Centre.

The proposed link from the LSP area to Norman Road is expected to carry about 6,500vpd. The provision of this link will reduce the traffic on the main east-west spine road and will send some of the LSP traffic, which is destined north via SWH to Norman Road. Norman Road is expected to carry about 3,600vpd in the vicinity of the SWH. Bishop Road is expected to carry about 5,000vpd at the railway crossing (refer Figure 25).

The projected traffic volume on SWH is about 10,000vpd to the south of the main LSP access intersection and will increase to about 16,000vpd to the north of the main access point. It must be noted that the projected traffic volumes on SWH is predicated on the extension of the Tonkin Highway, which has been assumed in this study.

Note: The rest of the roads carry less than 1000 vpd

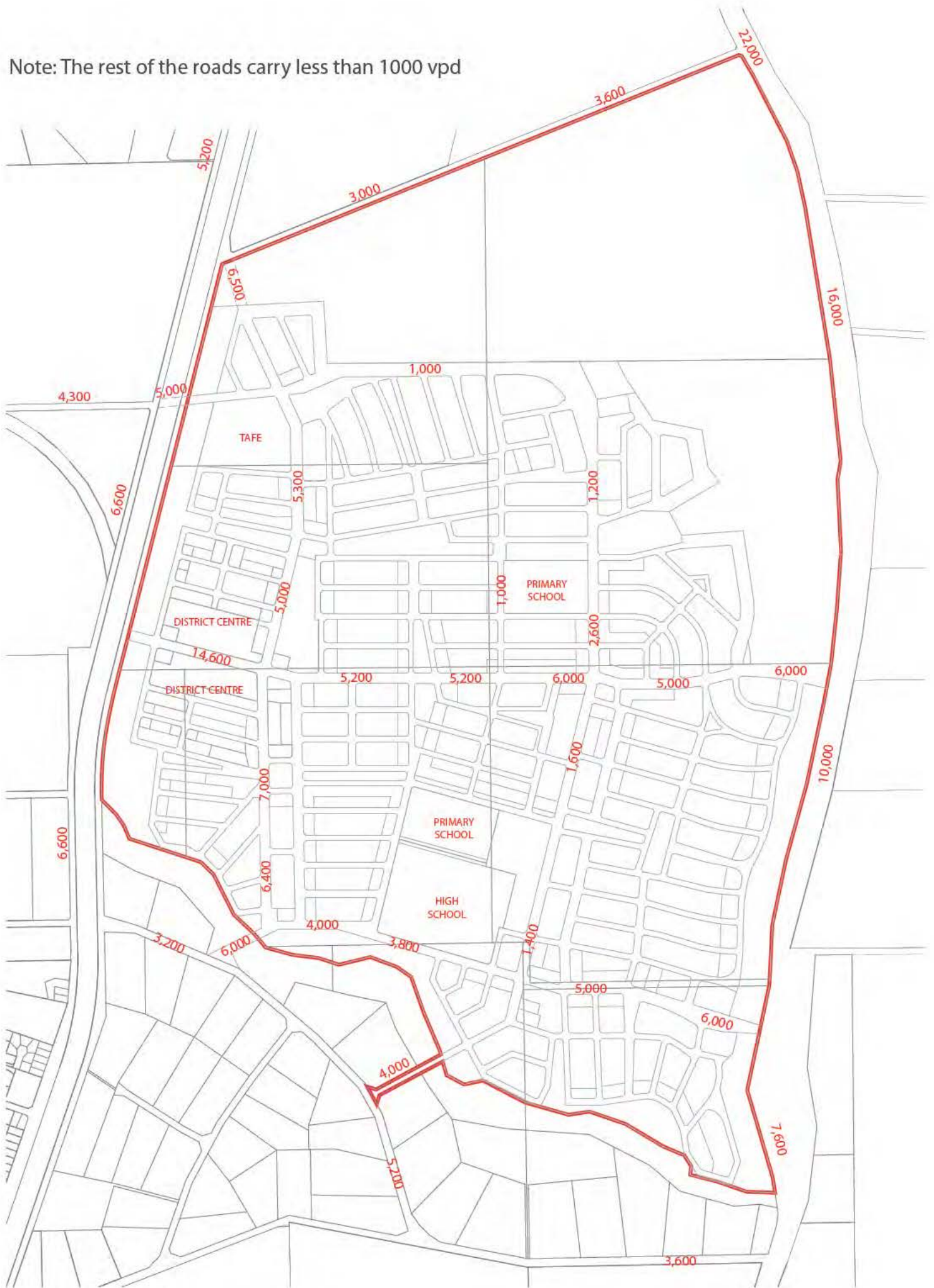


Figure 25: Traffic Volumes



5.3.2 Road Hierarchy and Proposed Cross Sections

The road hierarchy system in the Western Australian Planning Commission's Liveable Neighbourhoods (LN 3) has been adopted for the road network in the LSP area. Figure 26 shows the proposed road hierarchy in accordance with projected traffic volumes.

The main east-west spine road through the LSP area is proposed as Neighbourhood Connector A road, with a typical cross section of 24.4m as illustrated in Figure 17 of LN 3.

The access street abutting the schools are recommended to be constructed to the 17.9-metre Access Street B cross-section (Figure 20 of LN 3), which allows for on street parking on both sides of the street. The remainder of the local road network is proposed to have typical 14.2-metre Access Street D cross-section (Figure 22 of LN 3) or 6 metres wide lane way (Figure 24 of LN 3).

5.3.3 Connectivity

LN 3 establishes the requirement to create highly connected thoroughfare networks, with a relatively flat hierarchy in order to widely distribute traffic.

Most particularly, it requires that street connections to existing areas should be maximised to facilitate interconnection, and therefore recommends spacing of 200 metres or closer (Element 2, Requirements R17 and R18 of LN 3). Although the Whitby community is bordered by significant barriers (namely rail, a foreshore reserve, a rural highway and Bush Forever), the LSP nonetheless endeavours to provide connection points as frequently as possible. These include:

- Two connections west across the rail (to Bishop Road and the westwards extension of the Whitby mainstreet)
- Two connections south across the Manjedal Brook foreshore reserve to Kiernan Road,
- Two connections east to SW Highway, and
- One connection north to Norman Road

These connections are generally spaced at more than twice the LN requirement due to the nature of the barriers traversed, but are expected to provide adequate distribution of external traffic connectivity consistent with LN objectives.

It is acknowledged that these connections will require the support or approval of relevant authorities in order to be implemented. Main Roads WA has indicated in-principle support for the proposed connections to South West Highway.

Although the Whitby LSP does not prescribe the configuration of local access streets, its design has given great regard to establishing a high level of local connectivity to maximise movement (vehicular and pedestrian) as well as supporting sustainability and Crime Prevention through Environmental Design (CPTED) principles.

Legend

- Neighbourhood Connectors
- Major Access Streets/ Boundary Streets



Figure 26: Road Hierarchy

- ▲ Priority T-intersection Fully Channelised
- Roundabout
- Threshold Treatment
- ◆ Special Treatment
- ✦ Left In/ Left Out

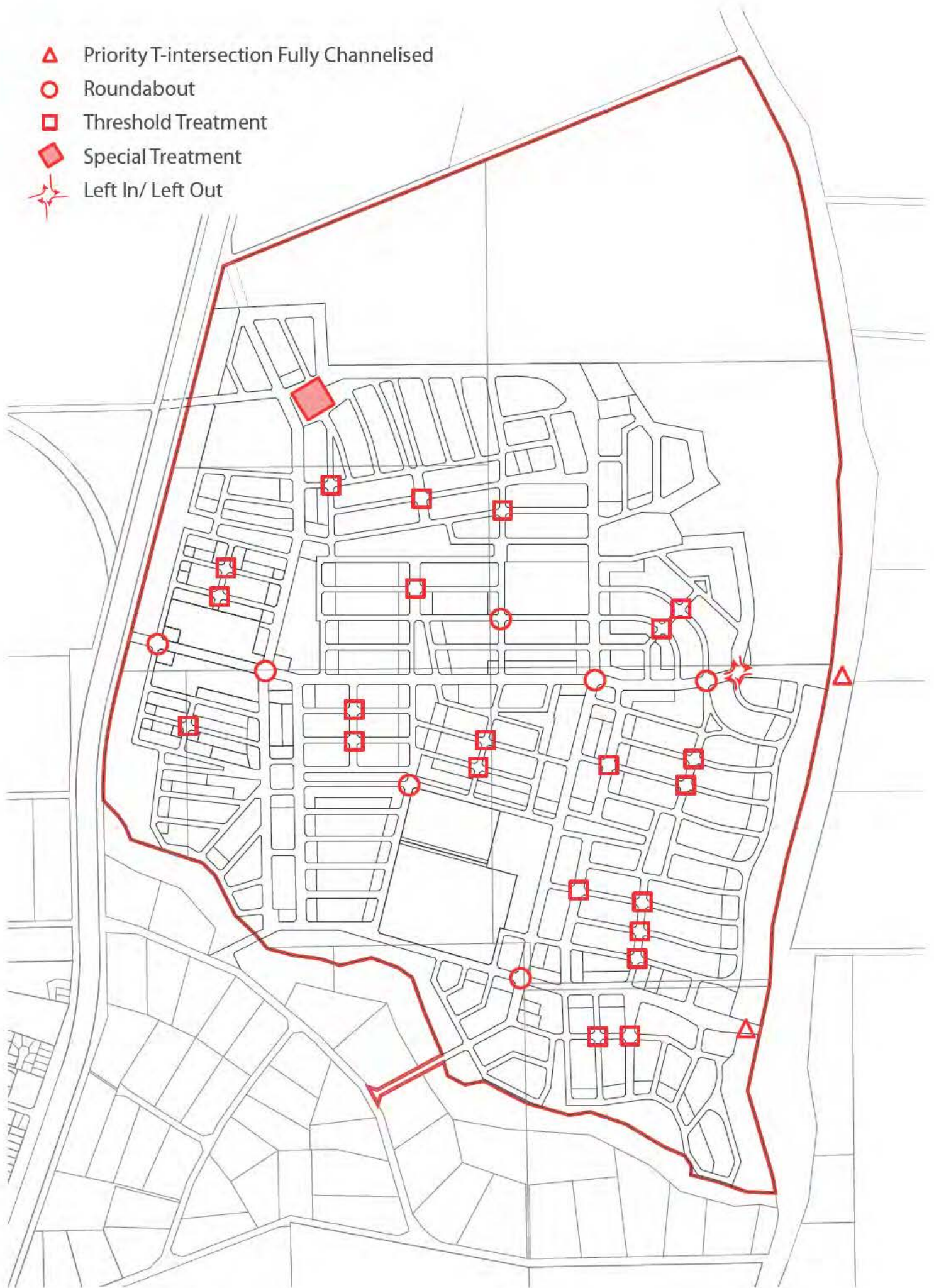


Figure 27: Intersection Treatments

5.3.4 Traffic Management

Based on the projected traffic volumes, the proposed LSP road system and the proposed road hierarchy, the suggested intersection treatments for the LSP are shown in Figure 27.

There are two roundabouts recommended for the intersections adjacent to the District Centre to provide for effective traffic circulation, bus turn around facility and control speed along the main east west spine road. Two more roundabouts are also proposed on the main east west spine road to the east side of the LSP area.

Roundabouts are also proposed for some key four-way intersections near the school sites and the major four-way intersections within the LSP area.

There are a number of 4-way intersections within the LSP area that do not justify the provision of a roundabout. Suitable threshold treatments (such as raised red asphalt) are recommended on the minor legs of all these intersections as shown in Figure 27. Other intersection treatments such as raised red asphalt are also proposed to control speed along reasonably long stretches of LSP roads.

The proposed main access point from SWH entails a left turn slip lane and a right turn pocket of 100m (including taper) on SWH in order to maximise safety, minimise traffic interruptions and satisfy Austroads requirements.

5.3.5 Public Transport

According to the information provided by the Public Transport Authority (PTA), four different bus routes are likely to service the entire DSP area and the surrounding developments. Figure 28 illustrates the different bus routes.

It is expected that the green and the blue routes serve the DSP area. The purple route is expected to operate as Byford feeder. The orange route, which is planned to be a spine route, is proposed to connect the Byford/ Armadale Area to the DSP and Serpentine Jarrahdale to the south.

A bus transit station is proposed to the west of the District Centre within the LSP area. This transit station would need to be a dual system with turnaround facilities for buses. Each facility should entail two stands and one layover area with approximate dimension of 60m x 8m. Further detailed design of transit facilities, and integrated design of land uses to encourage public transport use, will be developed in the Activity Centre Structure Plan for the district centre.

5.3.6 Pedestrians and Cyclists

The proposed facilities for pedestrians and cyclists in the LSP area are shown on Figure 29. In accordance with LN 3, shared paths are proposed on one side of the Neighbourhood Connector roads and a footpath on the other side. As these roads are carrying more than 3,000 vehicles per day, a 1.5m on-road cycle lanes in each direction is also proposed.

In addition to LN 3 requirements, some Access Roads will have shared paths on one side and footpaths on the other side, to provide walkability and pedestrian connectivity, and to promote cycling. All Access Roads in the LSP area will have a footpath on at least one side of the road.

The Shire of Serpentine-Jarrahdale's Local Planning Policy No 63, currently a draft policy, aims to achieve a modal split of 28% non-motorised trips. A number of features in the design of the LSP provide for this: the connected road network providing a clear and legible road hierarchy, the extensive series of pocket parks, the focus on walkability to local nodes, the concentration of density around the district centre, key attractors and areas of amenity, and the incorporation of linear parks into pedestrian routes to improve the quality and safety of the pedestrian and cycling environment. In addition, other measures may be employed to promote non-motorised transport such as walking school buses, high quality end of trip facilities including bicycle lockers, improved signage of major pedestrian and cycle routes, and encouragement to develop local nodes as community foci.

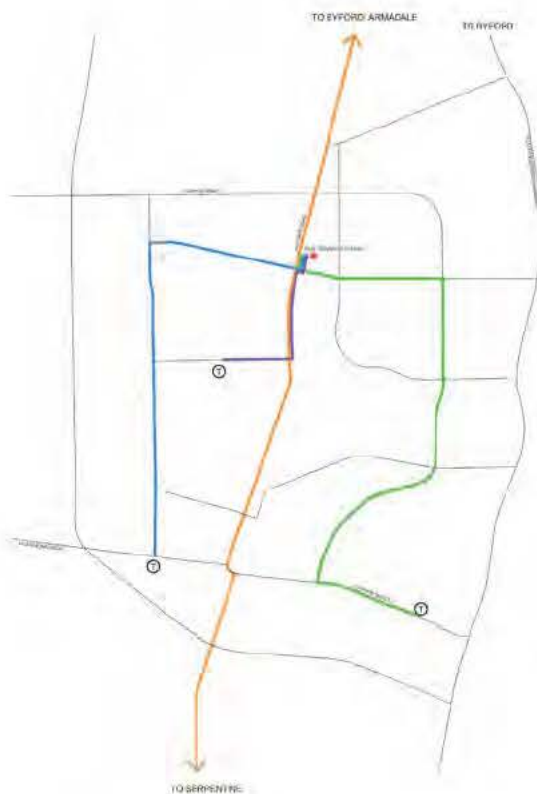


Figure 28: Public Transport Services



Figure 29: Pedestrian and Cycle Network

5.3.7 Accessibility

Consistent with Element 1 of LN 3, the LSP design places key neighbourhood nodes and activity centres at the intersection of Neighbourhood Connectors, thereby maximising local accessibility to facilities. In addition, the structure plan positions education precincts on Neighbourhood Connectors between to likewise maximise high level accessibility. In addition, the LSP further enhances accessibility to education precincts by:

- Designating major local access streets to provide a secondary vehicular/cycling/pedestrian access, and
- Ties their campuses into multiple use corridors, which provide alternative cycling and pedestrian access.

Although the Whitby LSP does not prescribe the design of the local street network, it enables the creation of a highly connective localised grid which maximises accessibility to all key facilities and destinations within the LSP.

5.4 Activity Centres and Employment

The Local Structure Plan includes the District Centre responsible for serving the district shopping and business needs for the entire Mundijong catchment.

5.4.1 Location

The location of the District Centre is ideally located to service the local LSP community as well as the broader Mundijong DSP catchment. The location is sited on an internal district road network that is able to deliver consumers easily to the centre from all areas within the planned Mundijong DSP area. The location of the District Centre is predicated on the establishment of an at-grade rail crossing immediately to the west of the site, and would require review should this crossing not be provided.

5.4.2 Components

The District Centre will ultimately incorporate up to 22,500sqm of retail floorspace including:

- Discount department Store (either Kmart, Target or BigW)
- Two full line supermarkets Coles and Woolworths
- Up to 70 -90 shops

There will also be room for up to 10,000sqm of office space and opportunities for community facilities to be developed adjacent to the District Centre.

5.4.3 Layout and Configuration

The District Centre is designed as a main street. It will be developed on 6 ha of land across two sites measuring approximately 300 metres by 100 metres in depth. The majority of car parking will be allocated toward the railway line to allow for flexibility in future planning and design of any rail station or transit hub.

5.4.4 Staging and Timing

The centre will be developed over three main stages – involving a major tenant and associated specialty shops starting with:

- Supermarket 1 and shops
- Supermarket 2 and shops
- Discount Department Store and shops

Office space is planned as second level above street front retail and community facilities can be developed as determined necessary.

5.4.5 Economic and Employment Impacts

The LSP is intended to provide employment opportunities for up to 2,300 of the 4,500 resident LSP labour force. This represents employment self sufficiency of 50% for the LSP, approaching the overall target of 60%.

5.5 Lot Layout

5.5.1 Lot Size and Variety

The LSP provides for a diverse range of lot sizes, arising from both a response to the site's natural features and to ensure a broad range of housing diversity.

There is a gradation of density from the eastern boundary of the site with larger lots, with density increasing in a westward direction to the District Centre:

- Larger Residential Lots are generally located around the eastern edges of the LSP. These provide a design response to noise associated with South West Highway, represent an opportunity to retain and portray a rural character, provide visual amenity for views from South West Highway, and allow for the identification and protection of significant trees and vegetation.

- Conventional Lots, with densities of between R15 and R30, comprise the majority of the proposed residential areas and provide for single residential housing to facilitate the main demographic of families.
- Local Activity Node Lots of between R20 and R50 are generally located along the main network spines, both roads and public open space, and in areas closer to the District Centre and centre nodes. The higher density lots will be located in areas of high amenity in and around the District Centre.

TABLE 4: INDICATIVE LOT SIZE AND DIVERSITY

Code	Indicative Lot Size	Approximate Dwelling Yield
R5	2000m ²	70
R10	1000m ²	40
R20	500m ²	2200
R25	350m ²	930
R30	300m ²	370
R50	180m ²	150
TOTAL		3750

5.5.2 Land Use Descriptions

The LSP lays out a structure for the future requirements of a population in the order of 10,000 people and comprises a district centre, community and educational facilities, and a variety of residential densities. The following land uses have been identified in the LSP:

- District Centre
- Residential, including Larger Residential Lots, Conventional Lots and Local Activity Node Lots
- Public Open Space (including Multiple Use Corridors)
- Bush Forever
- Public and Community Purposes (including schools)

District Centre

The DSP identifies the LSP area to contain a district centre abutting the rail line which will serve the needs of the entire Mundijong-Whitby catchment. The centre will include a mix of uses including retail, commercial and community facilities, a public transport interchange, and opportunity for higher density residential development. Figure 30 illustrates the potential future development of the district centre. The retail element of the district centre is to ultimately contain approximately 22,500sqm NLA retail floorspace. The centre is proposed to be designed as a mix of main street principles and free standing retail development.

The District Centre also provides for the development of office and commercial uses, which are likely to develop as the centre matures. The LSP has also made provision for apartments within the District Centre which will provide housing choice, generate after-hours activity, and promote walkability and the additional means towards supporting a possible future transit station.

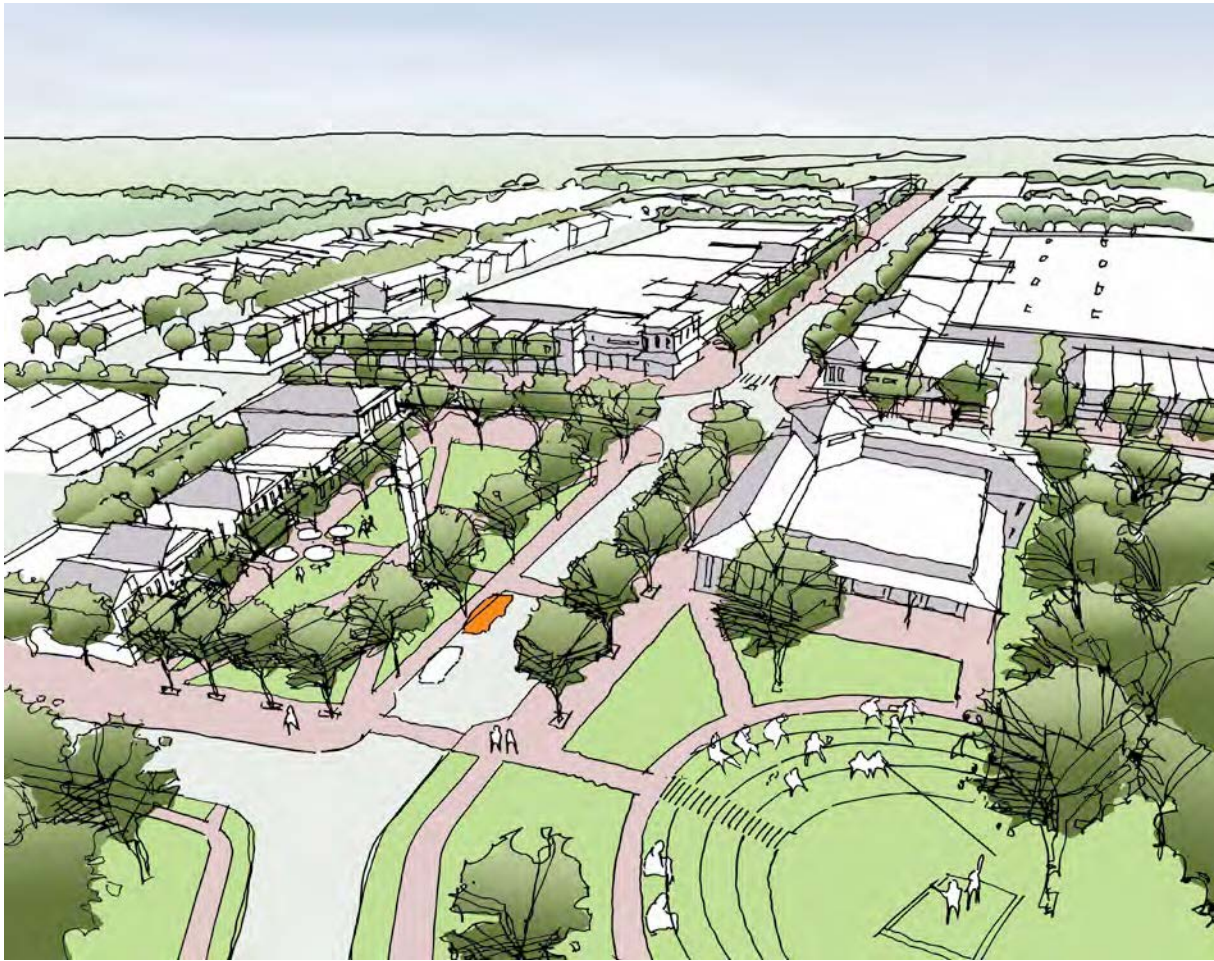


Figure 30: Perspectives sketch of future District Centre (looking west)

Access to the centre will be enhanced by the establishment of an at-grade crossing over the rail line, providing direct access to the centre from within the LSP area and also from the wider Mundijong area to the west. This crossing is vital to the development of the district centre as a viable activity centre. The increased accessibility from west of the rail line which this connection provides, and the traffic and activity which is then attracted to the centre will ensure the District Centre and its intended catchment are effectively connected, providing a source of local employment and serving the commercial needs of the DSP area.

In order to create a district centre that promotes activity and interest, a single zone is proposed over the District Centre to minimise unnecessary separation of uses and allow fine-grained development of the centre to occur naturally, as its catchment matures. In accordance with SPP 4.2, an Activity Centre Structure Plan will be prepared prior to the development of the site.

Residential

The LSP features a range of residential densities in keeping with the objectives of Directions 2031, Liveable Neighbourhoods, the Shire of Serpentine Jarrahdale Town Planning Scheme No 2 and the DSP. Larger Residential Lots are located along eastern boundary of the LSP. These lots provide a natural transition from the bushland and rural lots located outside the LSP area to the east whilst also providing the means to retain vegetation to both act as a buffer as well as to reflect a rural character at the perimeter of the LSP area.

Local Activity Node Lots, which will range in density from R20 to R50, provide opportunities for a diverse range of housing choice, allowing for compact housing which can be either front-loaded or served by laneways to allow garages to be sited at the rear. These lots are proposed around key community nodes such as open space and schools, in accordance with the nodes identified in the DSP. In addition, these lots are also located around the District Centre and proposed transit station to maximise the transit orientation of the LSP.

Conventional Lots will provide a traditional suburban density of R15 to R30 for the balance of the LSP. Some of these lots, particularly at entry points to the LSP area, will be served by laneways to remove garages from the primary frontages and to improve streetscapes in these locations.

Detailed Area Plans will be prepared for all lots less than 350m², all Larger Residential Lots and may also be applied to some Conventional Lots to guide development of the lots in respect of noise attenuation, lot access, interface with Bush Forever sites and building orientation.

Public Open Space

A variety of public open space is provided in the LSP, as depicted in Figure 31. An extensive linear open space system reflects the multiple use corridors, identified in the DSP and integrates drainage function within the open space. This linear form provides strong pedestrian connections and opportunities for passive recreation and the retention of existing vegetation. District Open Space, co-located with the primary and high school sites, integrates with the school ovals to provide an extensive area of active green space.

Other areas of open space, distributed throughout the LSP area serve to complement and enhance natural features of the LSP area, such as Manjedal Brook and the natural bushland to the northeast of the LSP area. The LSP has been designed so that all lots enjoy close proximity and access to a variety of green spaces.



Figure 31: Public Open Space Distribution

Public and Community Purposes

The Shire of Serpentine Jarrahdale Community Facilities and Services Plan (CFSP) is the guiding document for the planning of community facilities. The objectives of the CFSP are reflected in the District Structure Plan and the LSP.

Community purpose sites have been proposed for a variety of uses in the LSP. Two primary schools, one high school and a TAFE are proposed within the LSP area. These sites have been designed to enable integration of the sites in to the community. Specifically, the possibility of school facilities such as the high school library, gymnasium or performing arts centre being used by the community is to be investigated in partnership with the Department of Education. School halls may also serve as community meeting places, as identified in the CFSP. Such initiatives will be reflected in the Detailed Area Plans to be developed for the school sites.

Provision has also been made to locate community uses within the District Centre as part of a diverse node of activity. Other opportunities throughout the development for community facilities will be examined in conjunction with the Shire.

5.5.3 Retention of Existing Vegetation

Vegetation on the site includes remnant native vegetation and introduced species (including a tree plantation in the south of the LSP area). This existing vegetation over the site provides an opportunity to reflect and retain the rural character of Whitby in an urban setting. In addition, the LSP embraces the Bush Forever site identified to the north, with the design of the LSP enabling vistas towards the remnant bushland, ease of access (without threatening the integrity of the bushland) and retention of trees in nearby road reserves to ensure the landscape value from the Bush Forever site extends deep in to the LSP area.



Figure 32: Plantation vegetation can be complemented by street trees

Where possible, the open space network has been designed to incorporate the best quality existing vegetation including the retention of areas of locally significant bushland, as part of the variety of open spaces provided in the green network within the LSP area.

Additionally, provision has been made for some roads to be wider than conventional suburban streets to provide opportunities for trees to be retained in verges, thereby facilitating retention of landscape character and amenity throughout the LSP area.

The retention of trees on the larger residential lots provides further opportunity to retain existing vegetation and maximise the landscape value retention of the land while developing the LSP area for urban purposes. These lots abut the South West Highway frontage of the LSP area, and enable the rural aspect of from the highway to be maintained.

5.5.4 Effects on Local and Nearby Amenity

Because of the self contained nature of the Whitby site, there are limited effects on local and nearby amenity arising from the proposed development of the land. The site has definitive edges to its perimeters which separates the future development from adjoining areas and therefore limits the potential for impact. The South West Highway (eastern boundary) and the railway (western boundary) both represent a significant 'hard edge' separating the Whitby site from adjoining land uses. The Manjedal Brook (southern boundary) provides a significant and attractive natural feature between Whitby and the existing special rural lots to the south, whilst potential for impacts to adjoining land to the north are minimal due to presence of the large Bush Forever Site.

5.5.5 Provision of School Sites

The number of lots proposed and resultant projected population generates demand for two primary school sites and contributes towards the demand of a high school site.

In accordance with the DSP, two primary school sites and one high school site are located within the Whitby LSP area. The school sites reflect the locations broadly identified in the DSP and have been inspected and endorsed by the Department of Education. Further detail on the size and distribution of school sites is outlined in Section 5.6.

5.5.6 Climate Responsive Design

In preparing the design of the LSP there has been the need to respond to a range of competing factors including the desire to work with the landform; retain vegetation where possible; respond to the density targets; the need to mitigate noise; and to facilitate the significant design issues relating to the management of onsite drainage.

In addition to the above factors the LSP design has adopted a climate responsive approach to the design. Whilst needing to accommodate the combination of physical features into the design, the LSP has still maintained a predominance of north-south and east-west lots through the application of a regulated street grid layout. More detailed design to allow for solar orientation will be undertaken at subdivision stage, however an indication of which street blocks are oriented to provide optimum solar orientation is provided in Figure 33. For those street blocks which are not aligned to optimise passive solar orientation, additional guidance can be provided through Detailed Area Plans and Design Guidelines.

5.5.7 Density Target

At a regional level Directions 2031 sets a gross density target of 15 dwellings per hectare for land zoned Urban in the MRS. At the local level the DSP makes allowance for a range in dwelling yield at Whitby between 3400 and 4400 lots which is reflective of a range in the ultimate population for the DSP area. The LSP provides for 3750 lots which is the mid point in the DSP range and reflects a density of 13 dwellings per hectare.

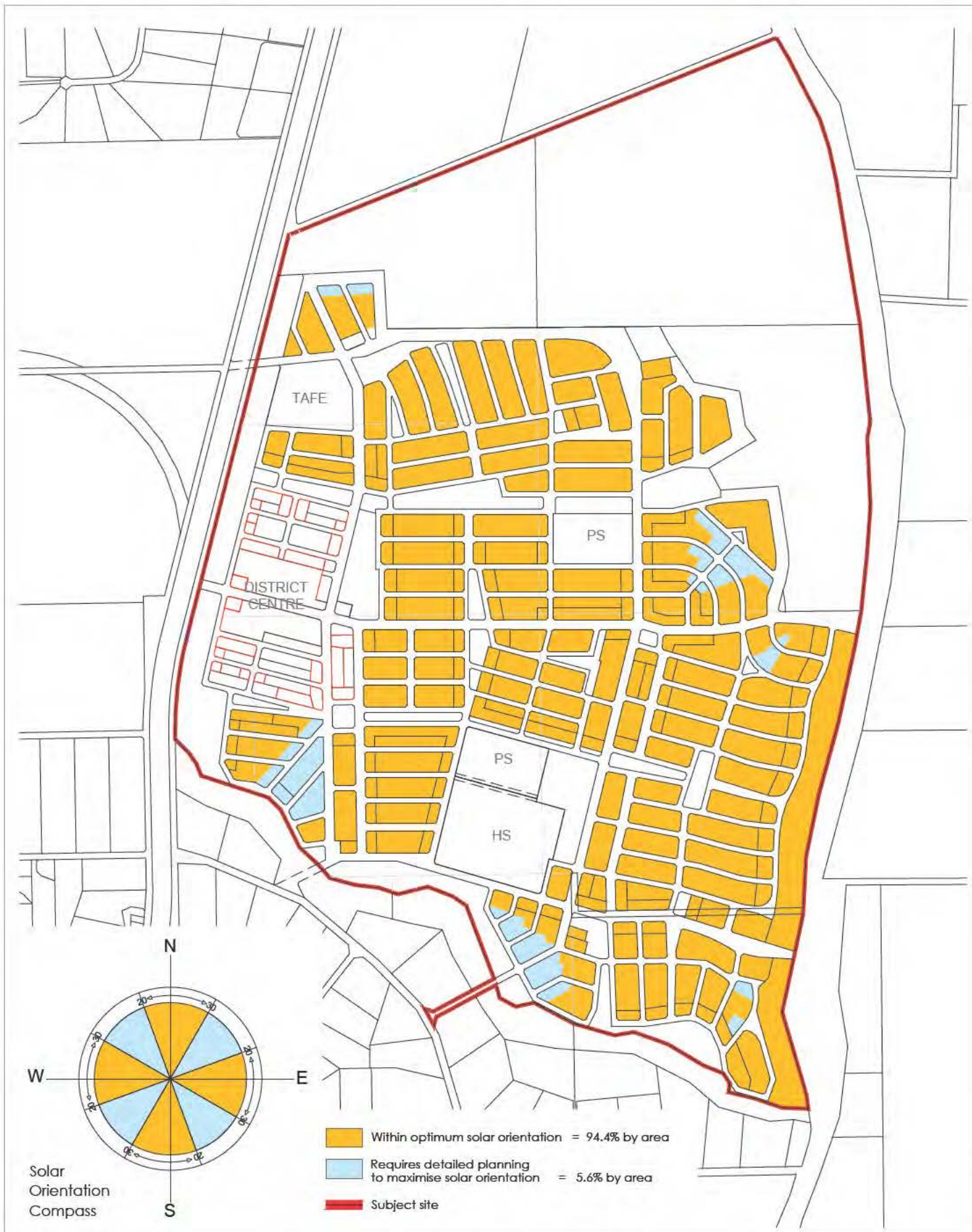


Figure 33: Solar Orientation Plan



5.6 Public Parkland

5.6.1 Size and Distribution of Public Open Space

The public open space is evenly distributed throughout the LSP and combines a number of parkland functions to provide a full range of recreation experiences.

The form of the open space is influenced by a number of factors including the objectives of integrating drainage function into the open space network, retaining vegetation, providing safe and attractive pedestrian and cycling links and providing a range of different recreation spaces for both passive and active pursuits.

The multiple use corridors resulting from the integration of drainage with open space provide well defined east-west spines of open space. Several areas, including large spaces near the District Centre and adjacent to the co-located primary and high schools are sited such to preserve impressive and attractive stands of trees, providing opportunities for spaces with high amenity to reflect and preserve the area's landscape character.

Open space is also provided through small pocket parks ensuring proximity and easy access for residents to recreation space.

Open space has also been utilized to optimise the space and natural attributes of the Manjedal Brook to ensure that this becomes a recreational focal point, not only for residents of Whitby, but also for the broader Mundijong community.

In addition, the co-location of the primary and high schools with the adjoining open space also makes provision for shared active open space which allows the opportunity for the consideration of larger areas dedicated to playing fields to serve a district level function if required in the future.

Whilst not part of the formal public open and not designated as open space, several areas provide opportunities to further complement the overall function of open space. Several areas are designated as extra wide road reserves where the intention is to provide space to potentially retain additional trees and incorporate drainage swales which will add to the overall parkland environment.

Overall the public open space has been configured to respond and leverage off the sites natural attributes, provide recreation opportunities for residents and to accord with the principles of Liveable Neighbourhoods. In this regard open space has been categorized as either Unrestricted or Restricted Open Space and calculated accordingly in the preparation of the Public Open Space Schedule.

5.6.2 Public Open Space Schedule

The Public Open Space proposed in the LSP is divided in to the POS within Conservation Category Wetland (CCW) buffers which gain partial credit and are considered restricted POS under LN 3, and POS outside of the CCW buffers, which may be:

- excluded from POS calculations (if within 1:1 year drainage basins),
- considered restricted POS (if within 1:5 year drainage basins but not within 1:1 year drainage basins), or
- considered unrestricted POS (if not within 1:5 year drainage basins)

The public open space provided within the LSP is greater than the ten percent required by WAPC Policy. This amount may be reduced to ten percent as part of the detailed design process for developing the subject site. Variations to public open space provision in detailed subdivision design will have regard for the passive recreational, active recreational, drainage, vegetation retention and other functions of the public open space.

The schedule should be read in conjunction with Figure 34. The areas provided are subject to further refinement and final survey.

Table 5: Public Open Space Calculations

Total LSP Area	505.35 ha
Deductions	
Schools (two Primary, one Senior High, TAFE)	23.0 ha
District Centre and Non-Residential Uses	6.65 ha
Bush Forever Site	137.0 ha
Surplus Open Space (Restricted and Excluded)	13.14 ha
Total Deductions	179.79 ha
Gross Subdividable Area	325.56 ha
10% POS Requirement	32.56 ha
Unrestricted POS	30.185 ha
Total Restricted Open Space	16.8047 ha
<i>Credited Restricted POS</i>	<i>6.51 ha</i>
<i>Surplus Restricted Open Space</i>	<i>10.2947 ha</i>
Excluded Open Space	2.953 ha
Total POS provided in LSP	49.9427 ha
Total Credited POS	36.695 ha

Table 6: Public Open Space Schedule

POS Area No	Total Area (ha)	Unrestricted	Restricted	Excluded	Indicative Function(s)
1	0.6961	0.6961	0	0	P, V
2	2.9813	1.3903	1.166	0.425	A, D, P
3	0.9672	0.4957	0.3925	0.079	A, D, P
4	0.2852	0.2437	0	0.0415	D, P
5	0.7297	0.5732	0.109	0.0475	D, P
6	0.2425	0.0655	0	0.177	D, P
7	1.2071	1.2071	0	0	P, V
8	0.0688	0.0688	0	0	P
9	2.5286	2.5286	0	0	P, V
10	1.2688	0.8138	0.385	0.07	D, P
11	2.915	2.296	0.491	0.128	A, D, P
12	3.5327	2.5032	0.9495	0.08	A, D, V
13	0.2124	0.2124	0	0	P
14	0.653	0.393	0.1805	0.0795	D, P
15	0.6351	0.2681	0.2625	0.1045	D, P
16	0.2012	0.2012	0	0	P
17	0.91	0.91	0	0	A, P
18	0.2479	0.0179	0	0.23	D, P
19	0.9973	0.5703	0.3225	0.1045	A, D, P
20	0.8797	0.4847	0.321	0.074	A, D, P
21	3.9514	3.9514	0	0	A, P, V
22	0.1014	0.1014	0	0	P
23	0.24	0.24	0	0	P
24	0.2435	0.2435	0	0	P
25	0.8405	0.6455	0	0.195	D, P
26	0.506	0.137	0.369	0	D, P
27	0.383	0.383	0	0	P
28	2.3824	1.1734	0.8475	0.3615	A, D, P, V
29	0.2633	0.0953	0.096	0.072	D, P, V
30	1.0988	0.5333	0.3835	0.182	D, P, V
31	0.1242	0.1242	0	0	P, V
32	0.5396	0.3381	0.126	0.0755	D, P
33	3.2386	2.3011	0.7345	0.203	D, P
34	1.051	0.53	0.3705	0.1505	D, P
35	0.2938	0.0583	0.1625	0.073	D, P
36	0.0865	0.0865	0	0	P, V
37	0.1516	0.1516	0	0	P, V
A	1.4068	0	1.4068	0	P, V
B	2.7224	0	2.7224	0	P, V
C	3.7367	0	3.7367	0	P, V
D	3.806	0	3.806	0	P, V
E	0.277	0	0.277	0	P, V
TOTAL	49.6041 ha	27.0332 ha	19.6179 ha	2.953 ha	

Key: A: Active/Organised Recreation, D: Drainage, P: Passive Recreation, V: Vegetation/ Environmental

Note: Figures are provided for drainage calculation purposes and may be subject to change



Figure 34: Public Open Space Plan

5.6.3 Landscaping Masterplan

The objective of the Integrated Landscape Management Strategy (ILMS; Cardno and Emerge 2010) is to provide an appropriate balance between ecological function, amenity and public recreation.

The Landscape Masterplan (Figure 35) provides a graphic representation of the aspects covered under the ILMS. This illustrates the layout of the open space in relation to the various development cells and demonstrates the opportunities to provide an integrated network of conservation areas, parkland, widened road reserves, district open space and school facilities. The accompanying selected sections (Figure 36) provide further detail.

The plan outlines the extent to which buffer zones and interfaces between conservation areas and development cells have been provided and extended as a continuation of the public open space network. The cross sections provide an illustrative guide to the type of treatment proposed within the POS and demonstrate the integration of ecological function, conservation, drainage, topography, pedestrian and cycling routes and recreational amenity.

Existing vegetation and Local Natural Areas are mapped together with proposed revegetation areas. The function of the various typologies of POS is discussed in further detail in the text of the ILMS. Further development of a design theme beyond the functional aspects discussed in the ILMS will be undertaken at subdivision stage

Drainage volumes for the 1 in 1 year and the 1 in 100 year storm events are represented on the plan in order to indicate the size of the basins. Further refinement of the shape and treatment of the drainage areas will be undertaken at subdivision and detailed design stages.

5.6.4 Ongoing Management Arrangements and Responsibilities

Funding and management of the landscape and irrigation maintenance for POS will be provided by the developer for the first two years following completion of landscape construction works. Typically the first year is an establishment period, followed by a year of landscape consolidation.

At the end of this two year period, POS landscape and irrigation maintenance will be handed over to the Shire to control, fund and manage.

More detail on management arrangements for POS can be found in the accompanying Integrated Landscape Management Strategy (Cardno and Emerge 2010).

5.7 Education and Training

5.7.1 School Catchment Requirements

Through the preparation of the DSP process, school site catchment requirements have been identified with the assistance of the DOE. The DSP has therefore nominated the number and approximate location of primary and high school sites throughout the Mundijong Whitby area.

In regard to Whitby, the DSP has identified one high school and two primary schools in this LSP area.

LEGEND

- SITE BOUNDARY
- NEIGHBOURHOOD NODE
- MAIN STREET
- NEIGHBOURHOOD CONNECTOR A
- PEDESTRIAN AND CYCLE LINKS VIA POS AND WIDENED ROAD RESERVES
- POS
- EXISTING VEGETATION
- BUSH FOREVER INTERFACE
- EXISTING FRINGING VEGETATION TO BE RETAINED
- INDICATIVE 1:100 YR ARI DRAINAGE
- INDICATIVE 1:1 YR ARI DRAINAGE
- WETLAND BUFFERS
- 30m FORESHORE SETBACK FOR MANDEJAL BROOK
- 30m CENTRAL STREAMLINE SETBACK
- REVEGETATION TO BE UNDERTAKEN AS PART OF LSP IMPLEMENTATION
- POTENTIAL REVEGETATION TO OFFSET WIDER DSP REQUIREMENT (UNDERTAKEN BY OTHERS)



title: whiby landscape masterplan
 client: urban pacific ltd
 dwg no: wp-imp-01
 scale: 1:11000 AT A3
 date: 6.6.2012

5.7.2 School Size and Distribution

The schools are located to comply with the DSP. The two primary school sites (4ha each) and high school site (10ha) are sized in accordance with DOE requirements.

One primary school has been co-located with the high school to provide for opportunities for shared facilities including access to playing fields. All schools are also co-located with public open space to provide further opportunities for shared facilities.

Primary school sites have been located central to each identified catchment and the high school is located central to its catchment, as one of three existing or proposed high schools in the DSP area.

5.7.3 School Site Analysis and Design

Due to the undulating terrain the school site locations have all been refined to be sited in areas most suitable for their development. The DOE is satisfied with the respective locations and is presently conducting on site analysis regarding the specific suitability of each site.

For the co-located primary and high school sites a service/access road is proposed between the sites ensuring compliance with the DoE's three road frontage requirement but also provides future access to facilities associated with the adjoining open space, such as clubrooms.

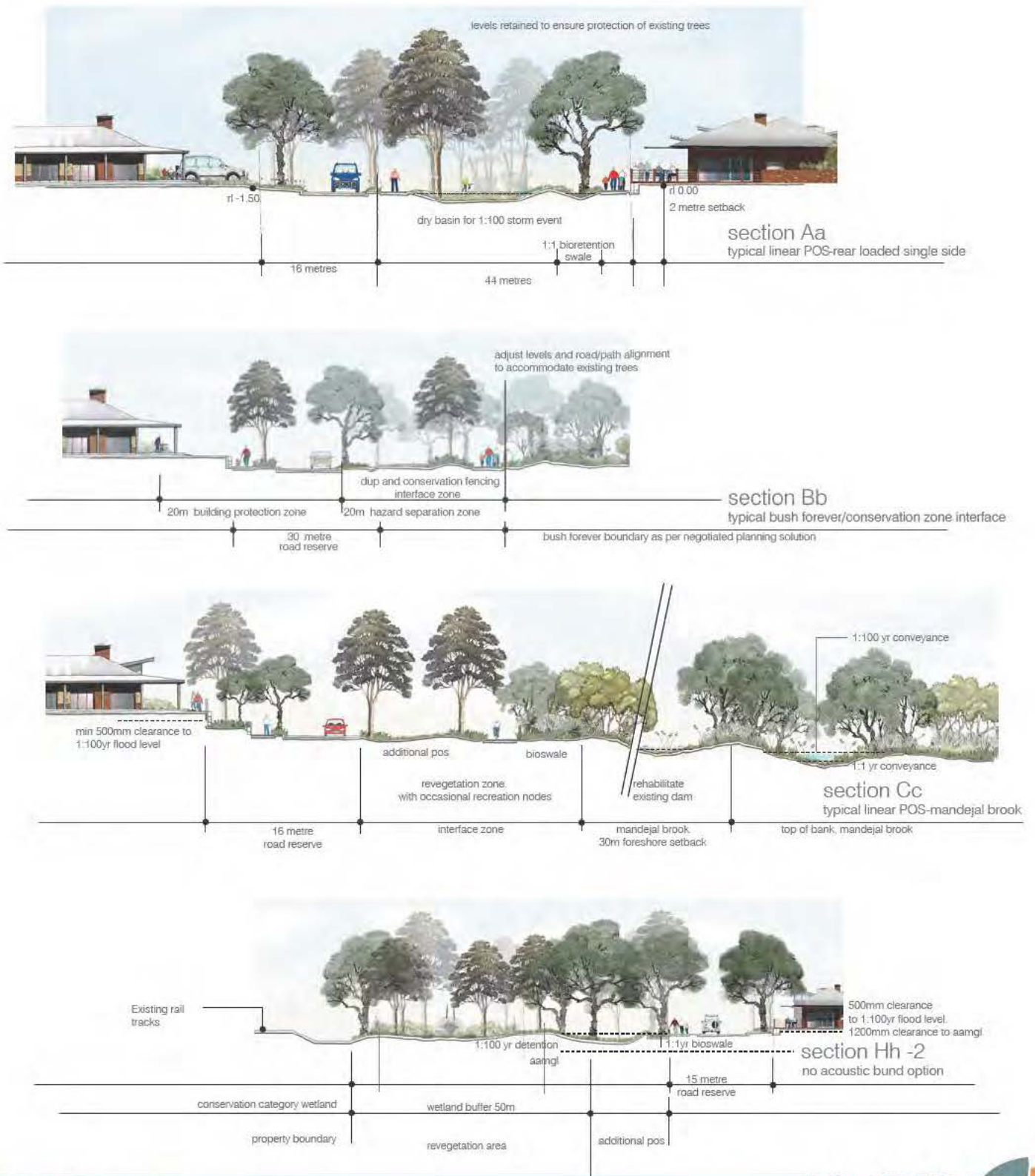
5.7.4 School Site Detailed Area Plan

As part of the subdivision process involved in excising the land and creating separate lots for each school site, a Detailed Area Plan (DAP) will also be required.

Liveable Neighbourhoods Element 8 and Appendix 5 establish design principles for schools, and favour the adoption of DAPs for school sites. In developing the LSP, detailed attention has been focussed on the planning of the schools precinct, and the concept plan presented in Figure 37 represents a basis for DAP formulation.

Most particularly, the concept design depicts:

- roads bounding the schools/POS precinct on all boundaries, with Neighbourhood Access frontage limited to the southern HS boundary only,
- accessibility maximised by a high degree of Local Access Street connectivity, along with the provision and integration of secondary linear POS/cycling networks,
- parking and student pick-up/drop-off accommodated within abutting street networks, as well as consolidated on-site parking lots suggested in locations where shared use can be maximised,
- buildings consolidated along the western boundaries of the sites (at Department of Education recommendation), but with a design emphasis to visually strengthen the southern Neighbourhood Connector frontage and key south-west corner. In particular, the plan illustrates an opportunity to locate the High School Performing Arts building complex at the south-eastern corner of the high school site, proximal to the adjacent Neighbourhood Node, to strengthen the legibility of the local centre, and achieve cross-pollination of uses between education, cultural and commercial activities.
- playing fields towards the centre and north-east of the schools precinct, and co-located with a senior sized active playing field situated in public open space. The co-location maximises



file: whitty landscape masterplan - supportive sections
 client: urban pacific ltd
 reg no: wb-imp-012
 scale: illustrative only - not to scale
 date: 16.11.2010

Figure 36: Landscaping Sections

- shared usage opportunities, management and maintenance.
- landscape qualities of the site, particularly the existing plantation timber, is retained through extensive tree retention throughout the schools/POS precinct. The tree retention will establish strongly defined treelines/skylines when viewed from the surrounding streets, and is therefore essential in retaining a 'village character'.
- conservation of the biodiversity vegetation contained within the schools/POS precinct is achieved through retention in POS (to clarify maintenance responsibilities), but integrated into the schools plan such that the retained environmental qualities can provide educational values in HS curricula. The precinct is also co-located with the foreshore reserve which provides further educational values.

5.7.5 Possible Technical and Further Education (TAFE) Site

On the northern edge of the District Centre a 5ha site is proposed for a possible future TAFE site. This location has been identified because:

- Dependent upon the ultimate location of the station, the site will be in the vicinity of 250m to 450m from the station;
- It is a regular configuration;
- It is within 500m of the district centre main street;
- The site will have frontage to 2 neighbourhood connectors, providing direct access from the wider Mundijong locality to the west and to the south;
- It creates another component that will add to the viability of the future local node in this locality;
- It does not compromise the objective of promoting increased residential densities immediately adjacent to the district centre.

As stipulated in Part 1 of the LSP, development of the TAFE site will be subject to a Detailed Area Plan.

5.7.6 Movement Network (Traffic and Pedestrian)

The three school sites and the TAFE site are located on neighbourhood connectors and/or high order access streets ensuring direct and legible access for both private and public transport.

In addition, the public open space network has been configured with strong linear form providing safe spaces for pedestrians and cyclists to access the schools. The open space network is complemented by a local street layout that provides direct pedestrian access to the schools.

5.8 Engineering and Servicing

5.8.1 Siteworks and Earthworks

The majority of the developable land within the WLSP is cleared and has been used for grazing and plantation purposes. There are some pockets of existing vegetation that have been identified for retention, and there are a number of significant trees identified across the site that will be retaining within future POS areas.

The site grades evenly at approximately 3% from east to west. Elevations vary from RL 98m AHD at South Western Highway to RL 40m AHD at the intersection of Robertson Road and Manjedal Brook. The Darling Scarp and north-south aligned Darling Fault are located east of the development.

The Serpentine Sheet of the 1:50,000 environmental geology series map indicates that the Site is underlain by the following:

- Alluvial Clayey Sandy SILT (M_{sc1}) associated with the Manjedal Brook along the southern boundary of the site.
- Colluvial SAND (S_{12}) of the Yoganup Formation in two areas to the east of the site.
- Colluvial Gravelly Sandy CLAY (C_{sg}) underlying the central portion of the site.
- Alluvial Sandy CLAY (C_s) of the Guildford Formation at the western edge of the site, overlain in places with Bassendean Sand.

A geotechnical investigation was completed by Golder Associates in September 2005 and December 2005. These reports confirmed that the ground conditions at Whitby are generally represented by a sand layer overlaying silty sand, sandy clay and clayey sand.

In order to generate a "Class A" Site Classification (Australian Standards AS2870 – Residential Slabs and Footings), a sand depth of 1.5 metres or greater is required to the clayey/gravelly/silty layer. Based on this information, some importation of clean fill will be required to ensure Class A Site Classification is achieved.

It is generally intended to grade the site to create level lots, while maintaining the general landform of the development. Earthworks levels will match as close as is practicable to the surrounding interface with the Bush Forever site, Manjedal Brook, the South Western Highway and the rail line. It is the landowner's intent to retain existing vegetation where possible within road reserves, public open space areas and multiple use corridors.

There is adequate separation to groundwater for the majority of the site, to mitigate the requirement for subsoil drainage or the importation of fill material to gain cover to ground water levels. Groundwater may be expressed near the south-western boundary in the vicinity of the existing wetland, which will be retained as POS or drainage reserve.

The permeability and hydraulic conductivity was tested at a number of locations by Golder Associates as part of geotechnical investigations. Some higher values of 3 metres per day were recorded in areas of deeper sand deposits, while lower values of 0.05 metres per day were characteristic of infiltration rates for clayey soil areas.

Aquifer tests were also carried out to determine yield volumes for the appropriate location of irrigation bores. The highest yielding bore produced 1.7 litres per second, though the majority of the bores yielded



Figure 37: Concept Sketch of High School and Local Activity Node

less than 0.05 litres per second. Based on these values, it will be difficult to install a bore that would generate sufficient draw to provide an irrigation supply for public open space. Consideration should be given to how the on-going irrigation requirements will be addressed, potentially incorporating a lake or storage facility into the design.

5.8.2 Drainage

The LWMS has refined the water management measures that will be required within the LSP. Such measures give guidance to the likely infrastructure that will be required to achieve the water management objectives.

There are three main approaches for surface water management within the site, all with different infrastructure requirements. These are summarised as follows:

- i. Maintain flows originating upstream of the site through the site consistent with the pre-development environment. This will require the use of open swales that will be located within POS. The swales will be sized according to hydrological and hydraulic modelling from the DWMS and LWMS. There will be some culvert crossings over the swales/streamlines required for roads and some short sections of the conveyance swales may need to be piped to maintain useability of POS. The overall approach will be open swales with "streamlines" which integrate into the landscape.
- ii. Detain runoff from within the site so that peak flows are consistent with the predevelopment environment. These flows will be conveyed to approximately 30 sub-catchment scale detention areas. These will be broad flat areas that are integrated into POS. These areas are only intended to be required during events that occur for 1 in 5 year ARI through to 1 in 100 year ARI runoff events (i.e. very infrequently). They will have relatively flat side slopes and be relatively shallow so that the POS areas remain useable when they are not required to slow down stormwater runoff. These flows will be conveyed to the detention areas via combination of pit and pipe network and overland flow within the road reserve. These will be designed to the Shire's standards. Where open swales to convey upstream flows (i.e. point 1 above) intersect with sub-catchment detention requirements, these may be co-located i.e. the flows may pass through the storage areas to achieve efficient use of open space.
- iii. Retain minor events within the development to treat stormwater. This will be achieved by providing each lot with either a soakwell or rainwater tank (or combination of both) so that the lots retain the 1 year 1 hour ARI event within the lot boundaries. For the remainder of the LSP (i.e. road reserves), the 1 year 1 hour event will be captured by the pit and pipe network and discharged to vegetated treatment areas sized to accommodate the runoff from this event.

Groundwater will be managed primarily by importing sufficient fill to ensure that all areas have adequate clearance to the Annual Average Maximum Groundwater Level. Some minor portions of the structure planning area may require subsoil pipes to ensure that groundwater does not rise up into the imported fill and destabilise foundations or road sub-grades. Wherever possible these would be installed within road reserves to ensure that they can be readily maintained.

Infrastructure required for water conservation will primarily be addressed within each lot, and is likely to consist of rainwater tanks, low water use appliances and water efficient gardens. Water efficiency will also be achieved at a development scale by ensuring that landscaping of POS uses appropriate irrigation infrastructure (e.g. subsurface irrigation where possible). Infrastructure to irrigate POS will include groundwater bores to an appropriate (and licensed) aquifer. The locations of these are yet to be determined.

5.8.3 Roadworks

An assessment of the traffic and transport planning aspects of the LSP has been carried out by Transcore. The results of this report include a recommended hierarchy for the roads within the development together with recommendations for public transport services, pedestrian and cyclist facilities.

The LSP comprises a network of development roads including neighbourhood connector roads, local access roads and laneways.

South Western Highway is constructed as a single carriageway rural style road. Ultimately, this road will be upgraded to a dual carriageway urban road. Two access points are proposed off South Western Highway, both of which would be full-T intersections.

Typical road cross sections have been prepared as part of the LSP process. In all cases the road cross-sections will be designed to cater for utility services, on standard verge alignments, street trees, parking embayments, pedestrian and vehicular traffic.

The engineering design of roads will be carried out to comply with the Department of Planning (DoP) and Liveable Neighbourhoods recommendations for design speeds and sight distances and will be constructed to the requirements of the Shire.

5.8.4 Wastewater

The subject site falls within the Byford Wastewater Scheme Catchment Area SD086. The Water Corporation have developed an interim strategy for wastewater which proposes the construction of a pump station and gravity mains within the Mundijong Whitby District Structure Plan area pumping north to the Byford Pump Station. There is a 20 litres per second cap on the capacity of this option which will be allocated to approximately 2,000 lots within the DSP on a first-come first served basis.

The ultimate wastewater strategy involves upgrading the Mundijong Whitby Main Pump Station to a Type 1000, diverting flows from the Byford and Mundijong areas southwards and then due west to the future East Rockingham Waste Water Treatment Plant.

5.8.5 Water Supply

The main water supply to Mundijong is currently supplied off the Serpentine Trunk Main in Summerfield Road to the south of the Site. The Water Corporation are currently completing upgrades to this supply to generate capacity to service approximately 600 residential allotments within the Mundijong/Whitby area.

The long-term water supply strategy for Whitby incorporates a supply from the existing Byford gravity tank along Soldiers Road. Supply from the Byford gravity tank has a supply height limit of RL 70m AHD. Development above this level, or beyond the 600 lot capacity constraint, would require the construction of a high level supply tank, booster station and possibly a re-chlorination facility.

It is likely that the high level tank construction would be staged to service firstly the subject site, and then subsequently the land east of the South Western Highway. In addition, for land greater than 110m AHD (south-east of the subject site), the Water Corporation propose to construct an additional Booster pump station.

5.8.6 Southern Source Integration Assets Pipeline Corridors

The Water Corporation has a planning strategy for the creation of service corridors for the construction of future major water and sewer infrastructure pipelines called the "Southern Source Integration Assets Pipeline Corridors".

A corridor has been identified on the western boundary of the subject site in Soldiers Road. No widening of Soldiers Road reserve is anticipated, any pipes will be constructed under the existing pavement down the middle of the road.

5.8.7 Electrical Power Supply

There are 22kV distribution feeders surrounding Whitby, which are supplied from the Byford Zone Substation, approximately 7 kilometres north. These feeders currently supply residential loads south of Byford, and north of Keysbrook between the Kwinana Freeway and Albany Highway. The 22kV distribution feeders (BYF508 and BYF523) in the South Western Highway and Soldiers Road have been identified as being suitable to supply the proposed subject site.

Based on the current network situation and load forecast, Western Power expects that they could supply the first 3 years of development at Whitby at a rate of 750kVa per year, or 150 lots per year, to a total of approximately 450 lots. This capacity is available on a first-come first-served basis, hence development of surrounding sites may reduce this forecast capacity.

As the available capacity in the 22kV high voltage feeders are exceeded, and the Byford zone substation reaches capacity, Western Power plan to off-load some of the demand to the proposed new Forrestdale zone substation, which is due for completion in 2015.

Once the Forrestdale and Byford sub-stations reach their capacity, a zone substation will be required in the Mundijong/Whitby area.

5.8.8 Telecommunications

It is anticipated that the subject site will be constructed under the National Broadband Network system which will provide high speed broadband to all newly created lots.

The broadband network will have potential to carry services such as:

- Internet
- Free to air television services both analogue and digital (without the need for an antenna)
- Pay television (no dish required)
- Telecommunications Services (multiple fixed line services)

5.8.9 Gas

There is no existing gas distribution/reticulation infrastructure in the Mundijong/Whitby area, and WestNet Energy has no current infrastructure planning for this area. WestNet Energy has confirmed that a high pressure extension will be required from Byford to service the development. Lateral gas mains would be extended off this HP main to service the Whitby Site in a staged manner to service development.

5.9 Illustrative Local Structure Plan

The Local Structure Plan in Part 1 of this report has statutory effect through the relevant provisions of the Shire's TPS. The Illustrative LSP in Figure 38 provides a more detailed articulation of development of the subject land, reflecting the elements outlined in Part 2 of the LSP report, and providing additional information on an indicative basis in order to illustrate the ultimate development of the subject land. The Illustrative LSP is intended as a guide only and does not have any statutory effect.



Figure 39: Illustrative Local Structure Plan



6.0 IMPLEMENTATION

6.1 Built Form and Detailed Area Plans

Clause 5.18.5 of Council's Scheme provides for the preparation of Detailed Area Plans, relating to particular lot(s) within the LSP area. DAPs will be provided on a per lot basis as required on the LSP, and are intended to enhance and expand on the planning provisions of the LSP, and provide for variations to the Residential Design Codes where desirable.

DAPs provide guidance on matters such as noise attenuation, vehicular access, building envelopes, private open space, servicing, landscaping, finished site levels, and lot orientation and interface treatments.

6.2 Integrated Landscape Management Strategy

An Integrated Landscape Management Strategy (ILMS, Cardno and Emerge 2010) has been developed to support the LSP. The objectives of the ILMS are to provide a comprehensive management strategy for the future management of a variety of environmental values and attributes found within or adjacent to the subject site (as outlined within the Environmental Assessment and Justification Report (Cardno 2010a)), as well as provide for the integration and enhancement of public open space with the existing landscape vales, as a part of future development of the subject site.

The ILMS addresses the management requirements of the Shire of Serpentine-Jarrahdale, outlined in the Mundijong-Whitby District Structure Plan and various local planning policies, as well as the criteria and expectations of the DEC and DoP for the management of conservation areas. This strategy incorporates the requirements of the following:

- Wetland Management Plan.
- Foreshore Management Plan for Manjedal Brook.
- Vegetation and Fauna Management Plan.
- Landscape Strategy and Master Plan.

This comprehensive approach is in line with Shire of Serpentine-Jarrahdale's intention to see that all relevant matters are integrated and considered in line with best practice management. The ILMS provides overall guidance on how the areas of conservation value and public open space will need to be managed as a part of future subdivision and development, and will guide the management expectations for:

- Wetland buffers.
- Manjedal Brook foreshore reserve.
- Bush Forever site and interface.
- Bush fire risk.
- Disease (*Phytophthora dieback*).
- Public open space areas.

The structure of the ILMS is outlined below, with the strategy provided as an appendix to this report.

- Section 1 provides an introduction to the ILMS.
- Section 2 describes the existing environmental values and attributes of the subject site.
- Section 3 outlines the legislation, policy and guidelines informing the management of the environmental values and attributes.
- Section 4 provides an overview of the LSP and Landscape Master Plan, detailing the different open space area 'typologies'.
- Section 5 outlines the general management elements and considerations, including required actions for the subdivision and development stages.
- Section 6 outlines the approval process and eventual handover of maintenance responsibilities for the conservation and open space areas to the Shire of Serpentine-Jarrahdale.
- Section 7 provides a summary of the strategy and recommended future actions.

6.3 Cost Sharing Provisions

TPS 2 provides for the preparation of a Development Contribution Plan for the DSP area. Contributions for district level infrastructure will be required as identified in the Shire's Community Facilities and Services Plan. Contributions are typically levied on a per-lot basis as a condition of subdivision approval. Items worthy of consideration in a Development Contribution Plan for the District Structure Plan include, but are not limited to:

- District Level Community Infrastructure
- District Level Roads (such as Soldiers Road, Patterson Road and Kiernan Road)
- Rail Crossings
- Implementation of the Foreshore Management Plan

No developer contribution arrangements are necessary to apportion costs within the LSP area as the land subject of the Whitby LSP is under single ownership.

6.4 Timeframes and Staging of Subdivision

It is anticipated that Whitby will be developed in stages over a relatively long period of time, the duration of which will be dependent on the demand for residential land in this corridor and the extension of services and facilities that are associated with it.

Initially, development will be focused in south-west corner of the site, to minimise the requirement for the extension of sewer and water headworks infrastructure.

Development of the commercial precincts and school sites will most likely be completed once demand in the area grows to support the proposed infrastructure within the development.

7.0 SUMMARY AND CONCLUSION

The Shire of Serpentine Jarrahdale has considered and endorsed the District Structure Plan for Mundijong-Whitby, which provides a broad strategic structure for the future development of Mundijong and environs.

The subject land has also been rezoned “Development” under the Shire’s Town Planning Scheme. In accordance with the provisions of the Development zone, prior to any subdivision or development, the Shire must endorse a Local Structure Plan over the subject land. Part 1 of this document fulfils that statutory requirement.

This LSP complies with the broad structure of the District Structure Plan, relevant WAPC and Shire policies, and Directions 2031, which provides strategic direction for the future development of the metropolitan area.

Part 2 of the LSP provides further detail, background, and a design and strategic context for future development. In addition to providing additional detail, the LSP has sought to retain the “country village” character existing in Mundijong and surrounds, and adapt it to an urban setting and comply with objectives and requirements of Directions 2031, without succumbing to suburban sprawl. Vegetation is retained where possible, the amenity of the Bush Forever site is retained and celebrated, and linear open space which draws the amenity of the surrounding area deep into the site and reflects existing contours.

The LSP seeks to retain a strong connection to Mundijong townsite to reinforce association of the LSP area with the historic country town, as well as replicating the traditional strong grid network while remaining responsive to natural topography. Design of the district centre, to be further guided by more detailed planning, will also be reflective of the “country village” character.

The Local Structure Plan therefore retains a strong link to the history of the locality, the character of the existing townsite and the natural topography of the land, while also adapting these elements to an urban context and complying with district, regional and strategic objectives.