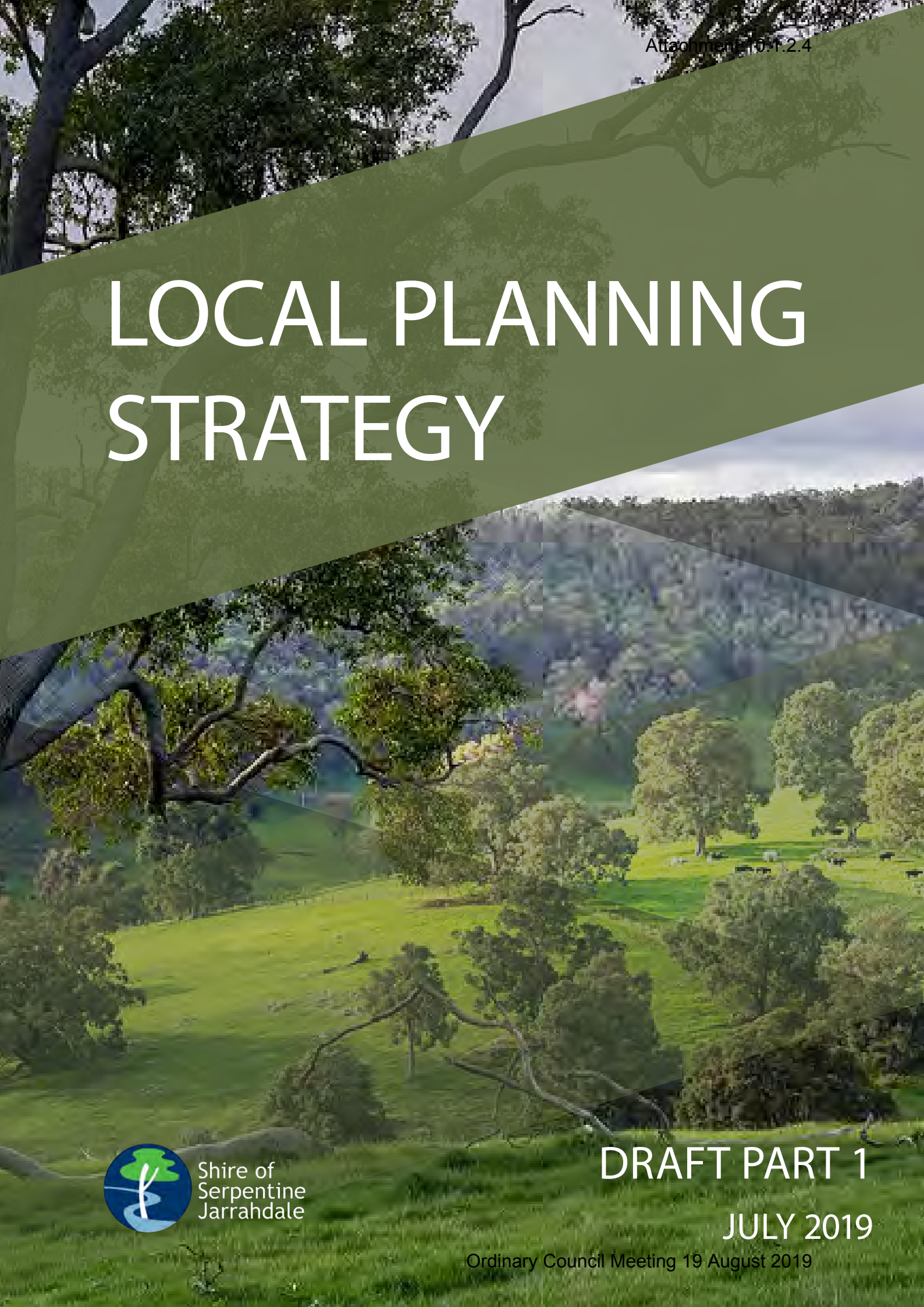
LOCAL PLANNING STRATEGY



Shire of Serpentine Jarrahdale

DRAFT PART 1

JULY 2019

Ordinary Council Meeting 19 August 2019

ADVERTISING

The Shire of Serpentine Jarrahdale Local Planning Strategy certified for advertising on 28 May 2019.

Signed for and on behalf of the Western Australian Planning Commission

_____
an officer of the Commission duly authorised by the Commission
(pursuant to the Planning and Development Act 2005)

Date _____

_____

ADOPTED

The Shire of Serpentine Jarrahdale hereby adopts the Local Planning Strategy, at the Ordinary meeting of the Council held on the
day of 20 .

_____
MAYOR/SHIRE PRESIDENT

_____
CHIEF EXECUTIVE OFFICER

_____

ENDORSEMENT

Endorsed by the Western Australian Planning Commission on

_____
an officer of the Commission duly authorised by the Commission
(pursuant to the Planning and Development Act 2005)

Date _____

LOCAL PLANNING STRATEGY DRAFT - PART 1

JULY 2019

Shire of Serpentine Jarrahdale

Prepared for the Shire of Serpentine Jarrahdale

6 Paterson Street
Mundijong WA 6123

T +61 8 9526 1111

www.sjshire.wa.gov.au

Hames Sharley

Cardno

Contents

1.0 INTRODUCTION 1

2.0 STRATEGIC INTENT 11

3.0 PLACE 17

3.1 URBAN AREAS AND TOWNSITES 18
3.2 RURAL LIVING 26
3.3 RURAL 32
3.4 HERITAGE AND CULTURE 38
3.4 TRANSPORT 42

4.0 PEOPLE 49

4.1 COMMUNITY INFRASTRUCTURE 50
4.2 PUBLIC OPEN SPACE 52
4.3 UTILITIES 60

5.0 PROSPERITY 65

5.1 ACTIVITY CENTRES 66
5.2 INDUSTRIAL 68
5.3 TOURISM 72
5.3 ENVIRONMENT AND NATURAL RESOURCES MANAGEMENT 76

6.0 IMPLEMENTATION 89

APPENDIX 1 - LOCAL PLANNING STRATEGY MAP 93

APPENDIX 2 - PART 2 BACKGROUND INFORMATION AND ANALYSIS 97

List of Tables

Table 1: Urban Structure 18
Table 2: Development Investigation Areas 18
Table 3: Urban Design: Strategy and Actions Summary 19
Table 4: Byford: Strategy and Actions Summary 20
Table 5: Mundijong: Strategy and Actions Summary 21
Table 6: Serpentine: Strategy and Actions Summary 22
Table 7: Jarrahdale: Strategy and Actions Summary 23
Table 8: Special Residential: Strategy and Actions Summary 27
Table 9: Rural Residential: Strategy and Actions Summary 28
Table 10: Rural Smallholdings: Strategy and Actions Summary 29
Table 11: Residential and Stables: Strategy and Actions Summary 30
Table 12: Protecting Agricultural Land: Strategy and Actions Summary 33
Table 13: Rural Enterprise: Strategy and Actions Summary 34
Table 14: Protecting the Rural Landscape: Strategy and Actions Summary 35
Table 15: Heritage and Culture Heritage: Strategy and Actions Summary 39
Table 16: Road and Freight: Strategy and Actions Summary 43
Table 17: Public Transport: Strategy and Actions Summary 44
Table 18: Cycling and Pedestrians: Strategy and Actions Summary 45
Table 19: Community Infrastructure: Strategy and Actions Summary 51
Table 20: Public Open Space: Strategy and Actions Summary 53
Table 21: Utilities: Strategy and Actions Summary 61
Table 22: Activity Centres Hierarchy 66
Table 23: Activity Centre: Strategy and Actions Summary 67
Table 24: Industrial: Strategy and Actions Summary 69
Table 25: Tourism: Strategy and Actions Summary 73
Table 26: Natural Landscape and Bushfire Risk: Strategy and Actions Summary 77
Table 27: Vegetation and Biodiversity: Strategy and Actions Summary 78
Table 28: Water Management: Strategy and Actions Summary 79
Table 29: Basic Raw Materials and Offsite Impacts: Strategy and Actions Summary 80
Table 30: Climate and Environmental Sustainability: Strategy and Actions Summary 81

List of Figures

Figure 1: Shire of Serpentine Jarrahdale Location Plan 2
Figure 2: Integrated Planning and Reporting and Land Use Planning Framework 3
Figure 3: Serpentine Jarrahdale Vision Scenario 12
Figure 4: SJ2050 Spatial Framework 13
Figure 5: Settlements 24
Figure 6: Rural Land 36
Figure 7: Heritage 40
Figure 8: Regional Transport 46
Figure 9: Community Infrastructure 54
Figure 10: Byford - Community Infrastructure 56
Figure 11: Mundijong - Community Infrastructure 57
Figure 12: Serpentine - Community Infrastructure 58
Figure 13: Jarrahdale - Community Infrastructure 59
Figure 14: Utilities and Services 62
Figure 15: Activity & Industrial Centres 70
Figure 16: Tourism 74
Figure 17: Vegetation and Biodiversity 82
Figure 18: Hydrography 84
Figure 19: Extractive Industries 86
Figure 20: Local Planning Strategy Map 94



EXECUTIVE SUMMARY

The Local Planning Strategy will guide the Shire's progress towards its vision to provide a rural lifestyle of choice offering a unique and attractive environment to work, live and visit. It provides strategic direction which, over the long term, will deliver a more consolidated urban form where residents will live closer to local shops, services and employment with easy access to public transport and greater ability to walk or cycle.

The Shire of Serpentine Jarrahdale has many competitive advantages that contribute to its unique rural character and livable environment, including its pristine natural environment, productive landscape and good air quality. It also offers competitive advantages in economic terms, including its diverse agricultural base and unique local heritage. The Shire residents benefits from high-quality education and community services, and its local sense of community.

Although the Shire of Serpentine Jarrahdale has these many advantages, it is an area experiencing rapid growth, characterised by low density residential development in the form of detached single family homes on large lots. It is composed of numerous car-dependent communities owing to the proliferation of single-use development; that is to say large, exclusively residential areas with retail-focused centres, located separately from other places of employment. As a result, the places where people live, work, shop and recreate are far from one another to the extent that public transport, walking and cycling are largely challenged or impractical.

There are a number of environmental, economic and social costs associated with urban sprawl. Valuable agricultural land is consumed for housing and areas of remnant vegetation cleared, leading to a loss of biodiversity. The provision and maintenance of infrastructure and services over greater distances, for fewer people is cost-prohibitive. The community is impacted by car-dependency leading to an increase inequities between various parts of the Shire due to discrepancies in access to employment and community services and an erosion of community cohesiveness. Based on the Shire's population forecast, there is sufficient land available within the major centres to achieve growth projections outlined in the Perth and Peel @ 3.5 Million.

On this basis, the overarching strategic direction is to not support further urban sprawl beyond the existing supply of land zoned and planned for settlement growth. Instead, the Strategy promotes urban consolidation by making better use of existing infrastructure and land. This will be achieved through building on the existing strengths of the district centre and other activity centres, such as Serpentine and Jarrahdale, and by progressively moving the Shire's retail centric shopping centres towards true activity centres that meet the shopping, employment and recreational needs of the community.

Consolidation will also be achieved by undertaking a review of opportunities to focus greater diversity and variety of housing typologies around key transit nodes in Byford and Mundijong. The Strategy also supports more efficient use of commercial, serviced commercial, light and general industrial zoned land through development of vacant and underutilized land, along with improvements to services and infrastructure, including environmental and amenity enhancements to attract private investment.

To support economic growth, sufficient land for serviced commercial, light and general industrial growth are designated in the Strategy. It encourages further diversification of the Shire's competitive advantages in agriculture, freight and tourism, and the protection regional assets such as its pristine Darling Scarp and other landscape qualities. These factors, in conjunction with improvements to accessibility through better integrated public transport linkages and cycle and pedestrian-friendly environments, will truly move the Shire towards its vision.

The directions set out in this Strategy will be implemented through the Shire's Local Planning Scheme, further investigation in specific areas such as preparation of local planning policies and structure plans, and through the management of subdivision and development. Where desired outcomes are outside the direct sphere of influence of local government, the Strategy promotes an advocacy role with relevant responsible agencies. Collaboration with State government agencies and other organisations will help to address cross-sectoral issues and will facilitate access to funding from both State and Federal government.

The Shire of Serpentine Jarrahdale Local Planning Strategy (LPS) has been undertaken in accordance with the Local Planning Manual 2010, published by the West Australian Planning Commission (WAPC) as the guiding document for all local planning strategies and local planning schemes within Western Australia. The development of the LPS has involved a significant review of background information, State and local strategy and policy frameworks, and community aspirations.

The LPS provides the vision and sets out the 10 year planning and development framework for the Shire. Subsequently, the rationale and strategic basis for the Shire's Local Planning Scheme No.3 is provided by the LPS. The LPS is comprised of two parts, Part 1 - The Strategy and Part 2 - Background Information and Analysis. Part 1 is the actual strategy, which incorporates a vision, principles, strategy objectives and a strategic plan to address the key opportunities, issues and challenges within the Shire. Part 2 of the LPS contains relevant background information about the Shire and planning issues, and provides the rationale for Part 1 of the LPS.

The Strategic Plan component of Part 1 is comprised of a spatial plan of strategic land uses, infrastructure, and natural resources and, land use categories that contain the objectives, strategies and actions required to implement the plan. The Strategy is guided by the following strategic objectives which have been informed by key challenges identified:

Place

» Unique Character
Ensure the diversity of natural and cultural landscapes in the Shire continue to offer an array of unique experiences to visitors and communities, enhancing social cohesion and a shared sense of place.

» Consolidated Urban Form
Promote urban consolidation by making better use of existing zoned land and infrastructure through better-quality infill redevelopment and rural living development.

People

» Inclusive Communities
Attract people to the Shire's many places and spaces supported by iconic landscapes, unique histories, range of activities and integrated settlement structures.

» Infrastructure and Technology
Explore incentives for the continued investment in research and development to ensure ongoing innovation and training help the shire remain competitive, resilience and sustainability.

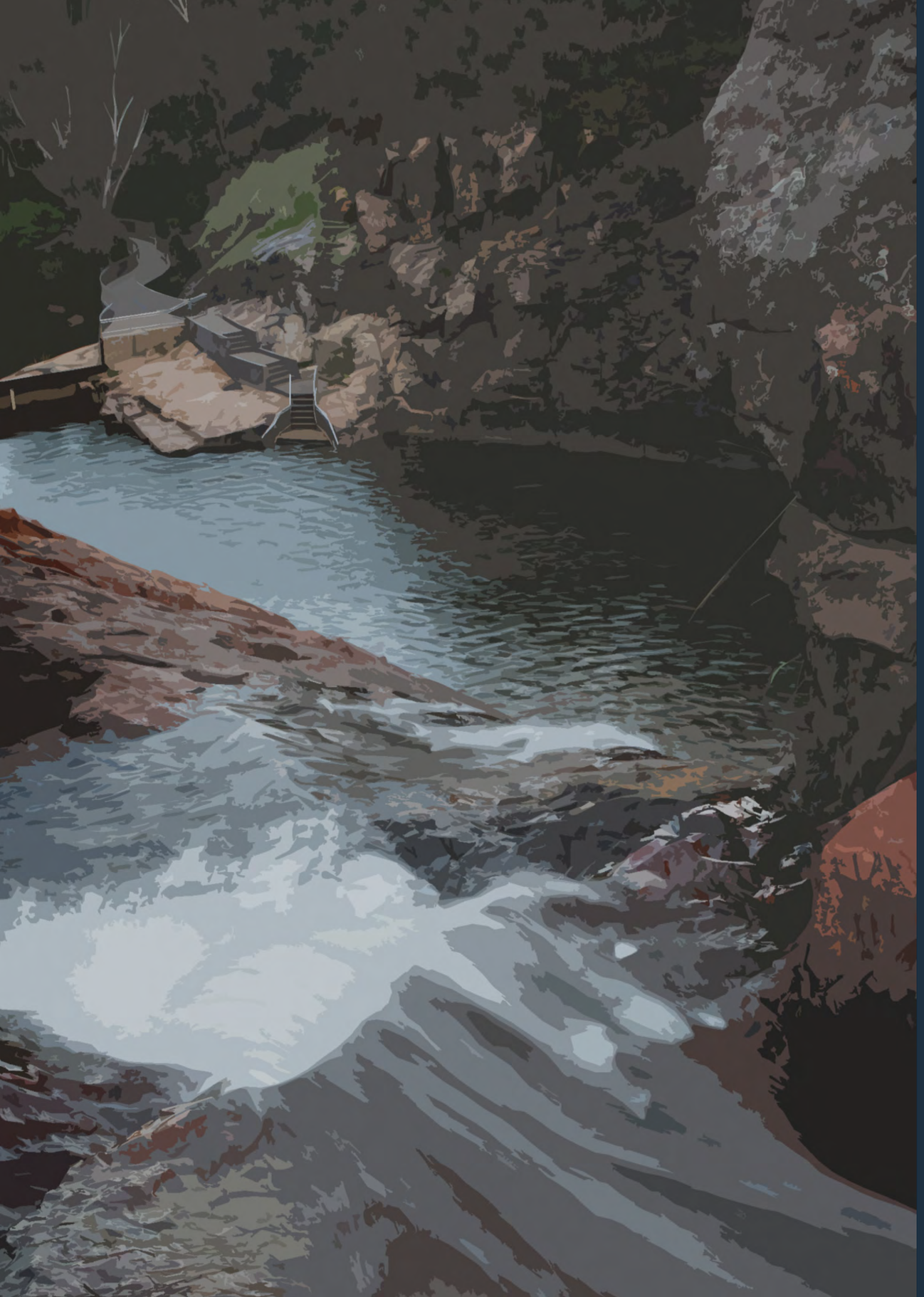
Prosperity

» Economic Diversity and Regional Development
Enhance our local competitiveness by seizing opportunities to diversity through innovation, research and development to create value-added goods, services and increased efficiencies.

Ensure, as our Shire grows, new homes, employment areas and places to shop are located in areas that are well planned, connected and affordable.

Ensure as the Shire grows, strong governance will guide well designed growth that makes the most efficient use of existing and planned infrastructure and investment.

» Environment and Water
Maintain access to the natural environment and preservation of our high value natural assets for future generations to come.



1.0
INTRODUCTION

INTRODUCTION

1.0 INTRODUCTION

The Shire of Serpentine Jarrahdale Local Planning Strategy (LPS) has been undertaken in accordance with the Local Planning Manual 2010, published by the West Australian Planning Commission (WAPC) as the guiding document for all local planning strategies and Local Planning Schemes within Western Australia.

The LPS has been developed for the area contained within the Local Government boundary, as depicted in Figure 1. The Shire of Serpentine Jarrahdale (the Shire) located in the outer south-eastern metropolitan area of Perth, covers an area of approximately 90,456 square kilometres. The Shire has an estimated population of 26,833 persons (2016 census) and includes the towns of Byford, Mundijong, Serpentine and Jarrahdale.

PURPOSE OF THE STRATEGY

The LPS is a live document (to be reviewed every five years) that provides the Shire of Serpentine Jarrahdale with a coordinated strategic planning framework, capturing the long term vision of the Shire and guiding its future growth and development.

The development of the LPS has involved significant review of background information, policy settings and community sentiment. In addition to aligning with State and regional planning frameworks to provide a considered basis for the rezoning, structure planning, subdivision and development of land. Subsequently, the LPS will provide the rationale and strategic basis for future reviews of the Shire of Serpentine Jarrahdale Local Planning Scheme.

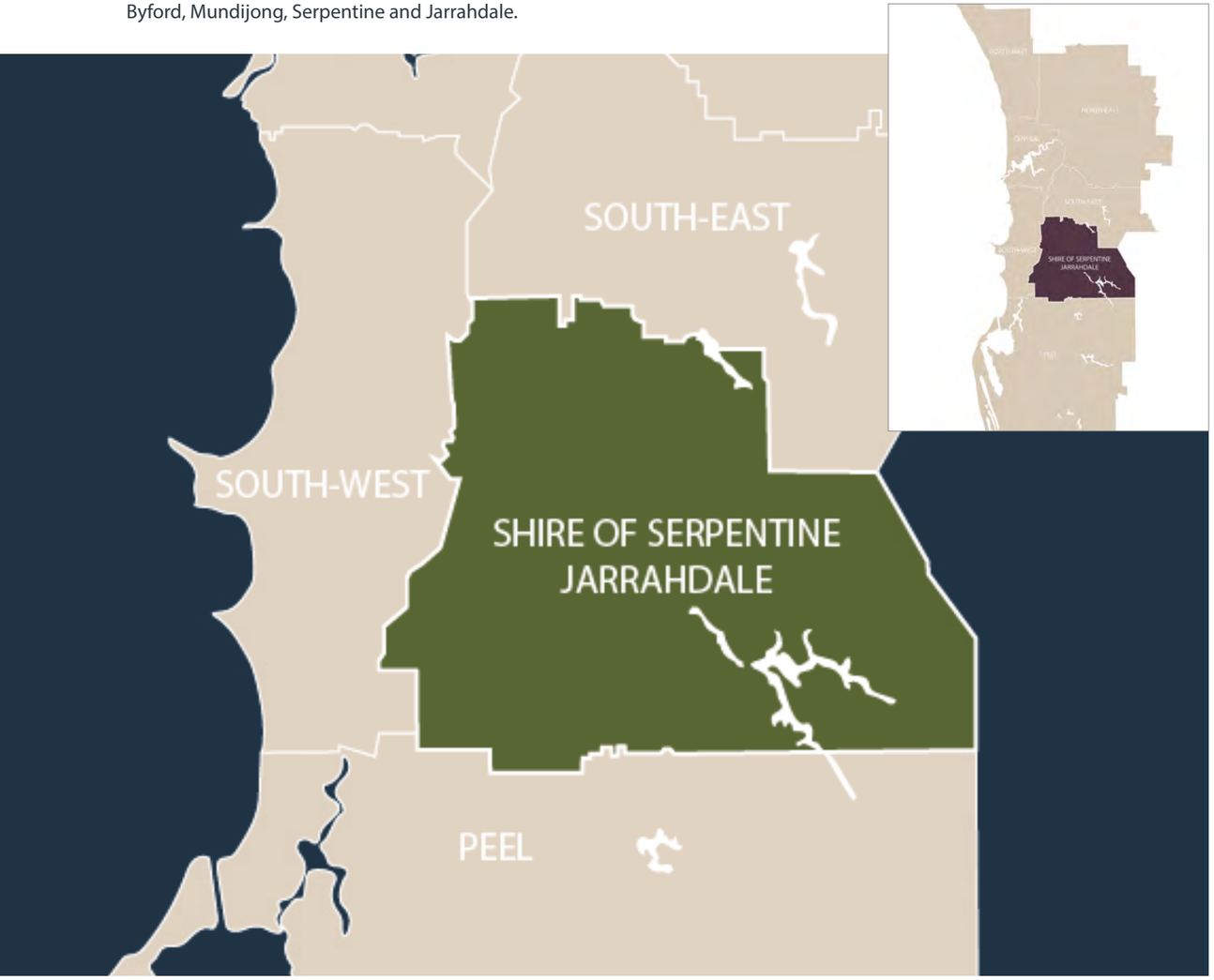


Figure 1: Shire of Serpentine Jarrahdale Location Plan

The purpose of the Local Planning Strategy includes the following:

+ To establish a vision for the Shire;
+ Coordinate the existing plans and strategies that have been developed for the Shire and surrounding region;
+ Identify issues and constraints for the future development of the Shire and propose strategies to address them;
+ To set out a 10 year framework for the Shire's future planning and development, and in doing so set a strategic basis for the establishment of the Shire of Serpentine Jarrahdale Local Planning Scheme No.3;
+ Review existing land use and development appropriateness based on strategic planning recommendations;
+ Identify the need for further studies and investigations within the Shire to address longer-term strategic planning and development issues; and
+ Identify future growth areas.

INTEGRATED PLANNING AND REPORTING FRAMEWORK

The Integrated Planning and Reporting (IPR) Framework has natural links to land use planning. Both the IPR and land use planning suites are guided by an overarching community vision. The community will also have aspirations for the shape and form of their area (for the whole area and/or particular parts of it) as shown in Figure 2 below. The community's aspirations for shape and form can be actioned through the provision of public space and community infrastructure identified in the Strategic Community Plan and Corporate Business Plan (as per the left hand side of the diagram), as well as land use regulations, such as, the Local Planning Strategy and Local Planning Scheme (indicated on the right hand side of the diagram).

Where the two cycles coincide, Local Development Strategies or local area plans covering a wider range of issues for a specific geographic area are aimed at providing more specific and detailed guidance on strategic direction, and in some cases actions for achieving the community's vision.



Figure 2: Integrated Planning and Reporting and Land Use Planning Framework

CONTENT OF THE STRATEGY

The format of the Shire of Serpentine Jarrahdale Local Planning Strategy is in two volumes:

Part 1 – Local Planning Strategy; and

Part 2 – Background information and analysis.

In terms of content and timing, Part 2 was prepared initially and includes relevant background information about the Shire and planning issues, and provides the rationale for the strategy (Part 1). The intention is that information in Part 2 be periodically updated to reflect current issues. This would happen at least every five years as part of the statutory review process, but could happen sooner if anything significantly changes that might the direction of the strategy.

This volume (Part 1) has been prepared to collate the information and analysis undertaken in the early work and synthesise recommendations to achieve the LPS vision over the short, medium and long term.

Part 1 is the actual strategy and includes a summary of the major issues and characteristics relevant to future planning and development of the Shire. It incorporates a strategic land use plan (map) and the strategies and actions required to implement the plan. It will be a key reference whenever a decision on a planning proposal requires the exercise of discretion.

In very simple terms, a local planning strategy asks:

+ What do we want to achieve (vision)?
+ What elements of our vision affect or are affected by how we manage land use and development (spatial elements)?
+ What do we have to take into address to achieve it (issues)?
+ What steps do we have to take to make it happen (strategy)?

Part 1 includes:

+ Vision and planning principles – the vision for planning and development within the Shire of Serpentine Jarrahdale area, and the principles upon which future planning decisions will be based;
+ Strategy Objectives – that guide preparation of the strategic plan and provide the basis for local policies and planning provisions to be included in the local planning scheme;
+ Strategic Plan – comprised of land use categories and a spatial plan of strategic land uses, infrastructure, and natural resources. The focus is on the general pattern of land use rather than specific zones.
+ Category specific objectives, strategies and actions – by which the strategy objectives are to be pursued and the strategic plan implemented, including potential local planning scheme provisions such as zones and development control, and proactive measures such as infrastructure development, promotion, direct investment, or other development initiatives.
+ Implementation – explanation of how the Shire will go about implementing the local planning strategy including how it will be used to inform future planning decisions both as longer-term projects with a longer-term timelines.

Part 2 includes:

+ Introduction – explaining the role and purpose of the LPS, its relationship to other planning mechanisms, the regulatory framework, and procedure for preparation, consultation, and approval;
+ State and regional planning context – explaining the planning framework to which the local planning strategy and other local planning documents must respond;
+ Local planning context – explaining the local circumstances within which planning must take place;
+ Local profile – includes a description of the major physical, environmental, social and economic influences relevant to planning for the future within the Shire;
+ Analysis of key issues arising from the local profile including an explanation of each issue, which interests are affected, the areas that are particularly affected, the urgency of the matter, and the information available to establish future direction.

Additionally, Part 2 involved consultation with key stakeholders identified with the potential to influence the future development of the Shire. Information received and feedback gained during consultation has informed the context for the LPS and assisted in defining the opportunities and constraints.

RESPONDING TO CHANGES IN THE LOCAL CONTEXT

The Shire of Serpentine Jarrahdale is one of the largest local governments in the greater Perth and Peel Metropolitan Region, having an area of 905 km^2. Situated approximately 45 kilometres and 45 minutes' drive south of Perth city centre and 13 kilometres inland from the Indian Ocean, the Shire has experienced significant growth within its major towns of Byford, Mundijong, Serpentine and Jarrahdale, as well as in rural-residential areas in Oakford and Darling Downs, being the most densely subdivided and developed areas.

The LPS has been based on a contextual analysis of the Shire of Serpentine Jarrahdale whilst aligning with the overarching State and regional framework for the region. It has been developed relative to current State, regional and local planning policies and strategies. The result is a LPS that provides an integrated and coordinated solution that emphasises and reinforces the State Government's objectives, whilst providing bespoke responses and priorities to particular issues affecting the Shire of Serpentine Jarrahdale.



2036

31,039 AS OF 2018

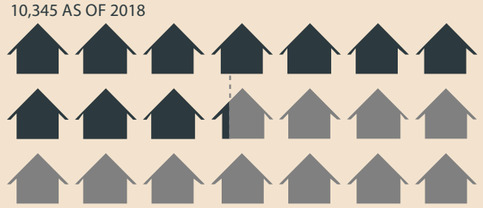


68,335 FORECAST POPULATION IN 2036



2.9 Average Household Size

10,345 AS OF 2018

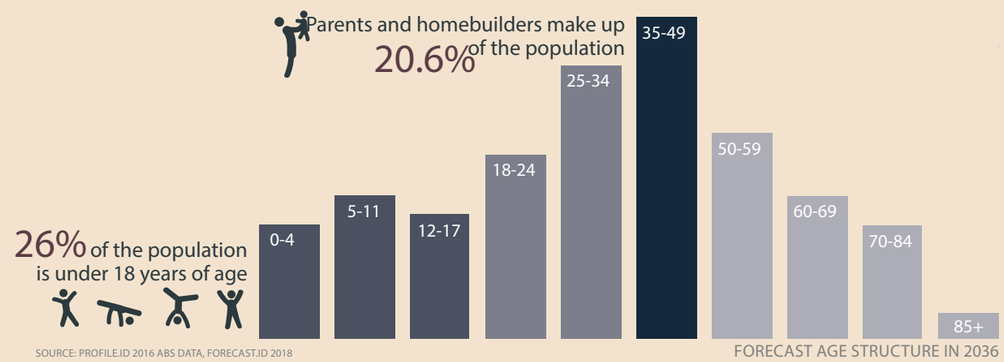


23,310 HOUSEHOLDS IN 2036

POPULATION FORECASTING

In conjunction with the LPS Review, a study into the 2036 forecast residential population of the Shire was undertaken. Following a preliminary analysis, it was evident existing growth forecasts for the Shire are considered to be 'significant' reflecting current trends anticipated for the area. The forecasting activities focused on the Shire of Serpentine Jarrahdale Local Government Area, with a primary focus on the key townsites of Byford, Mundijong and Serpentine.

Population forecasts are imperative for developing strategies that are suitable for the likely residential population growth, developing targeted approaches to meet future demands and therefore, delivering positive long term outcomes. Future growth will have a significant effect on the demographic composition of the Shire as new residents look for housing, jobs, services, entertainment and a sustainable lifestyle all accessed locally. Similarly, many baby boomers are choosing to downsize into smaller houses and townhouses. These trends will result in a significant shift in the shire's development pattern.



SOURCE: PROFILE.ID 2016 ABS DATA, FORECAST.ID 2018

FORECAST AGE STRUCTURE IN 2036

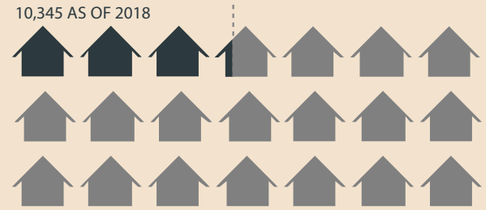
2050

110,000
POPULATION FORECAST IN 2050



31,039 AS OF 2018

10,345 AS OF 2018



42,242 FORECAST HOUSEHOLDS IN 2050

"Investing in public transport is an important priority for our shire"

SJ2050



CHALLENGES

The Shire's development in the past decade (2008 to 2018) illustrates the dynamics of the economy and population. It is anticipated fluctuations in the regions populations and rapid shifts in the global economy will present challenges for the sustained prosperity of the Shire.

The outcome of the background research and analysis undertaken in Part 2 identified key planning issues and constraints facing the Shire. The importance of population growth and development as a central influence of many of the issues and opportunities in the Shire should be noted, highlighting the importance of strategic planning interventions such as the LPS in positioning the Shire to respond to future social and economic change.

The LPS has been formulated to respond to the broad challenges that the Shire is both currently confronting, and projected to encounter over the next ten years. These challenges provide the backbone and evidence base for the LPS. They inform the strategy objectives and guide the strategies and actions to generate appropriate and focused change within the Shire. An assessment of key planning issues highlight the following strategic

Population Growth and Development

+ To accommodate a population of over 100,000 with anticipated growth of 6.5% between now and 2050, a particular challenge will be providing infrastructure with adequate capacity in a timely manner without burdening the community and economy in the short term with the cost of providing infrastructure that may not be required for many years.
+ Accommodating a significant number of new residential dwellings (around 42,242) by 2050 will require significant increases in dwelling density if valued rural land and landscapes are not to be consumed by a continuation of the unsustainable low density urban sprawl that has characterised so much suburban development to date.
+ To achieve higher density housing this needs to provide greater diversity. For example, dwellings need to be designed to meet the needs of families, share households, couples and singles – owner occupiers as well as renters.
+ One issue discouraging implementation of higher density housing in what is essentially a peri-urban area is the lack of connectivity – by private vehicles or other transport modes including public transport.
+ The economy of the Shire must grow and diversify to match population growth.

Place

People

Prosperity

LOCAL CHALLENGES

Urban Design

+ Balancing a desire to preserve the shire's uniqueness with the potentially conflicting pressures of accommodating the housing, employment and services needs of a growing population is one of the biggest challenges for planning in the Shire.

Heritage and Culture

+ Heritage places, including places of natural heritage value, are important contributors not only to the Shire's visual character but also to its cultural identity and the local economy through a multitude of tourism opportunities.

Rural

+ Pressure to further subdivide rural land for rural-residential lots, particularly in locations where provision of supporting utility, service, and community infrastructure cannot be guaranteed or is very expensive.

Transport

+ The private car is an even more dominant mode of transport within the Shire than it is across the metropolitan area generally. Public transport and active modes such as walking and cycling are low.

+ Employment locations highlight the absolute need for good transport links from the Shire if residents are going to be able to access jobs.

+ While every effort must be taken to separate freight from activity and residential areas, road freight traffic is still required to access businesses within centres and travel through local residential areas where pedestrians and cyclists commute.

Community Facilities

+ Community buildings require a large capital investment to provide and maintain so it is important that both design and management maximises sustainability.

+ Better distribution of facilities based on population is required between the activity centres of Byford, Mundijong, Serpentine and Jarrahdale. Rationalisation of facilities is advisable to ensure better use and better standards of facilities.

Recreation and Open Space

+ Over half of the Shire's population is currently outside the recommended catchment of any form of public open space.

+ Limited provision of public open space suitable for sporting purposes must be addressed on a regional, district and local scale in structure plans for new areas and also when considering the redevelopment of existing park assets.

Utility Services

+ At present, service provision is still largely traditional and this must be allowed for in planning, however planning must also remain flexible enough to respond to alternative modes of delivery.

+ Changes in regulation as well as technology are also making it more viable for private providers to enter the market, including for water supply and waste water treatment.

+ Important to ensure that development in the Shire is not hampered by inadequate infrastructure to meet the needs of emerging technologies.

Economy

+ The economy of the Shire must grow and diversify to match population growth. Key to this will be encouraging economic and business development within the Shire to strengthen local employment and the local economy.

+ Diversifying and expanding the largely agricultural economic base in response to contextual challenges and opportunities, in areas of competitive, comparative and collaborative advantage within the regional setting.

+ Preserving and enhancing the Shire's rural character and role as regional food bowl and food exporter, in the face of population growth and major climate change impacts.

Environment

+ Many Shire reserves suffer from high levels of disturbance, and this encourages weed invasion. Uncontrolled access also leading to a direct loss of biodiversity.

+ Altered hydrology is a key water resource consideration. Filling of land has resulted in a loss of wetlands and the installation of drains has significantly altered the natural hydrology of the landscape.

+ Erosion is a risk from clearing, whether for agricultural, urban or other uses, particularly along the Darling Scarp.

+ Impacts of climate change coupled with natural climate variability continue to be felt. Temperature increases are likely to result in increased needs for cooling and/or impacts on environmental and public health.



2.0 STRATEGIC INTENT

2.0 STRATEGIC INTENT

SHAPING OUR FUTURE: SCENARIO TESTING

A key part of the SJ2050 visioning process was the testing of three growth scenarios. The scenarios were driven by population projections of Perth and Peel @3.5 trends, forecasts and a review of existing strategies to reflect the different ways the shire could grow in the future. The scenario options resulted in differing development patterns of land use, residential density and employment opportunities, each with unique issues and constraints.

No scenario met all potential shire priorities, however, feedback was used to help create a refined growth scenario and guide the development of the vision goals. Figure 3 captures the refined scenario illustrating centralised containment of growth and reinforcement of east-west corridors. New high to medium density development is concentrated around both Byford and Mundijong, spreading west. The District centres will be self-sufficient and will include mixed-use development, apartments and townhouses with a focus on higher density surrounding transit nodes. The unique rural character of the area will be maintained and enhanced with the development of neighbourhood centres and the surrounding farmland retained as a major local industry for the shire. Dedicated greenways with bus and cycle access will be utilised as the dominant movement system. These will connect the shire with existing rail infrastructure a opening up access to employment and education opportunities.

SHAPING OUR FUTURE: THE SJ2050 SPATIAL FRAMEWORK

The SJ2050 Spatial Framework illustrated in Figure 4. represents a future where the Shire have taken steps to reach a shared Vision and Outcomes. It was created using the best ideas from the public and local stakeholder input. The Framework is a roadmap for the shire's future, as shaped by the SJ2050 participants and stakeholders. The Spatial Framework depicts how various elements - such as well-planned residential development, reinvesting in existing centres and neighbourhoods, and a revitalised urban core and main street environments - will function.

The Spatial Framework embodies the values and outcomes expressed by the Serpentine Jarrahdale residents by: helping to keep existing centres strong; maintaining the shire's low cost of living; embracing new technology and innovations to expand its economic base; providing high mobility and new transportation options, such as a rapid bus and greenways, and access to nature and recreational opportunities.

SJ2050 strikes a balance between concentrated growth and distributed growth, locating mixed use development in the urban core and smaller centres. The Framework incorporates the uniqueness of our rural and natural environments to create strategies for preserving and enhancing these natural assets. Finally, the Framework was refined by using feedback from the local community and Shire staff to ensure strong direction for the future prosperity of the shire.

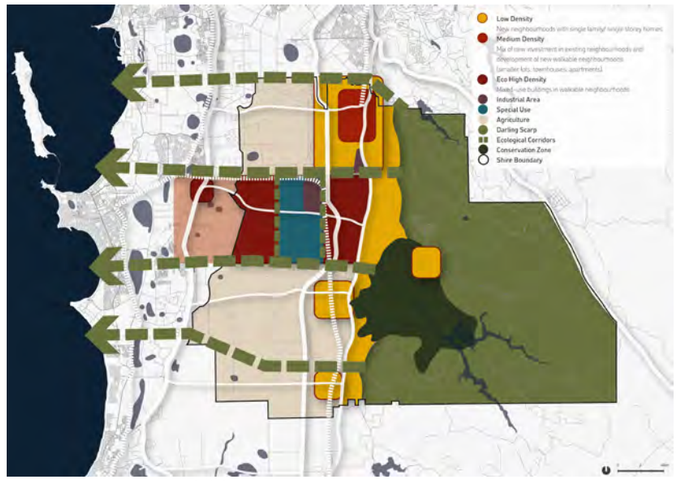


Figure 3: Serpentine Jarrahdale Vision Scenario



Figure 4: SJ2050 Spatial Framework



COMMUNITY VISION

"CITY LIVING OFFERING A RURAL LIFESTYLE WITH ABUNDANT OPPORTUNITIES FOR A DIVERSE COMMUNITY"

PLANNING PRINCIPLES

The LPS is underpinned, developed and informed by a set of core planning principles which apply across the Serpentine Jarrahdale region. The purpose of the principles is to aid in delivery of sustained prosperity and improved liveability within the Shire.

The Principles have been generated to guide the Shire's vision, underline the LPS and underpin each of the strategic recommendations. This ensures a suite of implementable contextual recommendations that align with State and regional planning frameworks.

Liveability: Ensure communities offer a high quality of life and amenity.

Sustainability: Ensure development considers social, economic and environmental outcomes and does not compromise intergenerational equity.

Innovation: Strive to become a local government at the forefront of new technology and ideas, which encourages creativity and inventiveness to generate opportunities and address challenges.

Inclusion: Create communities which embrace diversity, foster a sense of belonging and encourage all members of the community to participate in the planning and decision making process.

Integration: Ensure that communities are planned in a coordinated and balanced manner with a multidisciplinary perspective to optimise functionality and self-sufficiency.

Connectivity: Develop and strengthen linkages within both the local context and the wider region.

Equity: Minimise spatial disparity and support the provision of services and infrastructure to improve accessibility.

Efficiency: Ensure land and resources are managed effectively to minimise consumption and maximise benefit.

Resilience: Demonstrate an ability to adapt and respond to future challenges.

STRATEGIC OBJECTIVES

The Objectives of the Local Planning Strategy have been informed by key challenges of the Shire identified in Chapter 2 to guide the specific direction of the Strategy Plan. These have been embedded within the Plan and provide the rationale for the Land Use Categories, which from a part of the Strategic Plan. The Objectives are contextually driven, aligning with the key areas of focus for the Shire.

The Objectives of the Local Planning Strategy are to:

Place

» Unique Character
Ensure the diversity of natural and cultural landscapes in the Shire continue to offer an array of unique experiences to visitors and communities, enhancing social cohesion and a shared sense of place.

» Consolidated Urban Form
Promote urban consolidation by making better use of existing zoned land and infrastructure through better-quality infill redevelopment and rural living development.

People

» Inclusive Communities
Attract people to the Shire's many places and spaces supported by iconic landscapes, unique histories, range of activities and integrated settlement structures.

» Infrastructure and Technology
Explore incentives for the continued investment in research and development to ensure ongoing innovation and training help the shire remain competitive, resilience and sustainability.

Prosperity

» Economic Diversity and Regional Development
Enhance our local competitiveness by seizing opportunities to diversity through innovation, research and development to create value-added goods, services and increased efficiencies.

Ensure, as our Shire grows, new homes, employment areas and places to shop are located in areas that are well planned, connected and affordable.

Ensure as the Shire grows, strong governance will guide well designed growth that makes the most efficient use of existing and planned infrastructure and investment.

» Environment and Water
Maintain access to the natural environment and preservation of our high value natural assets for future generations to come.

3.0
STRATEGIC PLAN
PLACE

3.0 PLACE

3.1 URBAN AREAS AND TOWNSITES

DESCRIPTION:

Urban areas provide for key infrastructure such as housing, shops, offices, health, financial and social services, educational establishments, and community and cultural facilities. The two largest urban centres within the Shire are the growth areas of Byford and Mundijong with two smaller urban areas in the form of the Serpentine and Jarrahdale townsites. The spatial development pattern of urban areas within the Shire currently follows a nodal development pattern interspersed by green corridors and rural forms of development.

RATIONALE

The urban areas within the Shire will be the focus of significant population growth over the next few decades. The Shire's population is projected to expand to approximately 68,335 persons by 2036, with the majority of growth occurring in Byford and Mundijong areas.

To accommodate such population growth, the urban areas will need to accommodate increased residential densities, employment opportunities, a range of services and facilities and improved transport connections. The nodal urban development structure comprised of defined urban centres separated by rural wedges is central to the preservation of the Shire's rural character and heritage values which distinguish urban development in the Shire from other urban areas within the metropolitan region.

It is therefore crucial that urban sprawl is contained and urban development only occurs within discrete cells which have unique, locally distinctive characteristics. This is supported by population forecasting for the Shire which indicates that projected growth can be accommodated within the currently planned urban areas. The structure of urban areas within the Shire can be summarised as follows:

Table 1: Urban Structure

Urban Area	Approximate Land area	Approximate Target Population
Byford	5,530 ha	50,000
Mundijong	5,461 ha	50,000
Serpentine	7,270 ha	5,000
Jarrahdale	45,032 ha	2,500

To achieve the urban structure described above, urban development should be contained within the existing areas planned for urban purposes (See Figure 5). The adaptability of lots and dwellings to meet the changing needs of the community will also be an important component in the design of this urban structure.

It is important for each of these urban centres and townsites to be developed with a distinctiveness and unique local identity which offers a different living environment. Providing a diversity of housing opportunities to suit a range of demographics, household types and lifestyle preferences will be important in achieving this urban structure. Proposals for new development or infill should also give consideration to the design of both the built form and the public realm to achieve high quality urban design outcomes, as well as the protection of the natural landscape.

Urban expansion should only be considered where the land has been identified as a Development Investigation Area within the Strategy to enable the necessary strategic planning for future population growth. All of the Development Investigation Areas identified by the Strategy are located adjacent to existing urban areas and have the potential to be contained within logical boundaries such as major roads. It is particularly important to designate strong boundaries to contain urban development and prevent sprawl. As these areas are identified for investigation purposes under this Strategy, it is important to note that the entire land area of each Development Investigation Area may not be considered appropriate for urban expansion, subject to further assessment and planning. The following Development Investigation Areas have been identified in the Strategy:

Table 2: Development Investigation Areas

Urban Area	Approximate Land area (ha)
DIA 1 - Byford	100 ha
DIA 2 - Byford	33 ha
DIA 3 - Byford	97 ha
DIA 1 - Mundijong	367 ha
DIA 2 - Mundijong	148 ha
DIA 3 - Mundijong	37 ha

3.1.1 URBAN DESIGN

OBJECTIVES

+ Achieve distinctive and locally responsive built form and public realm that enhances sense of place, community identity and the character of the urban areas and townsites.
+ Maintain a connection to nature and the environment while creating dense nodes within centres and other activity corridors.
+ Preserve and enhance existing character areas within existing urban areas and townsites and sensitively manage density transitions.
+ Create well-designed, walkable and safe streetscapes and public realm with a high level of amenity.
+ Achieve a high standard of building and urban design throughout the Shire.
+ Minimise the urban heat island effect.

Table 3: Urban Design: Strategy and Actions Summary

STRATEGIES

a. Ensure developments demonstrate a design response to the local context including climate, landscape and heritage.

b. Ensure density is delivered in a sensitive and integrated manner with regard to scale, bulk, views and amenity.

c. Ensure streetscapes and public spaces are accessible, legible and activated with many opportunities for passive surveillance natural elements and landscaping.

d. Ensure developments incorporate a high standard of landscaping which incorporates native vegetation.

e. Require the provision of locally relevant public art in significant developments and encourage early involvement of artists in the design of buildings and public spaces.

f. Encourage the retention of established trees in all developments and redevelopments.

g. Establish clear expectations for the design of all new development including buildings and the public realm.

ACTIONS

1. Prepare Development Strategies for Byford, Mundijong, Serpentine and Jarrahdale to guide the design and character of built form, streetscapes and the public realm to create a distinctive sense of place and local identity.
2. Include provisions within LPS 3 which allow the Shire to require landscaping for any development.
3. Include tree protection provisions within LPS 3.
4. Establish a Design Review Panel to provide expert advice on the design of significant development.
5. Include a provision in LPS 3 to allow the Shire to refer any development proposal to the Design Review Panel.
6. Develop a LPP or guidance document that sets out the Shire's expectations with regard to design quality and the operation of the Design Review Panel.
7. Prepare an Urban Forest Strategy.

3.1.2 BYFORD

OBJECTIVES

+ Achieve a diversity of housing types to provide choice, adaptability and to accommodate a range of incomes, households, life stages and the changing demographics of Byford.
+ Achieve greater housing densities in proximity to the Byford Town Centre, neighbourhood activity centres, schools, community facilities, public open space and transport nodes and corridors to improve accessibility and enhance community connections.
+ Integrate new housing and urban development with nearby rural land types and natural areas as well as older urban development patterns and housing in a sensitive manner.
+ Encourage urban development and housing to be environmentally sustainable and resource efficient.
+ Protect the Byford Trotting Complex and aim to minimise land use conflicts

Table 4: Byford: Strategy and Actions Summary

STRATEGIES:	ACTIONS:
a. Ensure that local structure plans and subdivision plans include a diversity of lot sizes to accommodate a range of housing types and sizes. b. Require applicants to demonstrate how housing diversity will be achieved, which may include the incorporation and retention of a range of housing types, tenures and price ranges in new residential developments. c. Encourage applicants to deliver a proportion of locally responsive housing outcomes (e.g. seasonal workers lodges, aged-care housing). d. Encourage built form, particularly dwellings, to be capable of being adapted in response to changing needs over time. e. Identify potential areas for densification or mixed uses within or surrounding the Byford Town Centre or other activity nodes or corridors. f. Restrict further subdivision within the Byford Trotting Complex precinct to preserve the well-established equestrian heritage in Byford, promote a diversity of housing types and address the interface between residential and the rural living areas surrounding the Byford Trotting Complex. g. Preserve historical urban development patterns to maintain the character and uniqueness of Byford and retain existing larger lots to provide a range of housing types and lot sizes. h. Preserve the historical urban development patterns of the Byford 'Old Quarter' while sensitively and selectively allowing for increases to density. i. Encourage housing to conform to universal and sustainable design principles.	1. Prepare a Local Area Plan for Byford to guide development, activity centres, density, housing typologies and configurations for the various precincts within Byford. 2. Review the Byford Town Centre Structure Plan. 3. Review the development contribution scheme and plan for Byford. 4. Prepare a development contribution scheme and plan for community infrastructure within Byford. 5. Identify land to the south of the Byford urban area and east of the future Tonkin Highway as a Development Investigation Area. 6. Include the Byford Trotting Complex precinct within a special control area under LPS 3 to maintain a diversity of lot sizes and dwelling types and preserve the historical character of this area and highlight its importance to the character of Byford. 7. Allow increased residential densities within centre zones in Byford under LPS 3. 8. Zone specific, strategically located land along South Western Highway within a 400m proximity to the Byford Town Centre as Mixed Use to provide greater diversity to the housing product offered in Byford. 9. Zone existing, larger lots in the Byford Old Quarter as Residential with an appropriate R-Code to prevent further subdivision and retain a range of lot sizes.

3.1.3 MUNDIJONG

OBJECTIVES

+ Achieve a diversity of housing types to provide choice, adaptability and to accommodate a range of incomes, households and life stages and to deliver housing product which will attract people to live in Mundijong.
+ Achieve distinctive urban precincts within Mundijong.
+ Integrate new housing and urban development with the older urban development patterns and housing as well as natural areas in a sensitive manner.
+ Encourage urban development and housing to be environmentally sustainable and resource efficient.

Table 5: Mundijong: Strategy and Actions Summary

STRATEGIES	ACTIONS
a. Ensure that local structure plans prepared for each precinct identify appropriate opportunities for increased residential densities. b. Ensure that structure plans and subdivisions plan for urban development in a responsive manner to existing and planned centres, facilities and natural features. c. Ensure that the future urban development of the existing Mundijong townsite and surrounding area responds to the historical settlement patterns and preserves the character and heritage of Mundijong. d. Ensure that local structure plans and subdivision plans include a diversity of lot sizes to accommodate a range of housing types and sizes. e. Require applicants to demonstrate how housing diversity will be achieved, which may include the incorporation and retention of a range of housing types and tenures in new residential developments. f. Encourage built form, particularly dwellings, to be capable of being adapted in response to changing needs over time. g. Encourage housing to conform to universal and sustainable design principles. h. Investigate the potential for urban expansion within the consolidated land parcels north of the Mundijong urban area and Bishop Road, with the potential to extend Norman Road to the west as a potential boundary to the urban expansion. i. Investigate the potential for urban expansion in the area between the existing southern boundary of the Mundijong urban area and north of the proposed Tonkin Highway extension to South Western Highway.	1. Prepare a Development Strategy for Mundijong to guide development, activity centres, density, housing typologies and configurations for the various precincts within Mundijong. 2. Review the Mundijong District Structure Plan. 3. Prepare a development contribution scheme and plan for Mundijong. 4. Identify the consolidated land parcels north of the Mundijong urban area and Bishop Road as a Development Investigation Area. 5. Identify the area between the existing southern boundary of the Mundijong urban area and north of the proposed Tonkin Highway extension to South Western Highway as a Development Investigation Area

3.1.4 SERPENTINE

OBJECTIVES

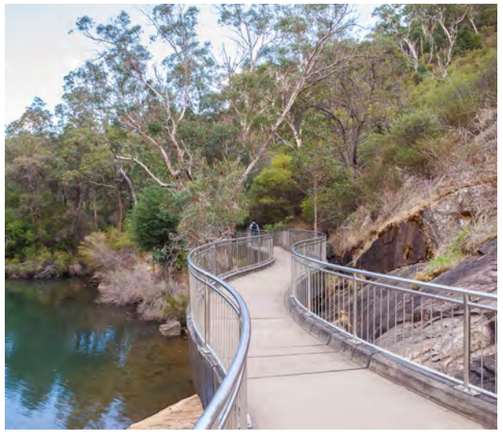
+ Provide a range of housing choices and lot sizes while preserving the character of the existing Serpentine townsite.
+ Increase the housing provision within the Serpentine townsite to provide more opportunities for housing in a rural setting and to accommodate greater populations to sustain the neighbourhood centre.
+ Encourage urban development and housing to be environmentally sustainable and resource efficient.

Table 6: Serpentine: Strategy and Actions Summary

STRATEGIES	ACTIONS
a. Encourage smaller lot sizes and denser housing forms to be located within and surrounding the neighbourhood centre. b. Provide increased residential densities in a sensitive manner which does not adversely impact the amenity of the rural context of the Serpentine townsite. c. Ensure that subdivision plans are responsive to the existing settlement pattern of the Serpentine townsite. d. Encourage housing to conform to universal and sustainable design principles.	1. Prepare a Development Strategy for Serpentine to guide development, growth, the neighbourhood centre, housing typologies and configurations.



Serpentine



Serpentine Falls National Park

3.1.5 JARRAHDALE

OBJECTIVES

+ Recognise and preserve the rich heritage of the Jarrahdale settlement.
+ Maintain a strong connection to the landscape and environment within the townsite of Jarrahdale.
+ Create a unique sense of place within the Jarrahdale townsite which will attract a specific market.

Table 7: Jarrahdale: Strategy and Actions Summary

STRATEGIES	ACTIONS
a. Encourage alternative forms of housing which represent the character of Jarrahdale. b. Preserve the natural environment and landscape and integrate the built form with natural elements. c. Preserve historical development patterns and buildings to celebrate the heritage of Jarrahdale. d. Encourage development and activities which promote tourism.	1. Prepare a Development Strategy for Jarrahdale to guide development, growth, the neighbourhood centre, housing typologies and configurations. 2. Include a special use zone within LPS 3 to provide appropriate land use and development provisions which preserve the heritage and character of Jarrahdale. 3. Establish a Special Control Area for Jarrahdale Heritage Precinct within LPS 3 to ensure the preservation of the heritage character of the Precinct.



Saw-Mill Jarrahdale



Millbrook Winery

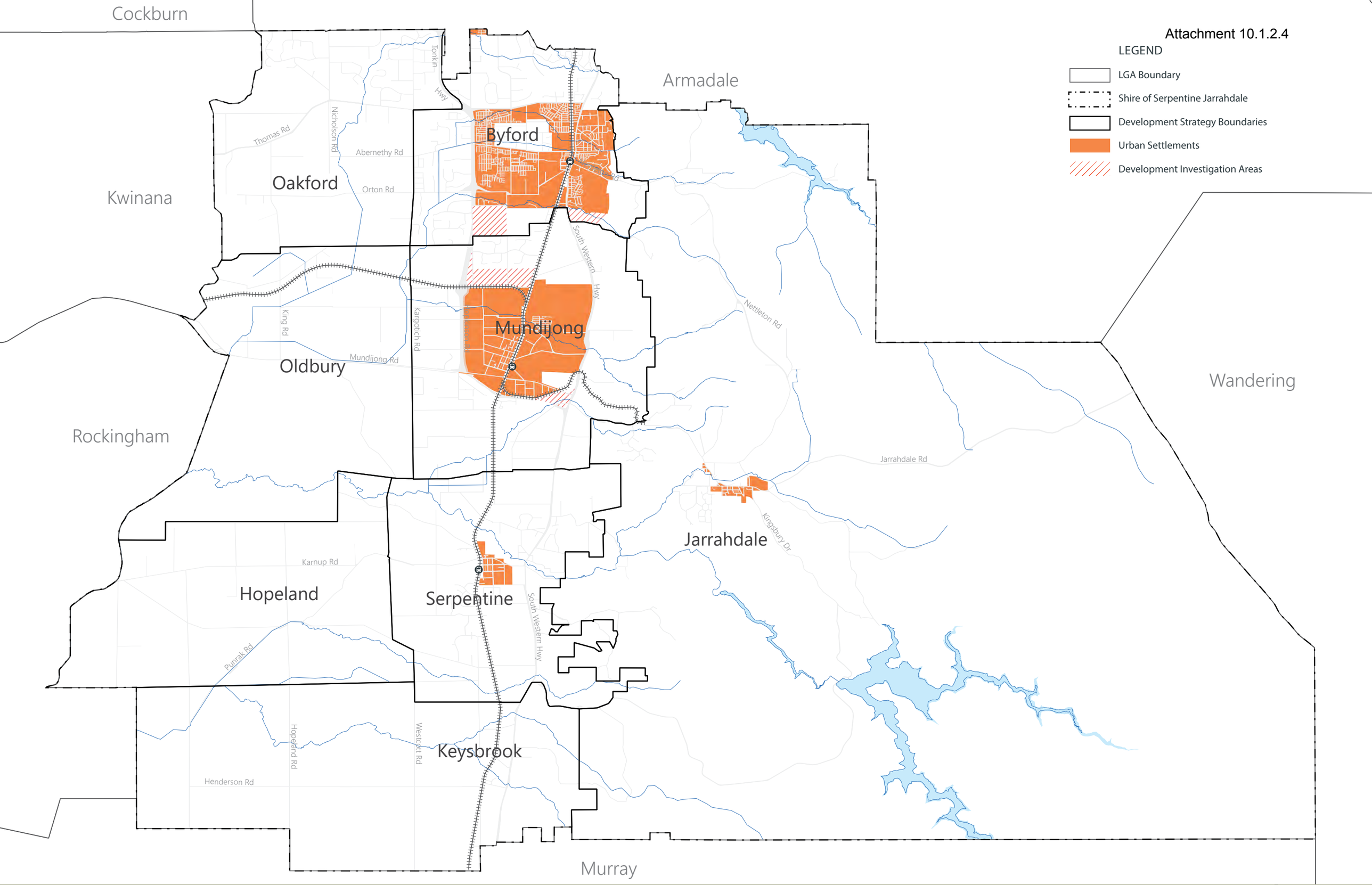


FIGURE 5: SETTLEMENTS

3.2 RURAL LIVING

DESCRIPTION:

The Rural Living land use category provides for residential development in a rural lifestyle context. Lot sizes generally range between 4,000m^2 and 4ha depending on the location of the Rural Living area within the Shire. Rural Living areas are generally located around existing urban areas and townsites and contained within logical and defined boundaries. Some rural pursuits may be permitted in Rural Living areas to allow for the development of hobby farms at an appropriate scale and in suitable locations. The other land uses within Rural Living areas should be of a predominantly residential nature.

RATIONALE

The amenity and character within Rural Living areas is recognised as an important aspect of housing choice within the Shire. Such areas should be retained and enhanced to ensure a high amenity living environment with strong connections to nature. Rural Living areas should be sensitively and appropriately located adjacent to existing urban areas and townsites in close proximity to facilities and services as depicted in Figure 6.

It is considered important for Rural Living areas to be contained within defined boundaries to prevent sensitive land uses and development from encroaching into rural areas and to ensure the increased populations in Rural Living areas are well located. Rural Living opportunities should be offered at a variety of scales which account for differing land use requirements. The preservation of environmental and landscape values is an integral element of maintaining high quality Rural Living areas which characterise the rural character and amenity that is important to the Shire's community. Rural Living areas should be arranged to form consolidated precincts which seek to preserve the natural environment and amenity of specific areas.

A Rural Residential sub category has been included to provide the opportunity for rural lifestyle properties with predominantly residential land uses to be catered for. The Special Residential sub category ensures that larger residential lots, developed within a rural context, are accommodated and preserved.

The Shire has a well-established focus on equestrian activities which is one of the defining elements of rural character within the Shire. A significant aspect of the Rural Living land use category is to provide lots for equestrian purposes. In addition to providing local character, the equine industry also has economic potential for support services and tourism. The growth of the equine industry should be supported and existing equine areas retained within Rural Living areas.

It is the intent that these areas provide for Residential and Stables land uses reinforcing a character different to other rural living areas. It is important for these areas to be identified at a strategic level as different land use and policy provisions may be required.

Rural Smallholdings areas provide an important rural lifestyle opportunity within the Shire. These areas allow for some rural land uses to be developed while preserving amenity and protecting the environment to create areas with enhanced rural character. Rural Smallholdings areas should be comprised of a variety of lot sizes and property types to accommodate a range land uses and lifestyles which do not compromise the amenity or environmental values of the surrounding area. This land use category provides the option to live in a high amenity rural environment on lots which are large enough to establish some rural land uses. Rural Smallholdings should be located to prevent areas with high natural amenity and character from being adversely affected by some of the more intensive rural land uses. Rural Smallholdings areas may also be located to sensitively manage the transition to more intensive rural land uses.

Providing a residence for additional farm workers can be crucial where the scale and nature of the agricultural enterprise routinely requires additional employees. This land use is recommended for inclusion to provide the opportunity for such additional dwellings for regular workers on an agricultural enterprise where there is a demonstrated need. Planning measures to control the development of rural workers dwellings, retain the productive use of the land and prevent development of a rural lifestyle nature will be necessary to ensure the intent of this land use.

3.2.1 SPECIAL RESIDENTIAL

OBJECTIVES

+ Preserve and enhance the high amenity residential development qualities of Special Residential areas in a rural living context.
+ Clearly distinguish Special Residential areas from other urban areas and rural living development.
+ Accommodate specific lifestyles and enable choice.
+ Ensure Special Residential developments are sensitive to environmental values.
+ Provide for Special Residential development in appropriate, well-located areas.

Table 8: Special Residential: Strategy and Actions Summary

STRATEGIES	ACTIONS
a. Contain Special Residential developments within defined areas and consolidate existing precincts.	1. Include a Special Residential zone under LPS 3 to ensure existing larger residential lots are accommodated within a rural lifestyle context.
b. Locate defined Special Residential areas around urban areas to provide a buffer to rural land uses and to define the urban edge.	2. Specify a 4,000m^2 lot size minimum for the Special Residential zone under LPS 3.
c. Provide for high amenity Special Residential areas by excluding some agricultural uses that may impact amenity.	3. Reserve existing bridle trails as Public Open Space under LPS 3.
d. Exclude land uses from Special Residential areas which may result in environmental or landscape degradation.	
e. Maintain a network of bridle trails to support equestrian activities within relevant areas.	

3.2.2 RURAL RESIDENTIAL

OBJECTIVES

+ Provide for Rural Residential development in appropriate, well-located areas.
+ Prevent the 'sprawl' of Rural Residential areas into rural areas.
+ Preserve and enhance the existing rural character of Rural Residential properties.
+ Accommodate a range of lifestyles and enable choice.
+ Ensure Rural Residential developments are sensitive to environmental values.
+ Protect the Byford Trotting Complex and aim to minimise land use conflicts.

Table 9: Rural Residential: Strategy and Actions Summary

STRATEGIES	ACTIONS
a. Contain Rural Residential developments within defined areas and consolidate existing precincts of Rural Residential development in close proximity to existing or planned urban centres or townsites.	1. Include a Rural Residential zone within the LPS 3 to allow for rural lifestyle properties with predominantly residential land uses.
b. Locate defined Rural Residential areas around urban areas to provide a buffer to rural land uses and to define the urban edge.	2. Introduce Rural Residential Codes to designate the Rural Residential lots with a 1ha subdivision minimum and those with a 2ha subdivision minimum.
c. Provide for high amenity Rural Residential areas which exclude potentially conflicting rural land uses and limit the establishment of rural industries.	3. Include the Byford Trotting Complex precinct as a special control area within LPS 3 to protect the heritage of equine land uses within this precinct and enhance the equestrian identity of the area.
d. Clearly define the boundaries of Rural Residential areas and rural areas.	4. Reserve existing bridle trails as Public Open Space under LPS 3.
e. Identify different forms of Rural Residential development with differing lot sizes.	5. Investigate trails as a part of a transport plan.
f. Exclude land uses from Rural Residential areas which may result in environmental or landscape degradation.	
g. Maintain a network of bridle trails to support equestrian activities within relevant areas.	
h. Recognise and provide for the continuation of trotting activities in Byford.	
i. Provide for a range of Rural Residential lot sizes.	

3.2.3 RURAL SMALLHOLDINGS

OBJECTIVES

+ Preserve and enhance the existing larger rural living lots and equestrian character of Rural Smallholdings areas.
+ Accommodate a variety of land uses and types of properties to provide choice.
+ Maintain a strong equestrian identity and the continued development of the equine industry as a significant contributor to the local economy.
+ Ensure Rural Smallholdings areas are sensitive to, and enhance environmental values and water systems.

Table 10: Rural Smallholdings: Strategy and Actions Summary

STRATEGIES	ACTIONS
a. Retain a range of lot sizes to accommodate various land uses and provide larger lots for equine land uses which encourage sustainable practices that considers viable stocking rates.	1. Include a Rural Smallholdings zone within LPS 3 to provide for high amenity rural lifestyle and equestrian areas on larger lots between 4 ha – 40 ha, and exclude potentially conflicting land uses.
b. Exclude intensive rural industries from Rural Smallholdings areas to preserve a high level of amenity and character.	2. Allow for up to one rural worker's dwelling in addition to the main dwelling to provide accommodation for workers of agricultural businesses on lots within the Rural Smallholdings zone under LPS3, where appropriate.
c. Exclude land uses from Rural Smallholdings areas which may result in environmental or landscape degradation.	3. Investigate trails as a part of a transport plan.
d. Encourage the development of equestrian land uses and supporting services in appropriate areas.	
e. Maintain a network of bridle trails to support equestrian activities within relevant areas.	

3.2.4 RESIDENTIAL AND STABLES

OBJECTIVES

+ Recognise the importance of the equine industry.
+ Recognise the adverse impacts of some activities carried out within rural living areas and ensure that these are adequately planned for.
+ Maintain a strong equestrian identity and the continued development of the equine industry as a significant contributor to the local economy.
+ Main and protect the rural living and equine dominated character of these areas.

Table 11: Residential and Stables: Strategy and Actions Summary

STRATEGIES	ACTIONS
a. Ensure development is compatible with the equine dominated character of the area. b. Retain larger rural living lot sizes in these areas to prevent the intensive stabling of horses. c. Ensure these areas are zoned appropriately to exclude potentially incompatible land uses.	1. Zone land within this category as either Rural Residential (2ha subdivision minimum) or Rural Smallholdings (4ha subdivision minimum). 2. Reserve existing bridle trails as Public Open Space under LPS 3. 3. Investigate trails as a part of a transport plan.



Rural Living, Cardup

3.3 RURAL

DESCRIPTION:

The Rural land use category provides for a full range of rural land uses, tourism opportunities, rural enterprise and the preservation of the natural landscape. Rural land facilitates agricultural production and the protection of the natural landscape. A significant proportion of the Shire is comprised of rural areas which are located in many of the undeveloped areas of the Shire where it is considered preferable for large lots to be retained. Rural enterprise areas allow for the operation of rural and light industries on the same lot as a residential dwelling, enabling businesses and intensive agricultural industries. Rural enterprise land is identified in the Oakford area where many smaller lot sizes already exist and accommodate light industrial and intensive agricultural land uses.

RATIONALE

Rural land including both agricultural and natural areas are central to the local economy, lifestyle opportunities and character of the Shire. The various rural and agricultural activities undertaken within rural areas support significant economic activity and economic opportunity. The Shire considers it is important to maintain rural land in close proximity to Perth to accommodate various rural industries and food production activities for the growing population. It is important that rural land is preserved for this purpose and is not consumed by the encroachment of inappropriate activities or suburban expansion. Preserving the natural landscape is also an important function of the Rural land use category to maintain rural character. Rural land can also support the expansion of the tourism economy by providing a combination of attractive landscapes ranging from pastoral and horticultural to natural bushland, and accommodating a range of tourist activities and attractions. Rural Enterprise areas provide the opportunity to operate rural and light industrial businesses on the same lot as a residential dwelling (Figure 6).

In order to protect the Shire's agricultural areas it is important to preserve land capable of supporting specific types of agricultural production without causing damage. A number of different Landscape Systems are located throughout the Shire. Each landscape system is defined based on the soil types found and their characteristics. This also provides correlation between the landscape system and land capability. Areas of low, moderate and high capability soil types exist across the Shire. In general there are four ratings provided. Annual horticulture typically includes the production of irrigated horticultural crops which have short-term life cycles such as annual fruits, vegetables and cut flowers. Perennial horticulture typically includes the production of irrigated horticultural crops which have long life cycles such as trees, shrubs and woody vines. Dryland Cropping encompasses the production of rain-fed field crops (i.e. without the use of irrigation) under a cropping system that incorporates minimal tillage and stubble retention. This includes crops such as wheat, barley, canola, lupins and oats. Grazing encompasses the grazing of sheep and cattle on broad scale dryland pastures (i.e. land that is not irrigated) in agricultural areas (i.e. areas that receive less than 350mm of rainfall annually). It does not apply to intensively managed paddocks or irrigated pastures.

Rural Enterprise areas provide the opportunity for landowners to develop light industrial and rural enterprises on the same lot as their primary residence, enabling more landowners to contribute to the local economy. These areas seek to consolidate light industrial uses and intensive rural industries in designated locations to prevent these uses from developing in rural areas and adversely impacting amenity. Consolidating these land uses which may impact the rural lifestyle and character preserves the amenity of other areas and informs current and prospective landowners within the Rural Enterprise land use category of the potential impacts from light industrial land uses. Emerging non-traditional rural activities should be encouraged in areas where they do not adversely impact on environmental or landscape quality and are appropriately managed to minimise offsite impacts. While it is recognised that the development of light industrial and intensive rural industries may impact visual amenity, such developments should utilise sustainable and innovative technologies to ensure the natural environment is not adversely affected and measures should be undertaken to enhance amenity. Rural Enterprise areas should be identified in locations where the amenity of the land has already been, or is likely to be compromised by existing or planned land uses in the vicinity. Rural Enterprise areas are also considered to be a suitable interface between industrial and rural areas.

3.3.1 PROTECTING AGRICULTURAL LAND

OBJECTIVES

+ Protect large rural lots to ensure access to well positioned land for productive use is possible.
+ Strengthen agricultural production as a significant economic contributor to the Shire and the broader region, promoting the Shire as a 'food bowl'.
+ Promote alternative technologies and sustainable practice in agriculture and food production.
+ Manage urban growth boundaries.
+ Protect land for agricultural enterprises in proximity to Perth and its markets.
+ Minimise or eliminate nutrient (particularly phosphorus) export into the Peel-Harvey Estuarine System.

Table 12: Protecting Agricultural Land: Strategy and Actions Summary

STRATEGIES	ACTIONS
a. Prevent the fragmentation of large rural lots to allow for rural activities that may have buffer requirements to be separated from sensitive land uses.	1. Include a Rural zone within LPS 3 to permit a full range of rural uses.
b. Support the continuation of pastoral and extensive agricultural activities that adopt more sustainable farming practices that minimise or eliminate nutrient export to the Peel-Harvey Estuarine System.	2. Include an objective under the Rural zone within LPS 3 to prevent further subdivision.
c. Encourage and establish a centralised meat production such as poultry and pork farming.	3. Allow for up to one rural worker's dwelling in addition to the main dwelling for agricultural businesses on lots within the Rural zone under LPS 3.
d. Prioritise agricultural and food production industries within rural areas.	4. Include an agri-food processing and production special control area within LPS 3.
e. Advocate for improved freight links for rural produce and services.	5. Include a special control area to designate buffers around existing agricultural industries to protect these operations from sensitive land uses.
f. Preserve land classified as having a high land capability for annual and perennial horticulture and grazing in the regional soil-landscape to enable the protection of productive rural land.	
g. Prevent further subdivision in rural areas.	
h. Provide for monitoring of nutrient levels within soils to reduce nutrient export for environmental protection.	
i. Encourage development nodes of closed agricultural systems, for example poultry and hydroponic/ glasshouse horticultural systems, on locally higher ground to reduce nutrient export.	

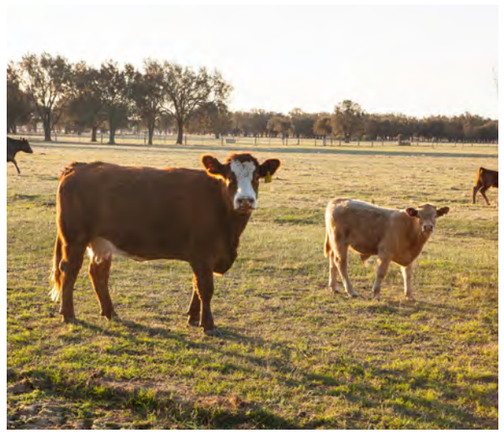
3.3.2 RURAL ENTERPRISE

OBJECTIVES

+ Identify land for intensive agricultural and light industrial purposes.
+ Minimise land use conflicts and co-locate similar uses.
+ Facilitate a range of industries within Rural Enterprise areas.
+ Provide specific controls in relation to water management.

Table 13: Rural Enterprise: Strategy and Actions Summary

STRATEGIES	ACTIONS
a. Facilitate the development of intensive rural enterprises, rural industries and supporting activities in appropriate areas and prevent such industries from proliferating throughout rural areas. b. Consolidate non-rural land uses within confined geographical areas to minimise land use conflicts and preserve the character and amenity in rural areas. c. Retain a range of lot sizes to enable a variety of land uses. d. Ensure that commercial and light industrial activities do not result in unacceptable impacts on the environment or intrusion on the landscape.	1. Identify land north of the West Mundijong Industrial Area as a Rural Enterprise Investigation Area. 2. Introduce a Rural Enterprise zone under LPS 3 which allows intensive agriculture, hydroponics, rural industries and light industries to be developed on smaller lots. 3. Include an objective within LPS 3 to allow subdivision within the Rural Enterprise zone within the range of 2ha-4ha lot sizes. 4. Zone a portion of land in Oakford/Oldbury where many intensive rural and light industrial land uses have been developed as Rural Enterprise. 5. Include specific provisions within LPS 3 for vegetated buffers and visual screening of development in Rural Enterprise areas.



Rural Serpentine



Rural Serpentine

3.3.3 PROTECTING THE RURAL LANDSCAPE

OBJECTIVES

+ Preserve and enhance the existing rural character and amenity within rural areas.
+ Protect the rural landscape, environmental values and connections to nature.
+ Protect the water quality and the balance of water flows into water systems within the rural landscape.
+ Promote tourism activities based on the natural rural landscape.
+ Protect large rural lots and land for a range of agricultural enterprises reflective of the rural landscape and economic value to the shire.

Table 14: Protecting the Rural Landscape: Strategy and Actions Summary

STRATEGIES	ACTIONS
a. Protect areas of significant landscape value and encourage the retention of vegetation and trees. b. Prevent the intrusion of sensitive and incompatible land uses into rural areas. c. Consolidate intensive rural industries and light industries, which may have potential amenity impacts in defined locations to preserve rural amenity in other locations within the Shire. d. Prevent light industrial land uses from proliferating in general rural areas.	1. Include a special control area for the protection of the landscape and amenity of the Darling Scarp. 2. Include a special control area to designate buffers around existing agricultural industries to identify and protect rural landscape, environmental values and visual amenity. 3. Designate the Industry – Light land use as not permitted within the Rural zone under LPS 3.



Rural Serpentine



Rural Landscape Keysbrook

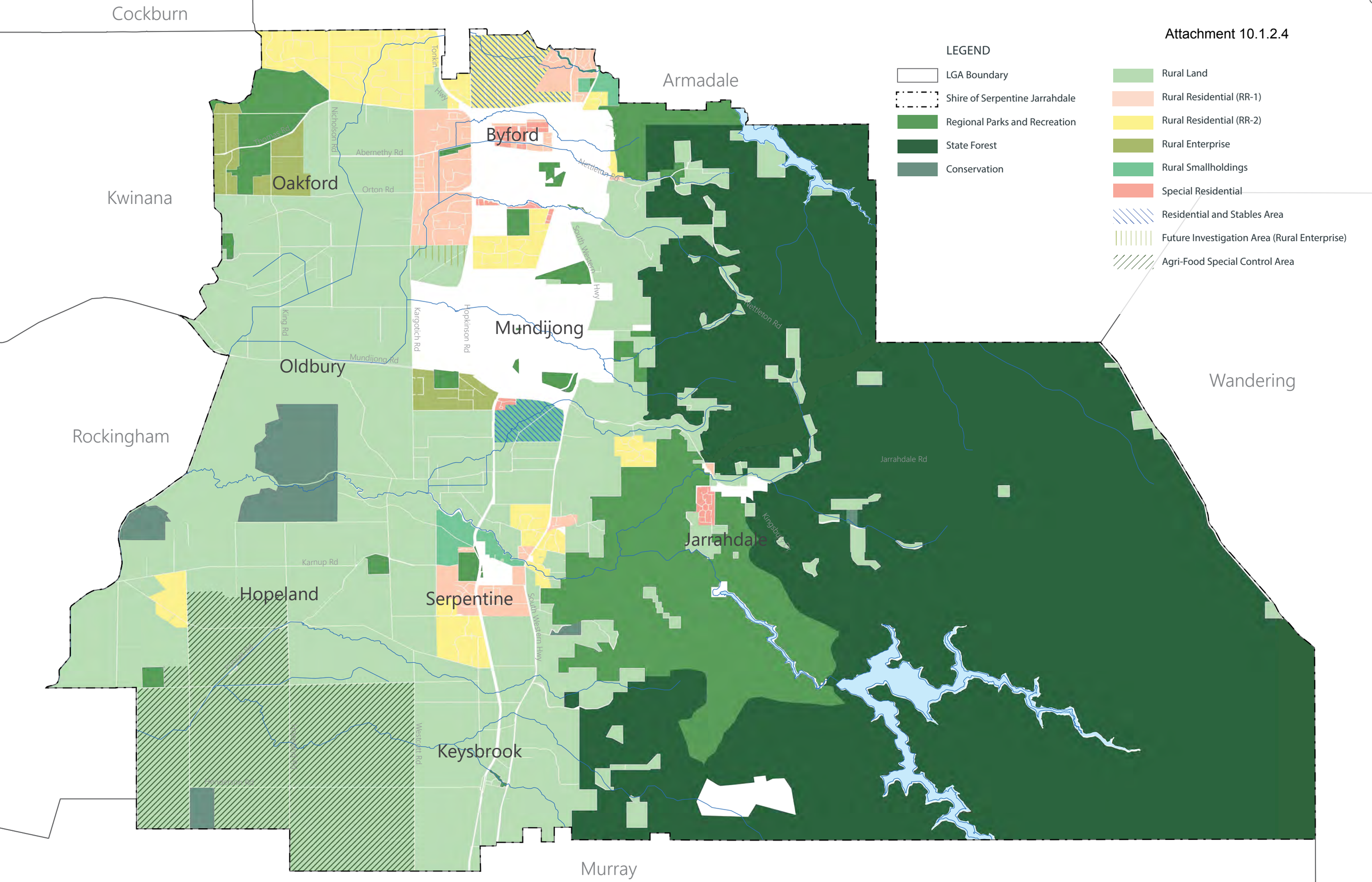


FIGURE 6: RURAL LAND

3.4 HERITAGE AND CULTURE

DESCRIPTION:

Heritage includes cultural heritage and heritage within the built environment which holds significance to the history, character and people within the local community. Significant waterways within the Shire are of cultural importance to Aboriginal people as well as some other dispersed sites. There are clusters of heritage sites and places of cultural significance within the four settlements of the Shire, particularly in Jarrahdale and Serpentine.

RATIONALE

The character of a place is closely linked to its heritage and it is therefore crucial that elements of heritage are preserved and incorporated into new developments. Heritage provides a depth to sense of place and creates a uniqueness which cannot be fabricated. Figure 7 illustrates the range of heritage sites distributed throughout the Shire ranging from areas of natural beauty, cultural places of significance as well as built heritage sites.

Highlighting and celebrating the areas natural, cultural and built heritage enables place attachment which is important in ensuring people feel a sense of belonging and ownership. Additionally, providing continuity to the story of a place can bring communities together and allow new residents to have a better understanding of established communities. For these reasons it is important to ensure heritage is preserved and reflected in the built environment. Incorporating elements of the Shire's history and culture in new developments and within the public realm is also important to ensure integration and provide a consistent character.

OBJECTIVES

+ Recognise and preserve Aboriginal heritage.
+ Recognise the character and heritage of the Shire's spatial development.
+ Celebrate and express cultural heritage within the built environment.
+ Conserve built heritage which is considered to be significant.

Table 15: Heritage and Culture Heritage: Strategy and Actions Summary

STRATEGIES	ACTIONS
a. Prepare a Heritage Strategy to consider the Shire's heritage assets – European, Aboriginal and environmental - identifying ways in which these assets can be conserved, interpreted, celebrated and (where culturally appropriate) promoted.	1. Prepare and maintain a Heritage List as required by the Planning and Development (Local Planning Scheme) Regulations 2015.
b. Preserve historical settlement patterns and street configurations within the Byford Old Quarter and Mundijong townsite.	2. Include a special use zone within LPS 3 to provide appropriate land use and development provisions to preserve the heritage and character of Jarrahdale.
c. Enhance the heritage values and character contained within existing urban areas and townsites.	3. Establish a Special Control Area for Jarrahdale Heritage Precinct within LPS 3 to ensure the preservation of the heritage and character of the Precinct.
d. Promote the expression of cultural heritage, art and history to be incorporated into the design of public open space and facilities.	4. Consider all Aboriginal and Non-Aboriginal Heritage matters in all strategic and statutory planning processes.
e. Ensure significant heritage buildings are preserved and maintained.	
f. Ensure new development is visually integrated with heritage buildings.	



Mill Manager's House, Jarrahdale



Spencer's Mud Cottage

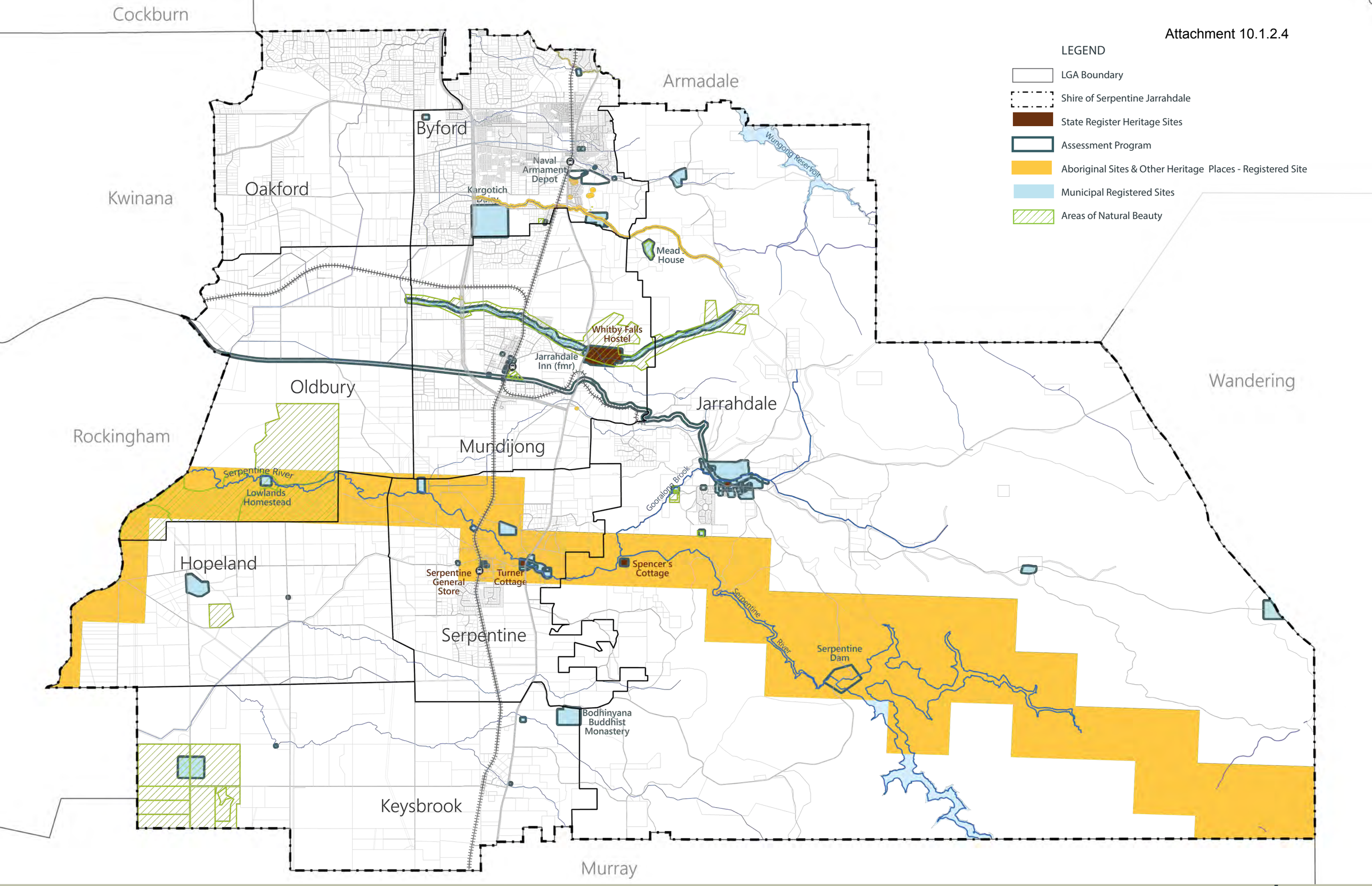


FIGURE 7: HERITAGE

3.5 TRANSPORT

DESCRIPTION:
The transport category describes the movement network within the Shire for both personal and commercial transportation. This includes all modes of transport including roads, freight rail, public transport, cycle ways and pedestrian pathways. The Shire is well serviced via Strategic Transport connects to and through the Shire including South Western Highway, Tonkin Highway, Kwinana Freight Rail and proposed passenger rail connections to the existing network.

RATIONALE

Providing connected and accessible transportation is essential to facilitating efficient movement within the Shire and ensuring the community, businesses and industry are well-connected to the greater region. A functional road hierarchy to distribute vehicular traffic within the Shire and to provide linkages to neighbouring local governments and strategic centres within the metropolitan region is crucial in facilitating access and enabling the transport of freight. Access to regional roads and the freight rail network provides opportunities for industries and businesses to be well-connected to markets and suppliers. Improved east-west road links are considered to be essential to support industry and provide residents with access to major employment opportunities located in Fremantle, Kwinana, Rockingham and Mandurah (Figure 8).

Regional transport connections are especially important in outer metropolitan local government areas to ensure local residents have equitable access to goods, services and opportunities within the metropolitan region, and ensuring that populations are not spatially disadvantaged. A key component of providing effective transport connections involves improvements to the provision and frequency of public transport. The first stages of the METRONET includes building the railway extension from Armadale to Byford (by 2023). This will significantly improve the public transport network to connect a larger demographic of the population, including those who do not drive, as well as offering convenience, reduced travel times and less traffic congestion and greenhouse gas emissions. Improvements to both east west and north south public transport connections within the Shire are therefore vital to sustain the Shire's growing population.

Active modes of transport such as walking and cycling are supported for short distance journeys within urban areas. Providing safe, accessible and interconnected pedestrian and cycle links between residential areas and destinations such as schools, shops, public transport stops and parks is essential in encouraging greater pedestrian and cycling activity. Such modes of transport have many benefits including improved physical and mental health, activated streetscapes with a higher level of passive surveillance, reduced dependency on the automobile leading to less traffic congestion and greenhouse gas emissions and increased engagement within communities. Facilitating active modes of transport is also important for recreational purposes offering opportunities for jogging, dog walking, bushwalking and off-road cycling.

Consideration also needs to be given to the implications of future technological changes in transport. Electric vehicles, autonomous vehicles, on-demand public transport, car sharing and other changes could affect the demand for and/or the design of transport infrastructure. Whilst many changes cannot be foreseen, it is extremely important for design to be adaptable and strategic transport corridors to be preserved.

3.5.1 ROAD AND FREIGHT

OBJECTIVES

+ Create strong regional freight linkages to support the economic viability of industries and businesses and improve connectivity within the region.
+ Minimise the impact of freight corridors on urban areas and sensitive land uses.
+ Ensure urban areas are highly accessible and well connected within the wider region.
+ Achieve an efficient, functional and safe road hierarchy to facilitate vehicular movements.
+ Achieve a legible, connected and easily accessible street network which facilitates safe and activated streetscapes.
+ Create future-focused streetscapes and built form which can accommodate new technologies in transportation.

Table 16: Road and Freight: Strategy and Actions Summary

STRATEGIES	ACTIONS
a. Promote the extension of Tonkin Highway from Thomas Road to South Western Highway to create a freight corridor.	1. Prepare a transport plan to address the provision of roads and freight routes.
b. Investigate and facilitate the realignment of the Kwinana Freight Rail out the Mundijong Whitby urban area to the more appropriate location adjacent to the West Mundijong Industrial Area and Tonkin Highway extension, removing a significant constraint to the urban development and amenity of Mundijong Whitby.	2. Work with the State government for the extension of the Tonkin Highway.
c. Ensure the detailed planning of the West Mundijong Industrial Area accommodates the Kwinana Freight Rail realignment and allows for a possible future intermodal facility.	3. Work with the State government for the realignment of the Kwinana Freight Rail.
d. Upgrade Mundijong Road, Abernethy Road and Thomas Road.	4. Investigate the land requirements and possible staging of the Kwinana Freight Rail realignment and intermodal hub.
e. Investigate the extension of Nicholson Road in Oakford from Thomas Road to Mundijong Road.	5. Prepare a local planning policy to address streetscape design.
f. Facilitate the provision of formal road access along George Street in Byford between Abernethy Road and Larsen Road to create an important connection within the Byford Town Centre.	6. Investigate bridle trails as a part of a transport plan.
g. Support the implementation of the proposed road link from Armadale to Cockburn Central and Fremantle, improving the regional connectivity between neighbouring local government areas.	
h. Ensure that street networks are safe, legible and permeable and avoid cul-de-sacs at the structure plan and subdivision stages.	
i. Encourage the provision of on-street parking where appropriate.	
j. Encourage the consideration of new transport technologies in new developments.	

3.5.2 PUBLIC TRANSPORT

OBJECTIVES

+ Increase public transport opportunities throughout the Shire to reduce car dependency, encourage sustainable modes of transport and improve connectivity.
+ Improve east west connectivity to facilitate greater accessibility to employment opportunities, and to the Kwinana Freeway and the Mandurah passenger railway.
+ Improve accessibility to strategic centres and employment nodes within the wider region.
+ Embrace and accommodate new technology and alternative, sustainable modes of public transport to provide greater choice, increase movement efficiency and reduce emissions through flexible infrastructure and land use planning.

Table 17: Public Transport: Strategy and Actions Summary

STRATEGIES	ACTIONS
a. Investigate and advocate for the provision of a rapid bus route service from Rockingham to Mundijong and Byford onto Armadale to improve regional connectivity and to ensure that the much-needed higher densities are viable. b. Plan the extension of the passenger railway service from Armadale to the Byford Town Centre. c. Investigate passenger railway extension to the Whitby District Centre in the longer term. d. Plan for the future passenger railway station within the Byford Town Centre. e. Plan for an intermodal transit hub within the Byford Town Centre. f. Investigate the potential to provide dedicated lanes or corridors along existing rail reserves to allow for autonomous buses and vehicles or future light rail. g. Improve the provision of bus services in urban areas.	1. Prepare a transport plan to address the provision of public transport. 2. Work with the State government to facilitate a rapid bus route service which travels from Rockingham to Mundijong, Byford and onto Armadale. 3. Liaise and work with the State Government for the extension of the passenger railway to the Mundijong area.

3.5.3 CYCLING AND PEDESTRIANS

OBJECTIVES

+ Create an extensive cycle network which prioritises safety, encourages cycling for both commuting and recreational purposes and is easily accessible.
+ Create an interconnected, accessible and safe pedestrian network.
+ Promote walking and cycling as viable transportation options which offer health benefits, improved air quality, reduced emissions, less traffic congestion and sustainable living.

Table 18: Cycling and Pedestrians: Strategy and Actions Summary

STRATEGIES	ACTIONS
a. Locate cycle routes to connect key areas such as activity centres, employment nodes, schools and public transport stops. b. Ensure that developments can accommodate the parking of bicycles and provide facilities and amenities for cyclists. c. Ensure new structure plans and subdivisions incorporate pathways which connect into surrounding pedestrian and cycle networks. d. Ensure that pedestrian pathways in residential areas lead to activity centres in a direct manner to facilitate walking as an efficient mode of transport. e. Ensure that pedestrian facilities and amenities are provided along pathways to encourage pedestrian activity. f. Provide a network of trails throughout the Shire to encourage walking activities and provide recreational opportunities.	1. Include provisions within LPS 3 which require end of trip facilities to be provided in new developments within activity centre zones. 2. Include provisions within LPS 3 which outline bicycle parking requirements for developments. 3. Investigate cycle ways, pedestrian pathways and trails as a part of a transport plan.

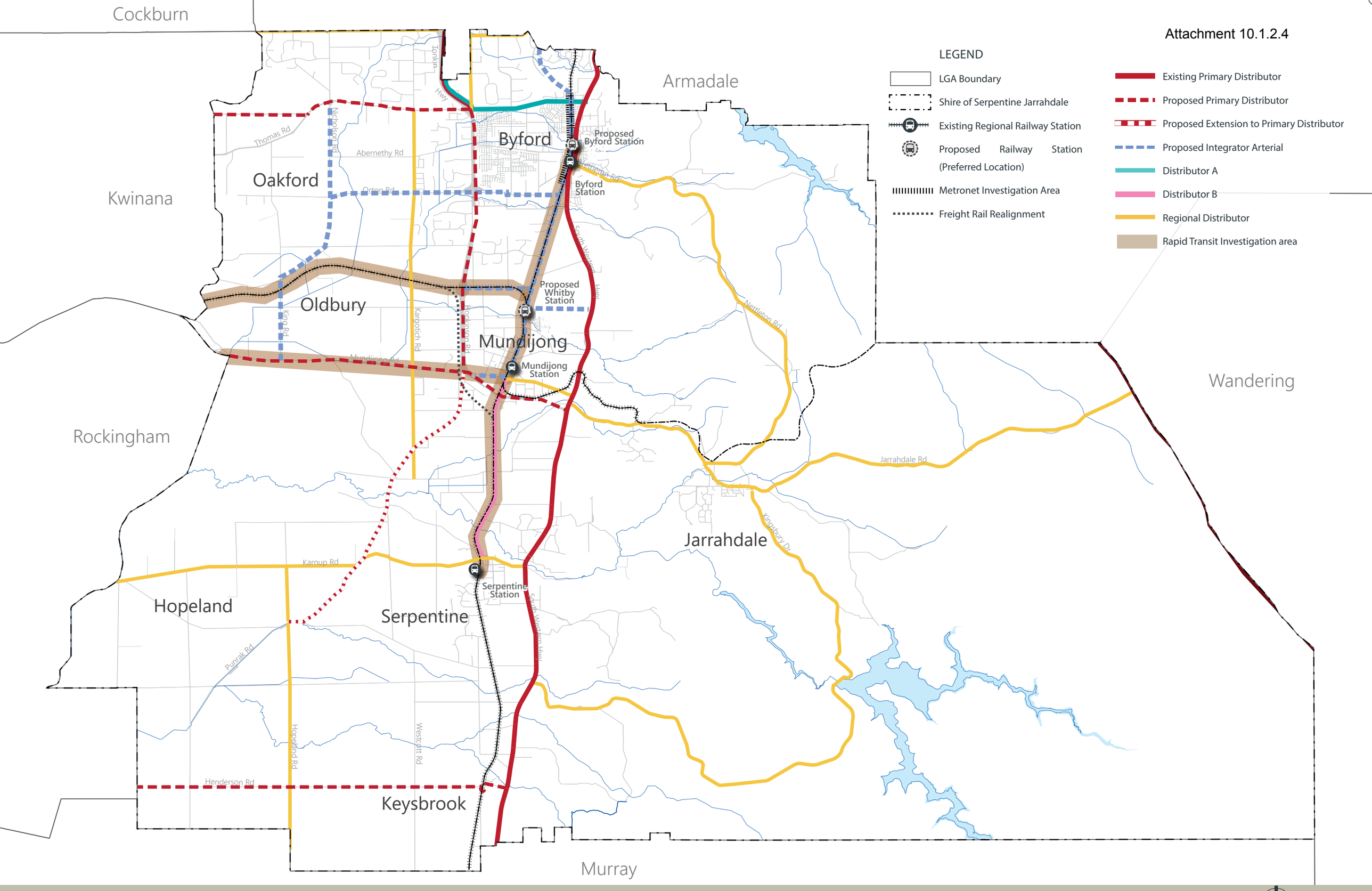


FIGURE 8: REGIONAL TRANSPORT



4.0
STRATEGIC PLAN
PEOPLE

4.0 PEOPLE

4.1 COMMUNITY INFRASTRUCTURE

DESCRIPTION:

Community infrastructure includes the facilities which support, contribute and respond to the needs of people living, working, studying in and visiting the Shire. This may include educational institutions, civic and emergency services, community centres, libraries, museums, arts and cultural facilities, sporting clubrooms and recreational facilities. Community infrastructure can be provided by both the State and local governments, the private sector and non-profit organisations.

RATIONALE

Community infrastructure is essential to sustain vibrant, socially inclusive and safe communities which facilitate interaction and a sense of belonging. Community facilities can have an important role in creating activated community hubs which bring together different groups and individuals. Figure 9 illustrates existing facilities distributed throughout the Shire. Figures 10-13 identify key facilities within the four major centres for Byford, Mundijong, Serpentine and Jarrahdale.

Educational institutions, libraries and other cultural facilities provide important opportunities for learning and advancement and these facilities often become central community focal points. Providing essential community infrastructure such as police and fire stations is critical to ensuring communities are safe and that local issues are addressed.

It is important to identify community facilities within the Shire to ensure that the needs of the community are being met and that the provision of community infrastructure is proportionate to catchment population density. Identifying the need for future community infrastructure to accommodate projected population growth in the early stages of the planning process is crucial to ensure that adequate facilities are provided.

Such planning will also prevent an oversupply of facilities, ensuring that the development of facilities will be timed appropriately and financially sustainable. It is also important to identify infrastructure needs in order to enable development contribution plans to be prepared for community infrastructure. This ensures that developments will contribute to the provision of the essential community infrastructure required to sustain communities.

OBJECTIVES

+ Create a connected, integrated and coordinated network of facilities which provide for the identified social needs of the community.
+ Ensure community facilities are central to the catchment and facilitate equitable access.
+ Ensure the location and design of new community facilities aligns with the guiding principles of the Community Infrastructure and Public Open Space Strategy and Community Infrastructure Implementation Plan.
+ Provide adaptable, resilient and multi-use facilities to maximise efficiency.
+ Integrate community infrastructure to enhance the public domain, contribute to sense of place and create community hubs.
+ Ensure the provision of community infrastructure is environmentally sustainable.

Table 19: Community Infrastructure: Strategy and Actions Summary

STRATEGIES	ACTIONS
a. Enable the provision of an appropriate level of community facilities and services in existing and planned localities through planning instruments.	1. Implement the recommendations of the Shire's Community Infrastructure and Public Open Space Strategy as guided by the Community Infrastructure Plan that have implications to land use planning.
b. Co-locate community infrastructure to create nodes of facilities.	2. Revise the Byford District Structure Plan and Mundijong District Structure Plan to identify community infrastructure.
c. Design community facilities to enable inclusive access for all ages and abilities.	3. Prepare a development contribution plan for Mundijong which includes community infrastructure.
d. Ensure community facilities are connected to public transport, pedestrian and cycling networks.	4. Prepare a development contribution plan for Byford for community infrastructure.
e. Ensure structure plans accommodate community infrastructure. and allocate adequate land required under a built out scenario.	
f. Ensure community facilities are of a sufficient size and design to enable expansion and/or adaptation.	
g. Promote the design of community facilities to utilise environmentally sustainable design principles in line with the Shire's sustainability targets.	
h. Ensure the development of community facilities is appropriately staged and master planned to integrate with the surrounding public realm and built form.	

4.2 PUBLIC OPEN SPACE

DESCRIPTION:

Public open space includes all green spaces and natural areas reserved for amenity or recreational purposes. Public open space is provided at a variety of scales and can have a range of functions. A hierarchical network of public open space including regional, district, neighbourhood and local spaces is planned for the Shire. Public open space which has a regional function is usually provided by the State government and designated as a Parks and Recreation Reserve under the Metropolitan Region Scheme, while district, neighbourhood and local public open space is provided by local government.

RATIONALE

Public open space provides an important role for communities and the environment. Creating functional, accessible and attractive public open spaces in urban areas is essential in enhancing the urban environment, providing greenery, shade, character and a community focal point and offering public spaces for passive and active recreation and sports. There are many benefits a quality public open space network offers to communities including improved well-being, mental and physical health, connections to nature and community activation.

The provision and quality of public open space is particularly important in areas with greater residential densities where households may have limited access to private open space. In facilitating increased residential densities within urban areas it is therefore vital to provide high quality public open space in close proximity to housing. Figures 9 to 13 illustrate the current distribution of public open space throughout the Shire.

Public open space can serve a variety of functions including both active and passive recreation spaces, sport spaces for designated sporting activities and nature spaces which have a role in preserving the natural environment and biodiversity.

Creating multiple use corridors within urban areas is an important function of public open space to treat stormwater drainage and improve environmental outcomes. Such corridors can incorporate elements of both nature and recreation spaces to offer a range of uses and functions.

It is important that adequate public open space of an appropriate scale is provided in appropriate locations to service the catchment populations. Ensuring that each of the different functions of public open space are accommodated is also essential to maximise community benefit.

It is also important for adequate sport spaces to be provided to enable a wide range of sports with the capacity to host games and tournaments. With regard to reserving land for sport spaces, it is important to ensure that the specific land areas required to accommodate senior ovals can be provided in areas designated for larger scale sporting facilities.

District open space typically provides for two senior sized football ovals to service surrounding urban and residential areas. Where new district open space is planned, shared site arrangements are proposed where the schools provide one senior sized oval the developers contribute the second senior sized oval. Under this arrangement, the district sports space would be under Shire control in its entirety. Furthermore, to alleviate the growing community pressure of Byford and Mundijong a strategic major sub-regional sports space is planned at Keirnan Park designed to function as the Shire's central sporting hub.

OBJECTIVES

+ Achieve a hierarchy of public open space that includes a balanced range of functions to effectively provide for the population.
+ Create a connected network of public open space.
+ Create adaptable public open spaces which can be utilised for multiple purposes.
+ Ensure a high level of safety and accessibility to public open spaces.
+ Create public open spaces which contribute to the amenity of the public realm.

Table 20: Public Open Space: Strategy and Actions Summary

STRATEGIES	ACTIONS
a. Ensure structure plans incorporate a range of recreation, sport and nature spaces. b. Identify a public open space hierarchy of regional, district, neighbourhood and local spaces. c. Provide public open space adjacent to areas with greater residential densities. d. Ensure senior sized playing fields can be accommodated in all new regional, district and neighbourhood sport spaces. e. Ensure structure plans allocate land to accommodate regional, district and neighbourhood public open space where the need for such spaces has been identified. f. Ensure the correct orientation of playing fields. g. Design public open space to optimise passive surveillance and accessibility. h. Promote the development of multi-use corridors to create an interlinked public open space network. i. Provide a network of walking, cycling and bridle trails throughout the Shire to encourage recreational activities. j. Ensure the provision and design of public open spaces can accommodate facilities and minor assets relative to their scale and function. k. Improve sustainable transport connections to public open space including pedestrian pathways, cycle ways and public transport. l. Maintain public open space appropriate to scale and function. m. Development of a regional sporting facility within the Shire.	1. Identify/locate and design public open space through structure planning (and any other relevant instruments/processes) in accordance with the Community Infrastructure and Public Open Space Strategy. 2. Prepare an implementation plan to address the distribution, function and hierarchy of public open space. 3. Prepare a local planning policy to guide the provision of public open space at structure plan and subdivision stage. 4. Reserve land which has been identified as public open space for this purpose under LPS 3.

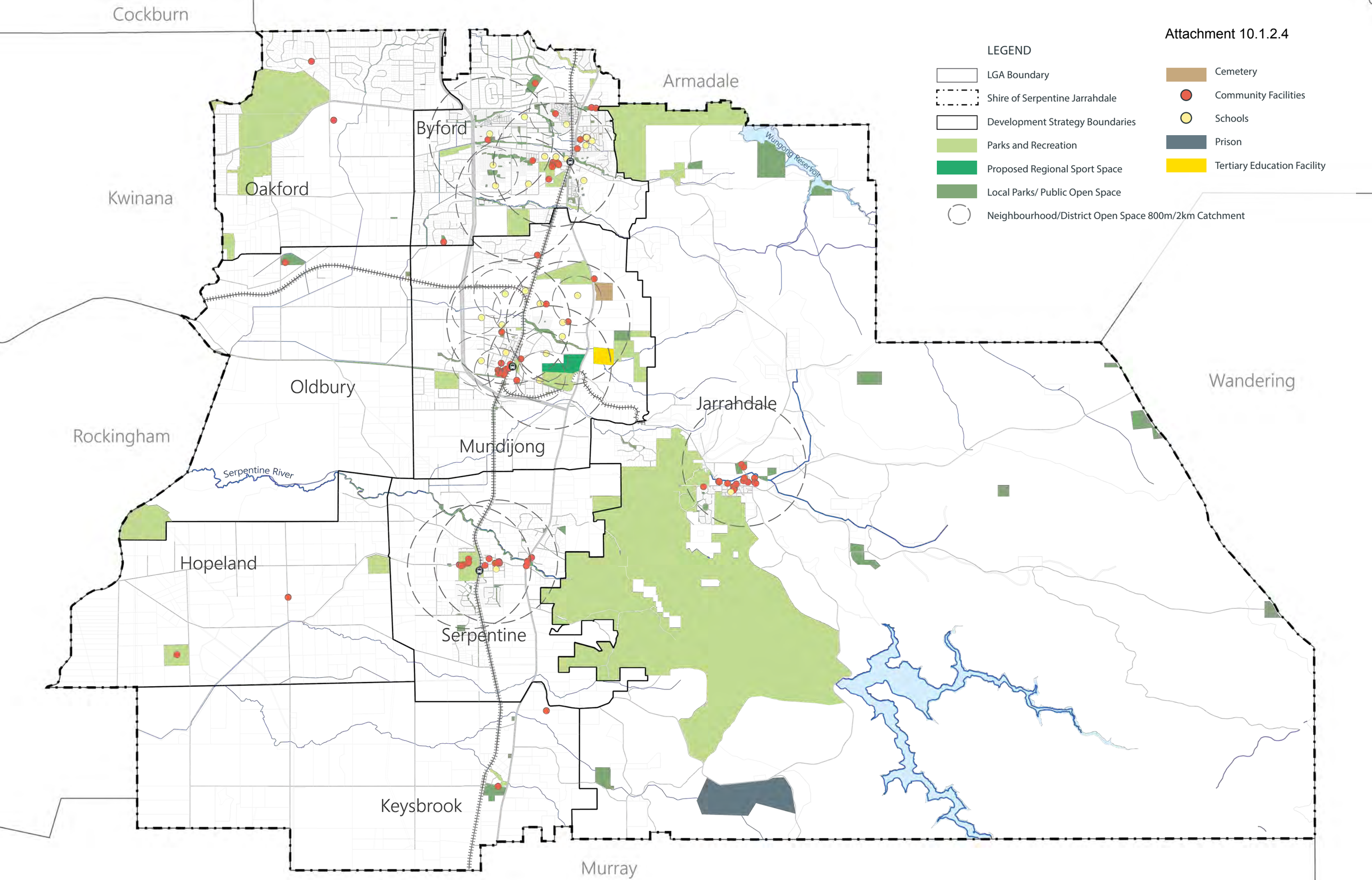
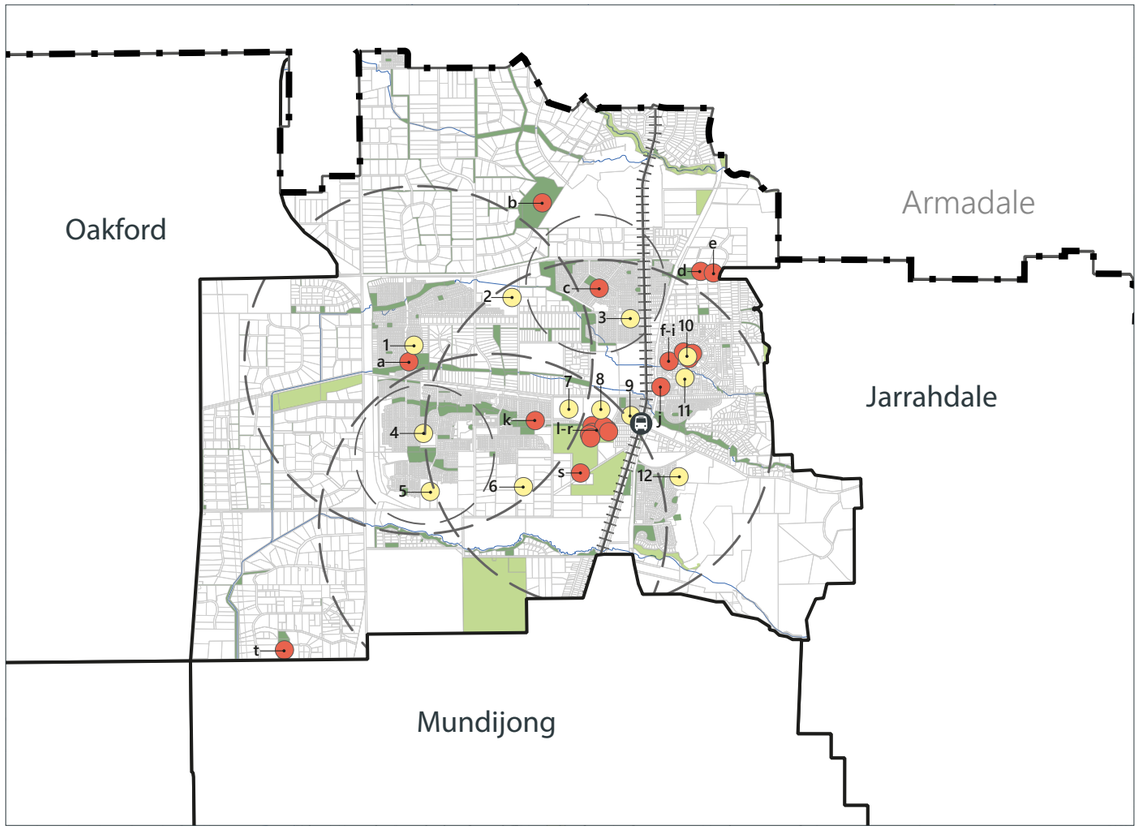


FIGURE 9: COMMUNITY INFRASTRUCTURE



LEGEND

- LGA Boundary
- Shire of Serpentine Jarrahdale
- Development Strategy Boundaries
- Parks and Recreation
- Local Parks/ Public Open Space
- Cemetery
- Community Hall
- Schools
- Neighbourhood/District Open Space 800m/2km Catchment

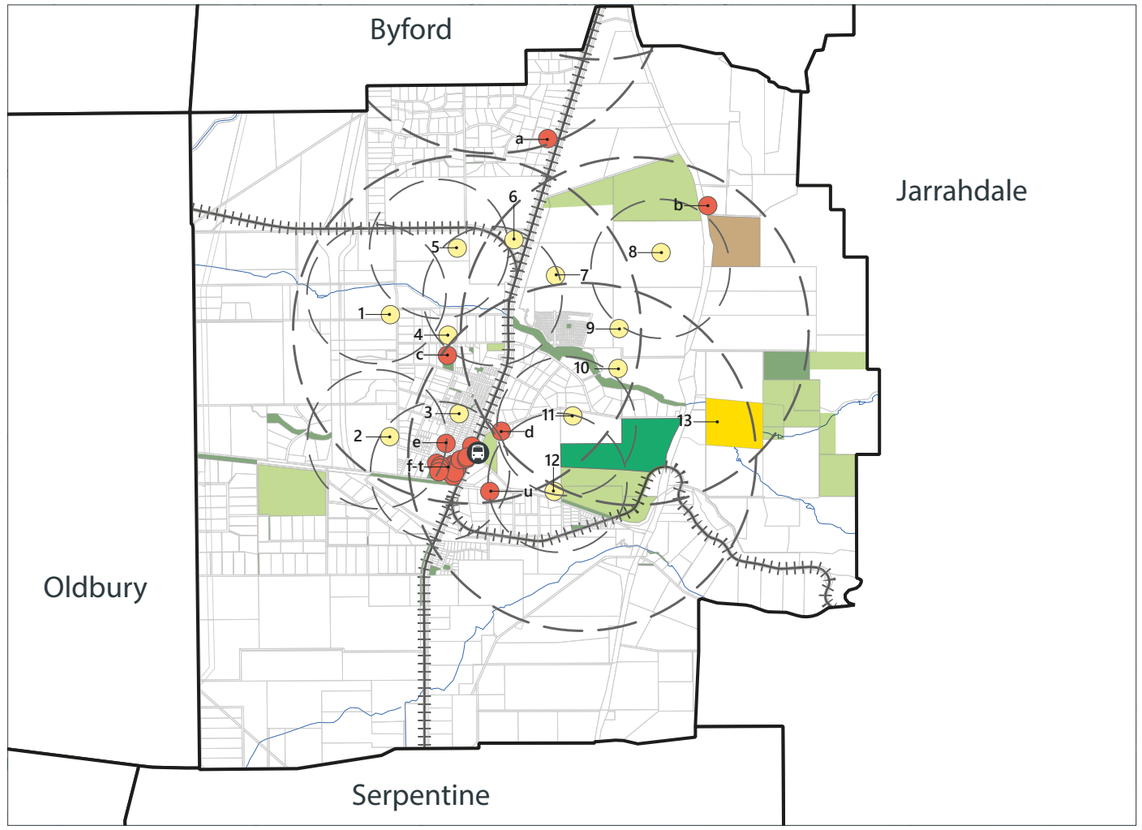
COMMUNITY

a. Kalimna Storage Facility
b. Darling Downs Equestrian Facility
c. Bill Hicks Facility
d. Byford and Districts Country Club
e. Byford Scouts Hall / Old Rifle Range
f. Byford Fire Station (to be relocated)
g. Byford Tennis Courts
h. Byford Community Kindergarten & Childcare
i. Byford Tennis Facility
j. Byford Hall
k. Byford Community Garden
l. Briggs Park Pavilion (to be relocated)
m. Serpentine Jarrahdale Community Recreation Centre
n. BMX Track
o. Bill Hicks Facility
p. Byford Cricket Nets
q. Canteen & Storage Facility & Toilets
r. Briggs Park Change Rooms
s. Brickwood Reserve Facility
t. Oakford Riding for Disabled Association

SCHOOLS

1. West Byford Primary School
2. Proposed Primary School
3. Marri Grove Primary School
4. Woodland Grove Primary School
5. Proposed Primary School
6. Proposed Primary School
7. Salvado Catholic College
8. Byford Secondary College
9. Byford John Calvin School
10. Byford Community Kindergarten
11. Byford Primary School
12. Proposed Primary School

FIGURE 10: BYFORD - COMMUNITY INFRASTRUCTURE



LEGEND

- LGA Boundary
- Shire of Serpentine Jarrahdale
- Development Strategy Boundaries
- Parks and Recreation
- Proposed Regional Sport Space
- Local Parks/ Public Open Space
- Proposed Cemetery
- Community Hall
- Schools
- Proposed University
- Neighbourhood/District Open Space 800m/2km Catchment

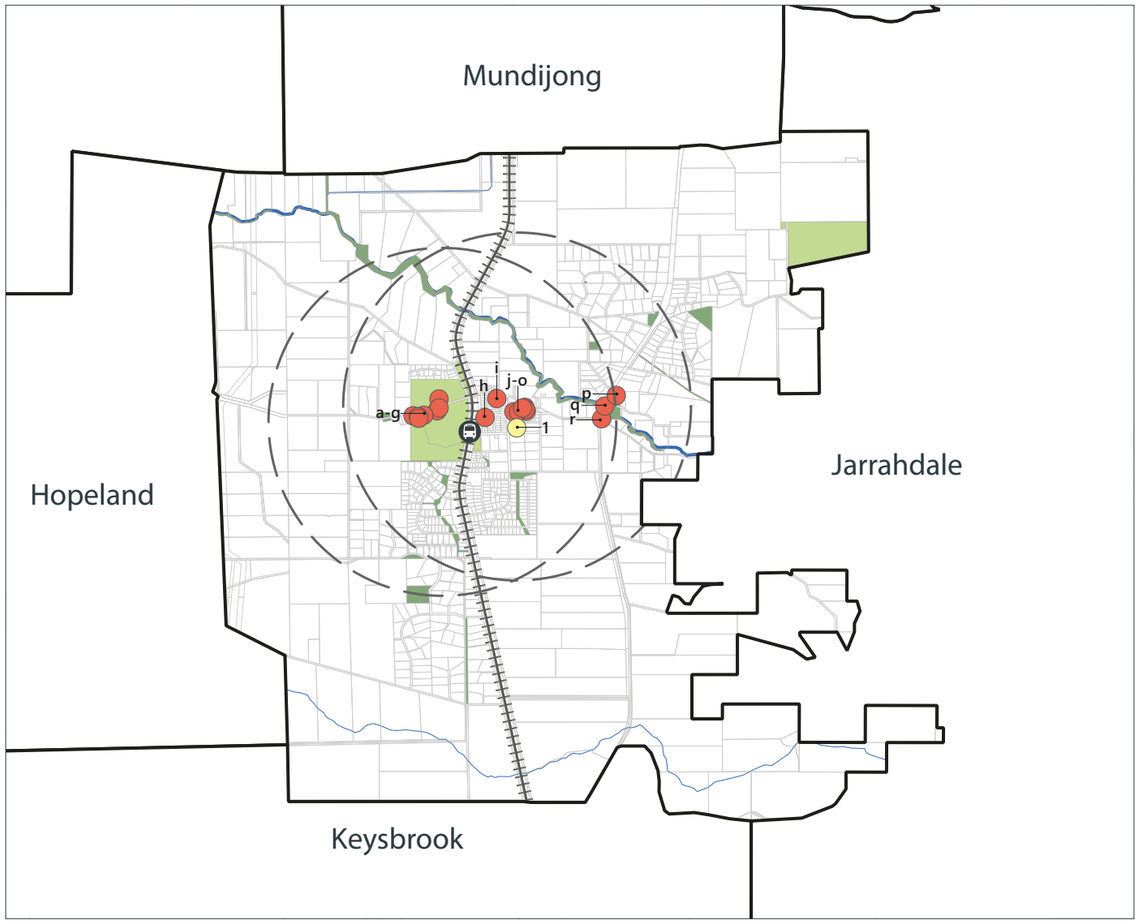
COMMUNITY

a. Cardup Community Centre
b. Hendley Motocross Park
c. Mundijong Community Shed
d. Mundijong Sale Yard
e. The Shire Depot (to be relocated)
f. Mundijong Neighbourhood Skate Park
g. Timber Goods Shed
h. The House
i. Atwell Pavilion
j. Mundijong Pavilion
k. Mundijong Public Library (to be relocated)
l. Mundijong Fire Station
m. Mundijong Netball Courts
n. SES Building
o. Community Resource Centre
p. Old Railway Station
q. Land Care
r. Mundijong Cricket Nets
s. Shire Administration Building
t. Civic Centre
u. Shire Dog Pound

PLACES

1. Proposed Primary School
2. Proposed Primary School
3. Mundijong Primary School
4. Proposed High School
5. Proposed Primary School
6. Serpentine Jarrahdale Grammar School
7. Proposed Technical School
8. Proposed Primary School
9. Proposed Primary School
10. Proposed High School
11. Proposed Primary School
12. Proposed Primary School
13. Proposed University

FIGURE 11: MUNDIJONG - COMMUNITY INFRASTRUCTURE



LEGEND

- LGA Boundary
- Shire of Serpentine Jarrahdale
- Development Strategy Boundaries
- Parks and Recreation
- Proposed Regional Sport Space
- Local Parks/ Public Open Space
- Cemetery
- Community Hall
- Schools
- Neighbourhood/District Open Space 800m/2km Catchment

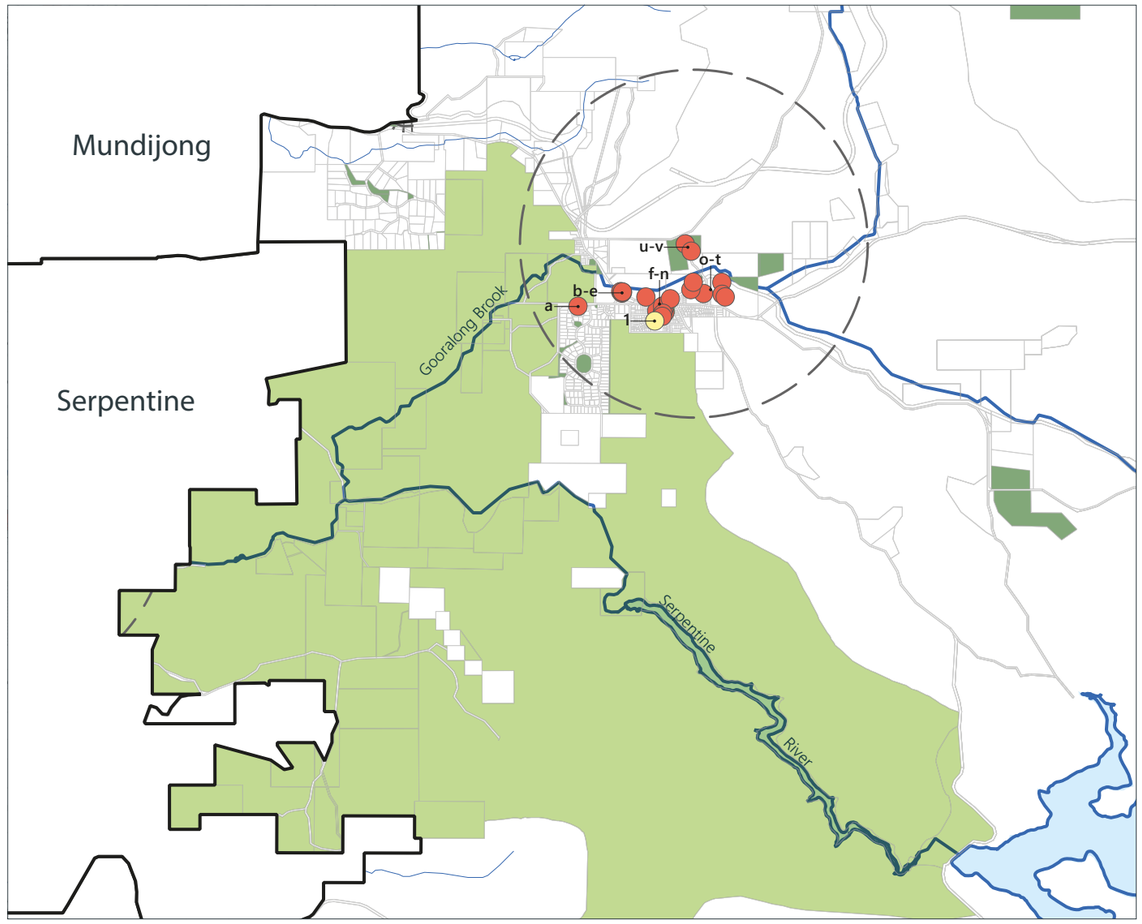
SCHOOLS

1. Serpentine Primary School

COMMUNITY

a. Serpentine Golf Course
b. Eric Senior Pavilion
c. Ivan Elliot Pavilion
d. Serpentine Golf Facility
e. Storage Faciility
f. Storage Shed
g. Storage Facility
h. St John Ambulance Hall
i. Serpentine Fire Station
j. Serpentine Tennis Courts
k. Serpentine Skate Park
l. Clem Kentish Pavilion
m. Tractor Museum
n. Serpentine Tennis Facility
o. Cricket Nets
p. Serpentine Cemetery
q. Serpentine Old School
r. St Kevin's Catholic Church

FIGURE 12: SERPENTINE - COMMUNITY INFRASTRUCTURE



LEGEND

- LGA Boundary
- Shire of Serpentine Jarrahdale
- Development Strategy Boundaries
- Parks and Recreation
- Proposed Regional Sport Space
- Local Parks/ Public Open Space
- Community Hall
- Schools
- Neighbourhood/District Open Space 800m/2km Catchment

SCHOOL

1. Jarrahdale Primary School

COMMUNITY

a. Jarrahdale Cemetery
b. Old Post Office Machinery Canopy
c. St Paul's Anglican Church
d. Storage Facility
e. Old Post Office Building
f. Mill Managers House (National Trust)
g. Jarrahdale Bruno Gianatti Hall
h. Jarrahdale Tennis Facility
i. Jarrahdale Tennis Courts
j. Jarrahdale Fire Station
k. Jarrahdale Skate Park
l. Storage Facility
m. Jarrahdale Environmental Centre
n. Old Jarrahdale Fire Station
o. Timber Mill Rotunda
p. Timber Mill Conveyer
q. Red Shed
r. Single Men Quarters
s. R.V. Park
t. Timber Mill (National Trust)
u. Jarrahdale Change rooms
v. Jarrahdale Oval Shelter

FIGURE 13: JARRAHDALE - COMMUNITY INFRASTRUCTURE

4.3 UTILITIES

DESCRIPTION:
The Utilities category includes the provision of all essential infrastructure and utility services which are necessary to support development.

RATIONALE

Providing infrastructure and utilities to support development in a timely manner is critical in rapidly growing areas. As the Shire's population continues to grow, it is important for strategic planning to consider and plan for the provision of essential utility services to facilitate a coordinated development approach and ensure communities have access to services. Planning for infrastructure and utilities is also important to minimise potential land use conflicts and impacts to the natural environment, and to consider potential buffer requirements. Sustainable practices and infrastructure which conserve resources and reduce consumption and waste are strongly supported by the Shire. Identifying resource efficient measures to be integrated into developments is greatly encouraged. Figure 14 Illustrates the layout and distribution of key servicing and infrastructure assets in the Shire.

OBJECTIVES

+ Ensure communities have access to necessary utility infrastructure and services in a timely manner.
+ Ensure the strategic planning for essential utility infrastructure and services.
+ Promote reliable and efficient connections to internet and telecommunications infrastructure.
+ Minimise land use conflicts between utilities and sensitive land uses.
+ Encourage sustainable practices and the adoption of new resource efficient technologies.
+ Reduce energy and water consumption and the generation of waste products.

Table 21: Utilities: Strategy and Actions Summary

STRATEGIES	ACTIONS
a. Ensure that developers make financial contributions for infrastructure and utility services.	1. Prepare development contribution plans for urban areas to ensure that developments contribute towards future infrastructure and utility needs.
b. Liaise with relevant utility and infrastructure providers to ensure essential infrastructure and services can be accommodated at the rezoning and structure planning stages.	
c. Ensure that infrastructure and utilities are provided in the assessment of structure plans, subdivisions and development proposals.	
d. Encourage the use of greywater systems, rainwater tanks and other water efficiency measures to promote the reuse and conservation of water resources and investigate options for water recycling on a larger scale to be used for the irrigation of public open space.	
e. Encourage developments to utilise renewable energy sources and energy efficient design and practices.	
f. Promote the use of energy efficient street lights.	
g. Require developments to minimise waste products and encourage the use of new technologies.	

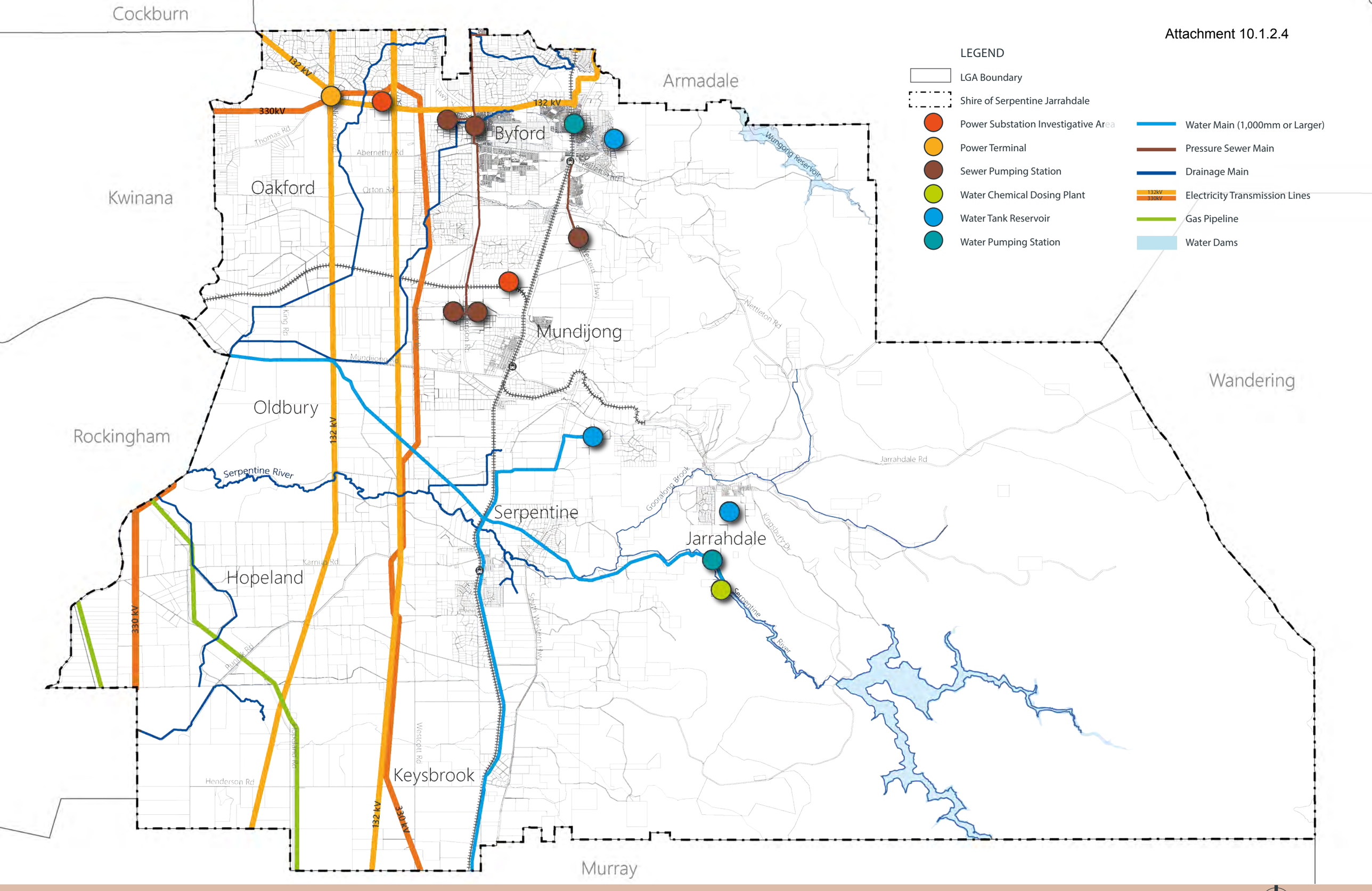


FIGURE 14: UTILITIES AND SERVICES

0 5Km

5.0
STRATEGIC PLAN
PROSPERITY

5.0 PROSPERITY

5.1 ACTIVITY CENTRES

DESCRIPTION:

Activity centres provide retail, commercial, services and facilities within consolidated centres in urban areas. Within each urban area in the Shire, a hierarchy of activity centres has been identified. The largest type of centre within the Shire's activity centre hierarchy is the district centre, with district centres identified in both the Byford and Mundijong Whitby urban areas. District centres provide a variety of retail uses including full scale supermarkets, discount department stores, specialty stores as well as convenience stores. Commercial services and office developments are also provided within district centres and residential development of an appropriate density may also be appropriate. The next tier in the activity centres hierarchy are neighbourhood centres which provide for daily and weekly retail and service needs including smaller scale supermarkets, convenience stores and local services. Neighbourhood centres have been identified in various locations within the Byford and Mundijong Whitby urban areas as well as within the Serpentine and Jarrahdale townsites. Table 18 below summarises the Shire's activity centre hierarchy.

RATIONALE

It is important for the LPS to identify a hierarchy of activity centres within urban areas to ensure retail and commercial uses are concentrated in appropriate locations and are of an appropriate size to be economically viable and to adequately service the population. Identifying these centres within the LPS enables these centres to be planned for and maintained. Activity centres are planned to service various sub-catchment populations within an urban area or townsite. It is crucial that the designated activity centres can provide for the sub-catchment population to ensure efficient and equitable access to goods and services. Activity centres should include a range of retail and commercial uses to meet the needs of their catchment. The distribution of activity centres to service defined sub-catchments can reduce the need to travel and can support more sustainable modes of transport such as walking and cycling. It is important that activity centres are of an appropriate scale for their sub-catchment to ensure retail and commercial tenancies are occupied and economically sustainable. Population growth generates economic activity within activity centres which can often become the focus for employment opportunities and public transport connections.

District centres have been identified in Byford and Mundijong, being the two largest urban areas in the Shire which are both projected to experience significant population growth (Figure 15). While the existing Mundijong centre has a neighbourhood retail function, due to Goverment and Emergency Services located within this node, it will have a distrit centre function. The district centres in each of these areas will be the primary focus of retail and commercial uses for each district. Smaller neighbourhood centres have been identified to service neighbourhood catchments and support the larger district centres. Neighbourhood centres have also been identified within the townsites of Serpentine and Jarrahdale to service these smaller urban areas and the surrounding rural populations. Table 22 illustrates maximum net lettable areas which are subject to structure planning and may change. All activity centres should be designed to activate the streetscape and public realm to maximise pedestrian traffic and create a vibrant, well patronised activity centre. Furthermore, the design of all activity centres within the Shire should be compatible with the character and design of the urban area in which the activity centre is located.

Table 22: Activity Centres Hierarchy

Activity Centre	Maximum Net Lettable Area (m^2)
District Centres	
Byford Town Centre	15,500m^2
Whitby District Centre	22,500m^2
Neighbourhood Centres	
The Glades Village Centre	5,000m^2
Thomas Road	5,000m^2
Mundijong Townsite	5,000m^2
Mundijong Whitby East	5,000m^2
Mundijong Whitby West	5,000m^2
Rural Townsites	
Serpentine	5,000m^2
Jarrahdale	5,000m^2
Keysbrook	500m^2

OBJECTIVES

+ Provide equitable access to a range of goods and services to meet the needs of the community.
+ Create activated, vibrant, and economically thriving activity centres which concentrate retail and commercial uses and are also a community hub.
+ Create quality streetscapes and public spaces which provide a high amenity and comfortable environment and encourage pedestrian activity and easy access.
+ Attract business development and facilitate local employment opportunities.

Table 23: Activity Centre: Strategy and Actions Summary

STRATEGIES	ACTIONS
a. Establish a hierarchy of activity centres to sufficiently support the catchment populations and to limit the establishment of retail and commercial uses outside of designated activity centres.	1. Introduce a District Centre zone within LPS 3 to outline specific objectives and land use permissabilities to achieve a district centre.
b. Encourage a range of retail and commercial uses within activity centres and support the location of significant office development, particularly within the Byford Town Centre and Whitby District Centre.	2. Zone developed land within the Byford Town Centre as District Centre under LPS 3.
c. Require the development of quality streetscapes, public realm and built form to attract prospective businesses and investment within activity centres.	3. Introduce a Local Centre zone within LPS 3 to outline specific objectives and land use permissabilities to achieve neighbourhood and local scale centres.
d. Ensure activity centres are well connected to residential areas, schools and public open space with safe pedestrian linkages and cycle paths.	4. Include a Mixed Use zone within LPS 3 to provide for the development of commercial uses with a residential component.
e. Provide opportunities for residential development with increased densities to locate within and surrounding activity centres to increase activation and passive surveillance and reduce the need to travel by car.	5. Zone land on South Western Highway surrounding the Byford Town Centre as Mixed Use.
f. Prevent the development of bulky goods retail and other large scale format retail, services or showrooms within activity centres to maintain a pedestrian scale, though ensure such developments are within close proximity to activity centres.	6. Include a provision within LPS 3 to require the residential component of mixed use development to be located above ground floor level.
g. Ensure that active primary frontages interface with major streetscapes, public spaces and pedestrian pathways to create activated, interesting places with a high level of surveillance.	7. Include provisions for landscaping requirements within LPS 3.
h. Require natural elements, landscaping and existing trees to be incorporated into developments within activity centres.	8. Include tree protection provisions within LPS 3.
i. Require public art and other points of visual interest to be developed within activity centres to provide landmark features to improve legibility and symbolise local character.	9. Establish a Design Review Panel to provide expert advice on the design of significant development.
j. Ensure the urban design of activity centres is compatible with the design of the urban area in which it is located to maintain local character and consistent visual elements.	10. Develop a LPP or guidance document that sets out the Shire's expectations with regard to design quality and the operation of the Design Review Panel.
	11. Investigate the potential for additional Health, Aged Care, and Education Facilities to be located within the Shire to service urban growth areas.

5.2 INDUSTRIAL

DESCRIPTION:

The Industry land use category provides for a variety of industries and businesses ranging from low intensity service industries to intensive general industries which may have offsite impacts. There are two industrial areas identified within the Shire including the West Mundijong Industrial Area and the Cardup Business Park. Both of these industrial and service commercial areas are well connected to regional roads and the freight rail network, with the West Mundijong Industrial Area bound by Mundijong Road, the future Tonkin Highway and the Kwinana Freight Rail and the Cardup Business Park located on South Western Highway.

RATIONALE

Industrial development is fundamental to sustaining and strengthening the local economy and creating local employment opportunities. The development of industrial land is important to generate investment within the Shire and attract businesses, creating a need for more services to support such industries. Industrial development generates employment opportunities in both the industries and businesses within industrial areas and the associated support services. Creating local employment opportunities provides the potential for local residents to work within the area in which they live. This may improve employment self-containment within the Shire reducing travel times, traffic congestion and improving resident's access to the workforce, which could result in higher rates of workforce participation, lower unemployment rates and less occurrence of socio-economic disadvantage.

Industrial areas can also attract skilled workers to the Shire to patronise local businesses and potentially locate within nearby residential areas, driving both the local economy and housing market. It is crucial for industrial areas to be well located with convenient access to regional transport networks.

The West Mundijong Industrial Area is optimally located to the west of the Mundijong Whitby urban area, bound by north-south and east-west regional road connections in the form of the future Tonkin Highway and Mundijong Road respectively, and the Kwinana Freight Rail. This location provides efficient connectivity to the freight network, making it ideal for various industrial purposes including the storage and transfer of goods.

There are long term plans for the realignment of the Kwinana Freight Rail to be relocated from the Mundijong Whitby urban area to run parallel to the future Tonkin Highway adjacent to the West Mundijong Industrial Area. The strategic location of the West Mundijong Industrial Area and the future realignment of the Kwinana Freight Rail potentially provides the opportunity for a strategically important intermodal node to be located within the West Mundijong Industrial Area. The proximity of the West Mundijong Industrial Area to agricultural land and food production activities provides the potential to create synergies between existing rural activities such as poultry farming and the new operations within the industrial area. The development of an agri-precinct within the West Mundijong Industrial Area is supported for such purposes.

The Cardup Business Park is well located on South Western Highway between the Byford and Mundijong Whitby urban areas. This area is conveniently located between the two district activity centres and large urban areas within the Shire, which makes the location optimal for providing service commercial land uses. These uses would generate businesses and industries which would create employment opportunities to support the local population.

OBJECTIVES

+ Provide for an appropriate and well located supply of industrial land to make the Shire an attractive, well connected location within the region to establish industries and businesses.
+ Encourage the growth, development and diversification of the local economic base.
+ Facilitate local employment opportunities and improve employment self-containment and self-sufficiency.
+ Protect industrial land from the encroachment of sensitive land uses.
+ Create sustainable industrial developments which utilise innovative technologies.
+ Develop well designed industrial areas with a high level of amenity.

Table 24: Industrial: Strategy and Actions Summary

STRATEGIES	ACTIONS
a. Ensure industrial development is located in appropriate locations which are highly accessible to road and rail transport connections.	1. Review the West Mundijong District Structure Plan and the Cardup Business Park Structure Plan.
b. Investigate the opportunity to develop an intermodal hub within the West Mundijong Industrial Area along the proposed realignment of the Kwinana Freight Rail to support the development of industry.	2. Prepare a development contribution scheme and plan for the West Mundijong Industrial Area and the Cardup Business Park.
c. Allow for a broad range of industrial uses to be developed within industrial areas.	3. Include a General Industry zone within LPS 3 to allow for a range of industrial uses.
d. Ensure that more intensive industrial uses which are likely affect the amenity of the surrounding area are located away from existing urban areas.	4. Include a Light Industry zone within LPS 3 to allow for a limited range of industries which are not likely to have offsite impacts.
e. Locate less intensive industries, rural industries or large scale commercial uses to act as a buffer between industries of a greater intensity and sensitive land uses.	5. Include an Industrial Development zone in LPS 3 to identify future industrial areas.
f. Provide for the development of bulky goods retail and other large scale format retail, services or showrooms within close proximity to activity centres.	6. Zone the West Mundijong Industrial Area as Industrial Development under LPS 3.
g. Prevent the development of sensitive land uses within the buffer of industrial land which may prejudice the future development of the industrial land for industrial purposes.	7. Include a Service Commercial zone within LPS 3 to facilitate development of bulky goods retail and other large scale retail and commercial services.
h. Encourage industrial developments to utilise best practice management techniques and innovative technology to minimise environmental impacts.	8. Facilitate the zoning of the Cardup Business Park to Service Commercial
i. Require industrial uses which may detract from visual amenity to be screened from view.	9. Zone the land between South Western Highway and Soldiers Road, north of Cardup Siding Road as Service Commercial.
j. Require landscaping and trees to be provided within industrial areas to enhance amenity and provide shade.	10. Include provisions to require the screening of industrial uses within LPS 3.
	11. Include provisions to require landscaping within LPS 3.

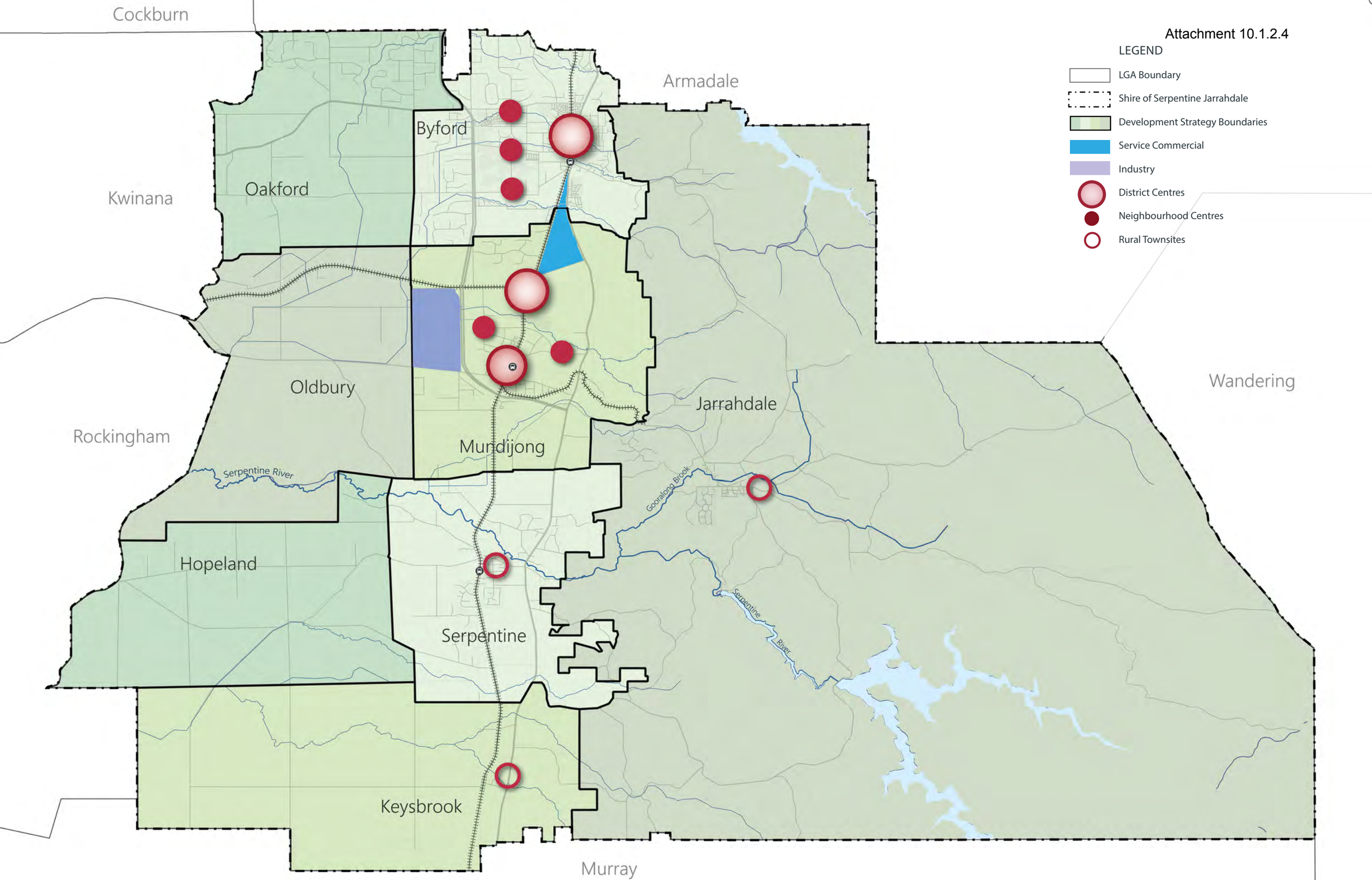


FIGURE 15: ACTIVITY & INDUSTRIAL CENTRES

5.3 TOURISM

DESCRIPTION:
Situated within both the Perth and Peel regions, the Shire offers a unique setting with an abundance of natural assets and distinctive features with easy access to Perth and Mandurah. The natural environment offers many opportunities for tourism, with extensive State Forest, the Darling Scarp, Serpentine Falls, Serpentine Dam and various other natural areas all located within the Shire. The rural landscape and farming activities set amongst these environmental assets offers a unique country atmosphere amongst the two rapidly growing urban centres in Byford and Mundijong Whitby. The rich heritage and natural beauty of the Jarrahdale and Serpentine townsites offer an urban escape with a great potential for tourism in close proximity to the conveniences and services of an urban centre.

RATIONALE

Promoting and facilitating tourism is extremely important to the growth of the local economy and creating activated and thriving communities. Attracting increased numbers of visitors will stimulate the local economy generating more investment within the Shire and more customers for local businesses.

Tourists may be encouraged to explore other attractions whilst visiting the Shire resulting in further increases to the economy. Increased patronage and investment would improve the financial viability of establishing a business within the Shire, attracting more businesses and investment. The growth of the tourism industry would also have many benefits to local communities, creating more recreation and entertainment choices, increased competition and activated and vibrant spaces.

Tourism within the Shire should be encouraged and developed to draw on existing features (Figure 16) as well as exploring new opportunities. A Tourism Strategy should also address the planning issues related to tourism within the Shire.

OBJECTIVES

+ Enable tourism growth and diversification through land use planning mechanisms.
+ Improve regional connections to larger population centres to support local tourism.
+ Promote the Shire as a tourist destination and attract greater numbers of visitors building upon the Shire's existing food industries and outdoor recreation landscapes, exploring opportunities for food and adventure tourism.
+ Contribute to employment self-sufficiency.

Table 25: Tourism: Strategy and Actions Summary

STRATEGIES	ACTIONS
a. Identify locally distinctive natural and environmental assets, unique features and characteristic settlements within the Shire to generate tourism.	1. Allow holiday accommodation land uses to be considered under LPS 3 within both the Serpentine and Jarrahdale Heritage/Tourism Precincts.
b. Identify new activities and enterprises to attract visitors which offer a point of difference to distinguish the Shire within the region.	2. Allow some non-rural land uses, such as boutique food and beverage outlets to be considered in rural zones under LPS 3 to encourage tourism.
c. Protect and enhance the character and heritage within the Serpentine and Jarrahdale townsites to attract visitors.	3. Include a special use zone within LPS 3 to provide appropriate land use and development provisions for Jarrahdale to allow the development of tourism uses.
d. Facilitate a range of accommodation services within the Shire to encourage tourism.	4. Investigate trails as a part of a transport plan.
e. Create an extensive network of trails across the Shire to improve accessibility and promote recreation activities.	
f. Attract and encourage the diversification and development of businesses which are likely to contribute to local tourism through appropriate land use planning.	
g. Encourage the development of tourism precincts which co-locate tourism activities, accommodation and access to transport connections.	
h. Improve local walkways and off road mountain biking and bridle trails to encourage recreational opportunities.	

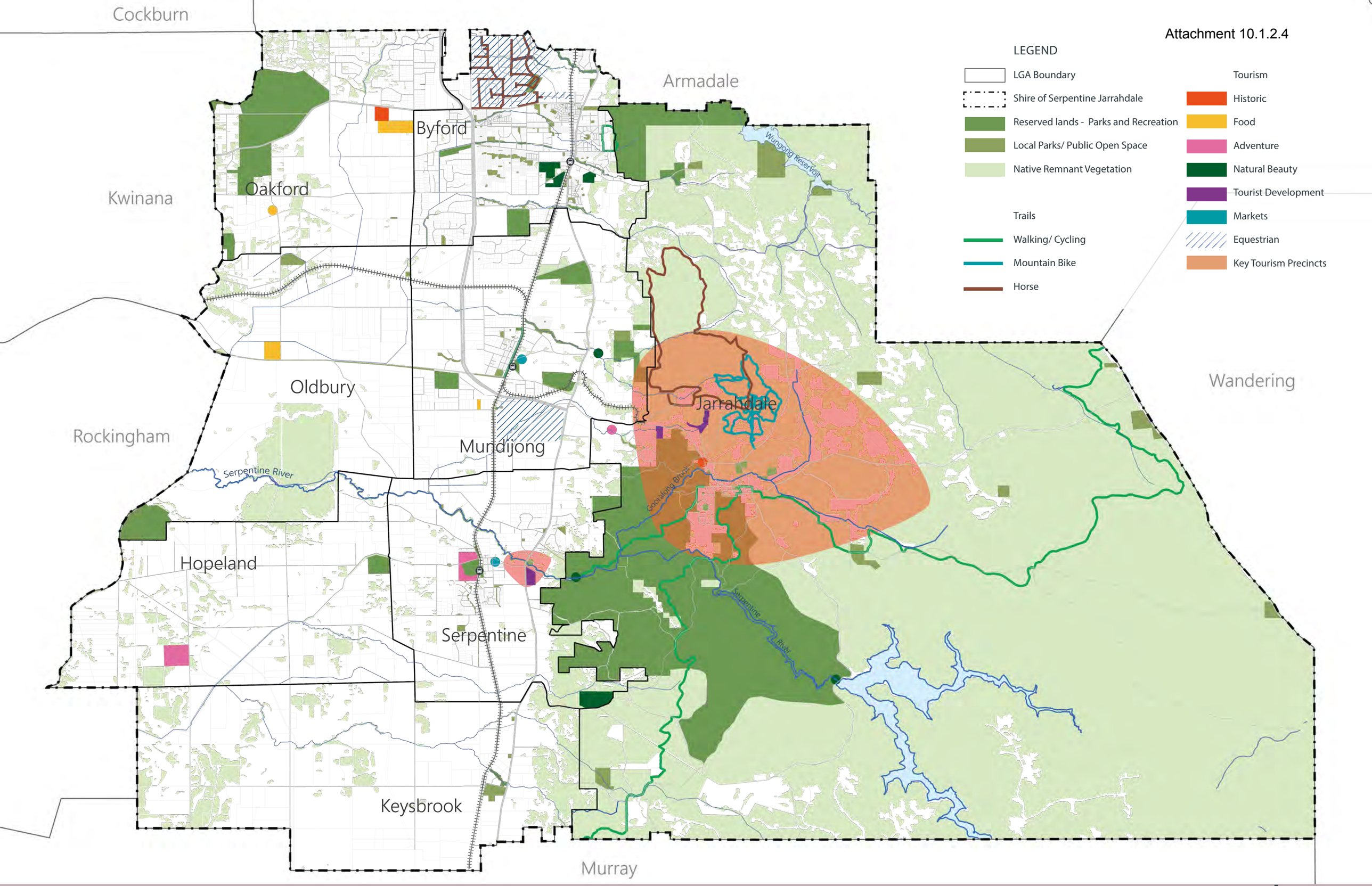


FIGURE 16: TOURISM

5.4 ENVIRONMENT AND NATURAL RESOURCES MANAGEMENT

DESCRIPTION:
This category addresses areas of significance to the environment and natural resources including environmentally sensitive areas, Bush Forever sites, conservation areas, natural corridors, waterways, flood prone areas, bushfire risk and basic raw materials. These elements are important considerations in guiding land use planning and development.

RATIONALE

The natural environment is a major asset to the Shire and the wider region providing an important habitat to sustain a unique ecosystem and support biodiversity. The natural areas within the Shire also serve a regional function, forming part of a network of regional ecological linkages (See Figure 17).

Additionally, environmental impacts within the Shire affect significant water resources in the region with parts of the Peel Harvey Catchment and Jandakot Groundwater Mound located within the Shire (Figure 18). It is therefore crucial that the Shire's environmental values are preserved and that natural areas, areas of significant vegetation, wetlands and waterways are protected. The natural areas and environmental quality of the Shire also enhances amenity and creates character within both urban and rural areas. It also important for this purpose to ensure that the natural environment is preserved and enhanced as a central element of liveability and a defining characteristic of the Shire.

Basic raw material resources also occur within the Shire providing an important natural resource in close proximity to developing urban areas. It is important to identify the location of basic raw materials to ensure that these resources are protected and remain in non-urban zones (Figure 19). It is important for land use planning to consider environmental assets and natural resources at a strategic level to ensure that more detailed planning and development does not compromise the integrity of environmental systems and the accessibility of natural resources. Ensuring that development occurs in a sustainable, climate responsive manner and is sensitive to surrounding environmental values is integral to maintaining and creating communities.

5.4.1 NATURAL LANDSCAPE AND BUSHFIRE RISK

OBJECTIVES

+ Protect important landscape features and landforms.
+ Prevent the degradation, contamination and erosion of land resources including productive soils.
+ Preserve the amenity and views of the Darling Scarp.
+ Ensure the safety of the community from bushfire risk.
+ Achieve a balance between managing bushfire risk and preserving natural landscapes, the environment and biodiversity values

Table 26: Natural Landscape and Bushfire Risk: Strategy and Actions Summary

STRATEGIES	ACTIONS
a. Recognise important landscapes and ensure that future development does not impact on land-scape values.	1. Include a special control area for the protection of the landscape and amenity of the Darling Scarp.
b. Ensure land uses and management practices are appropriate to the land capability of the land do not result in the erosion, contamination or acidification of soils.	2. Include provisions to manage intensive agricultural activities within LPS 3 to minimise impacts to the land.
c. Encourage development on seasonally waterlogged soils to utilize alternative construction techniques and footing designs to withstand these conditions, minimising the need to alter site conditions.	3. Encourage innovative and sustainable agricultural practices and technology to reduce environmental impacts.
d. Where development is proposed in the vicinity of bushland with regional or local values, there is a presumption that any buildings will be constructed to the appropriate Bushfire Attack Level (BAL).	4. Undertake bushfire hazard assessments as per SPP3.7 at structure planning, subdivision and development stages.
e. Not support the broad-scale clearing of vegetation as a means of addressing bushfire risk.	
f. Ensure future planning and development identified and appropriately manages bushfire risk.	

5.4.2 VEGETATION AND BIODIVERSITY

OBJECTIVES

+ Promote the conservation and sustainable management of natural areas.
+ Preserve significant flora and fauna, including threatened ecological communities, and protect biodiversity.
+ Protect and enhance tree canopy coverage to increase amenity, create a leafy character, provide shade and reduce urban heat island effect.

Table 27: Vegetation and Biodiversity: Strategy and Actions Summary

STRATEGIES	ACTIONS
a. Support the conservation of regionally significant areas and Bush Forever sites. b. Protect natural areas for conservation purposes and limit development within such areas. c. Identify natural corridors, including those along roads and railways to support ecological linkages. d. Encourage multiple use corridors which provide native vegetation and habitat to create important ecological linkages. e. Identify environmental features at rezoning and/or structure planning stages and promote the retention of such features within public open space. f. Work collaboratively with landowners and developers to protect natural areas. g. Identify significant tree species to be protected which meet a range of criteria. h. Encourage the retention and provision of trees in new developments. i. Require the revegetation of cleared areas with locally native species where appropriate. j. Require landscaping to incorporate locally native species. k. Ensure that development or changes in land use do not adversely impact on the conservation val-ues on the property.	1. Include vegetation protection provisions within LPS 3. 2. Include land clearing provisions within LPS 3. 3. Include provisions for landscaping to be comprised of locally native species in LPS 3. 4. Include an Environmental Conservation zone within LPS 3 to conserve areas of environmental significance which are usually privately owned. 5. Prepare a register of significant trees to be preserved. 6. Develop an Urban Forest Strategy.

5.4.3 WATER MANAGEMENT

OBJECTIVES

+ Protect and enhance the water quality of surface waters, groundwater and wetlands.
+ Prevent the pollution of the Peel-Harvey Catchment.
+ Ensure water resources are conserved and managed sustainably.
+ Preserve natural drainage systems and promote the integration of water into the landscape.
+ Mitigate and manage the risk of flooding.

Table 28: Water Management: Strategy and Actions Summary

STRATEGIES	ACTIONS
a. Require planning and development proposals to incorporate water sensitive urban design princi-ples and best management practices. b. Ensure that impacts to surface waters and groundwater including excessive nutrients, contami-nants, clearing, erosion, changes to water flow and runoff volumes are a primary consideration in the assessment of planning and development applications. c. Ensure that development in flood prone areas is constructed to minimise the risk of flooding. d. Encourage the development and retention of open drainage channels in preference to piped drainage where practicable in urban areas. e. Encourage multiple use corridors to be developed in urban and industrial areas which allow for the appropriate management of flood events. f. Identify opportunities for living streams within the existing rural drainage system to improve drain-age water quality. g. Encourage the use of greywater systems, rainwater tanks and other water efficiency measures to promote the reuse and conservation of water resources and investigate options for water recy-cling on a larger scale to be used for the irrigation of public open space. h. Require landscaping to be comprised of locally native species which have low water usage.	1. Introduce a special control area for the protection of the Jandakot groundwater supply mound. 2. Include provisions for flood risk management within LPS 3. 3. Include provisions for the protection of waterways within LPS 3. 4. Include provisions addressing the management of construction sites within LPS 3 to minimise im-pacts to water resources. 5. Include provisions to manage intensive agricultural activities within LPS 3 to minimise impacts to the Peel-Harvey Catchment. 6. Include provisions for landscaping to be comprised of locally native species in LPS 3.

5.4.4 BASIC RAW MATERIALS, INDUSTRIAL AND RURAL LAND USE BUFFERS

OBJECTIVES

+ Protect important basic raw materials and mineral resources.
+ Preserve the amenity of sensitive land uses and protect environmental values from any adverse off-site impacts of resource extraction or other land uses or development.
+ Mitigate and appropriately manage any potential impacts of development to air quality.

Table 29: Basic Raw Materials and Offsite Impacts: Strategy and Actions Summary

STRATEGIES	ACTIONS
a. Recognise the economic importance of protecting basic raw materials located in close proximity to developing urban areas. b. Prevent the development of incompatible land uses in close proximity to basic raw materials. c. Ensure development which may result in negative offsite impacts is appropriately managed. d. Ensure physical buffers which may incorporate landscaping or complementary land uses are located to manage emissions from industrial or intensive rural uses. e. Ensure sensitive land uses do not encroach on buffers of uses with potential offsite emissions.	1. Include provisions for buffers to land uses with offsite impacts within LPS 3. 2. Include a poultry farm special control area under LPS 3 to identify a specific area of land where poultry farms are encouraged and to notify existing and prospective landowners of potential offsite impacts in this area.

5.4.5 CLIMATE AND ENVIRONMENTAL SUSTAINABILITY

OBJECTIVES

+ Minimise the consumption of energy and resources within developments and reduce the amount of waste and emissions generated.
+ Ensure developments are responsive to the local climate.
+ Minimise and mitigate the impacts of development on climate change.
+ Reduce the urban heat island effect.

Table 30: Climate and Environmental Sustainability: Strategy and Actions Summary

STRATEGIES	ACTIONS
a. Ensure street layouts maximise solar access and are responsive to the direction of prevailing winds. b. Encourage built form outcomes that optimise passive solar orientation. c. Encourage developments to utilise renewable energy and energy efficient fixtures and fittings. d. Encourage developments to implement sustainable practices which reduce emissions and minimise waste products. e. Encourage the use of greywater systems, rainwater tanks and other water efficiency measures to promote the reuse and conservation of water resources and investigate options for water recycling on a larger scale to be used for the irrigation of public open space. f. Require landscaping to be comprised of locally native species which have low water usage. g. Maintain and increase tree canopy coverage throughout the Shire. h. Facilitate more sustainable modes of transport by ensuring the provision of a connected network of cycle paths and pedestrian pathways and improving access to public transport.	1. Prepare a local planning policy to address climate responsive street and lot orientation. 2. Include provisions in LPS 3 to require developments to utilise water sensitive urban design principles and best management practices. 3. Include provisions for landscaping to be comprised of locally native species in LPS 3. 4. Develop an Urban Forest Strategy.

LEGEND

- LGA Boundary
- Shire of Serpentine Jarrahdale
- Development Strategy Boundaries
- Environmental Conservation
- Reserved lands - Parks and Recreation
- Bush Forever Sites
- Native Remnant Vegetation
- Regional Green Linkages
- Environmentally Sensitive Areas

Cockburn
Armadale
Kwinana
Byford
Oakford
Mundijong
Oldbury
Rockingham
Wandering
Serpentine
Hopeland
Jarrahdale
Keysbrook
Murray
Tonkin Hwy
Nicholson Rd
Abernethy Rd
Orton Rd
South Western Hwy
Kargotich Rd
Hopkinson Rd
King Rd
Mundijong Rd
Wungong Reservoir
Nettleton Rd
Jarrahdale Rd
Goorabong Block
Kingsbury Dr
Serpentine River
Karnup Rd
Punrak Rd
Hopeland Rd
Westcott Rd
Henderson Rd

FIGURE 17: VEGETATION AND BIODIVERSITY

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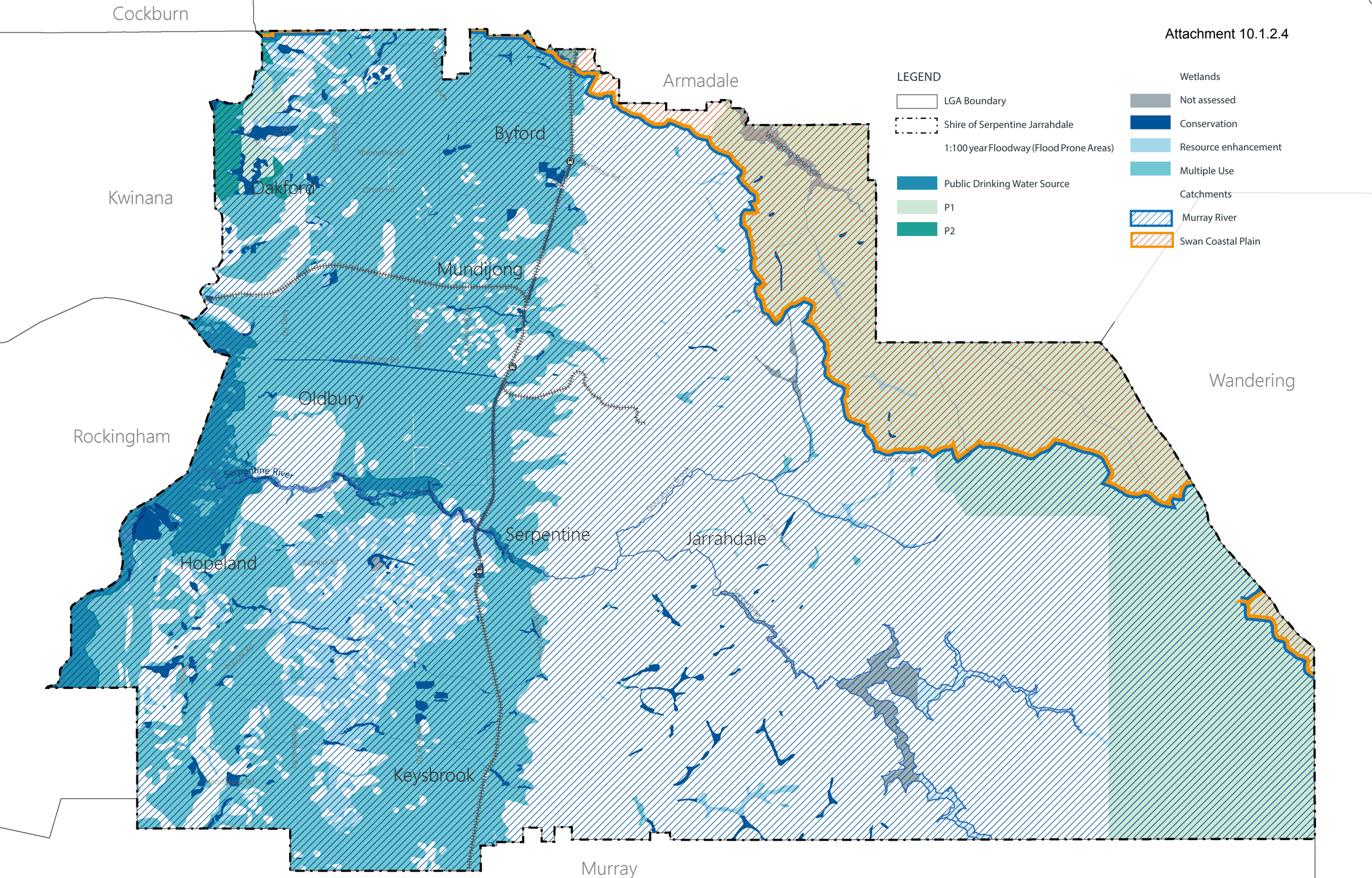
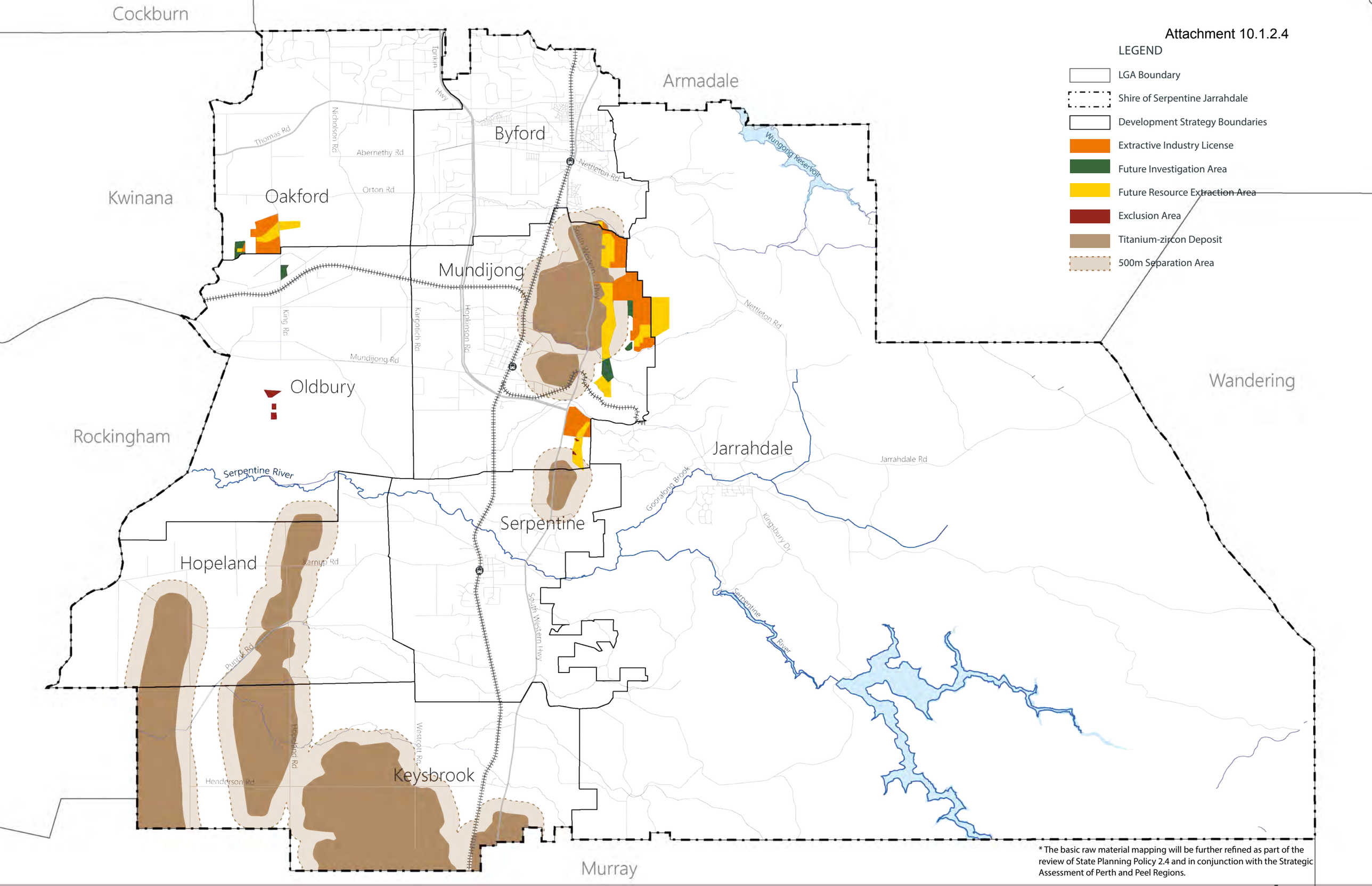
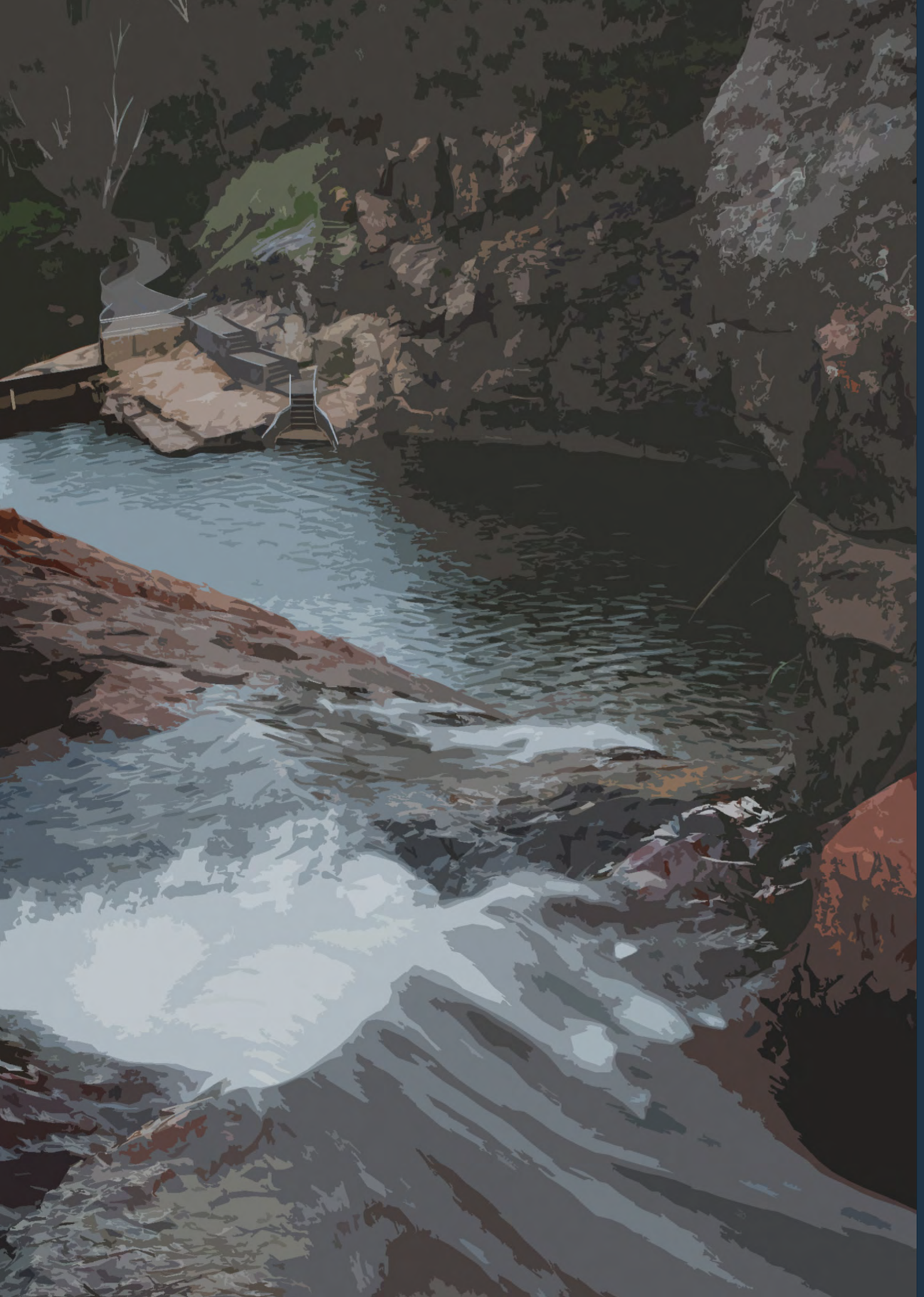


FIGURE 18: HYDROGRAPHY



* The basic raw material mapping will be further refined as part of the review of State Planning Policy 2.4 and in conjunction with the Strategic Assessment of Perth and Peel Regions.

FIGURE 19: EXTRACTIVE INDUSTRIES



6.0
IMPLEMENTATION

IMPLEMENTATION

6.0 IMPLEMENTATION

The Local Planning Strategy provides the justification for matters that require review under the Local Planning Scheme, and guides decision-making around amendments to the Scheme, structure plans, subdivision applications and development proposals. Its objectives and recommendations are to be used as a planning guide to assist Council and the Western Australian Planning Commission in their respective roles in land use planning.

IMPLEMENTATION

The following mechanisms will be used to implement the Strategy:

+ Review of the Local Planning Scheme and amendments;
+ Preparation of Local Planning Policies;
+ Structure Plans;
+ Local Plans;
+ Advocacy/promotion; and
+ Collaboration/partnerships.

Review of the Local Planning Scheme and amendments

The Strategy provides the justification for matters that need to be addressed in the review of the Local Planning Scheme. The Planning and Development (Local Planning Schemes) Regulations 2015 require local governments to undertake a review of their local planning scheme five years after its gazettal. Various actions identified relate to the scheme review such as rationalisation of zones in accordance with the model provisions, review of industrial land and activity centres.

Local Planning Policies

Local planning policies are prepared under the Local Planning Scheme. It is a tool to provide consistent and coordinated approach for decision making on land use and development matters. They provide additional guidance to applicants, planning staff and elected members on the preferred way in which discretion may be exercised under the Local Planning Scheme. The preparation of policies are recommended for example, to guide the preparation of activity centre structure plans and decision making in development applications. Existing policies should be reviewed to ensure consistency with the objectives and direction of the Strategy.

Structure Plans

Structure planning will be required as the basis for coordination of subdivision and development of greenfield sites, these areas are generally designated as 'future urban' and 'rural living' and re-development of areas and/or sites such as the Byford Town Centre Structure Plan and The Glades Structure Plan. Structure Plans are to be prepared in accordance with the objectives and strategic directions set out under this Strategy.

Local Plans

Local Plans are strategies similar to this one where objectives that fall outside of the scope of land use and planning can be addressed. Examples are the Reserves Management Plan etc. which goes beyond the scope of an urban planning strategy and covers other social, environmental and infrastructure outcomes.

Advocacy/Promotions

Advocacy is a tool that can be used to campaign for specific land use and planning desired outcomes of the strategy such as improving public transport provided by State government and education of developers and builders on the need for a greater diversity of lots and houses. Promotions are where the Shire actively works to encourage positive change behaviour and this is often achieved by education, information, displays, community events such as 'Shaping SJ' which encourage residents to contribute to the activation of places and spaces. The intent is to get the message and information out to as many interested parties as possible so as to advance the outcomes of this strategy.

Collaboration/Partnerships

Local Government cannot tackle major issues on its own. It is widely accepted by all governing institutions that collaborative, integrated approaches are more successful as there are often cross sectorial issues involved or funding models are at local, state government scale. Example of collaboration are the partnership between the Shire and State government for extension of the Tonkin Highway and Freight Rail Realignment.



LOCAL PLANNING STRATEGY MAP

APPENDIX 1

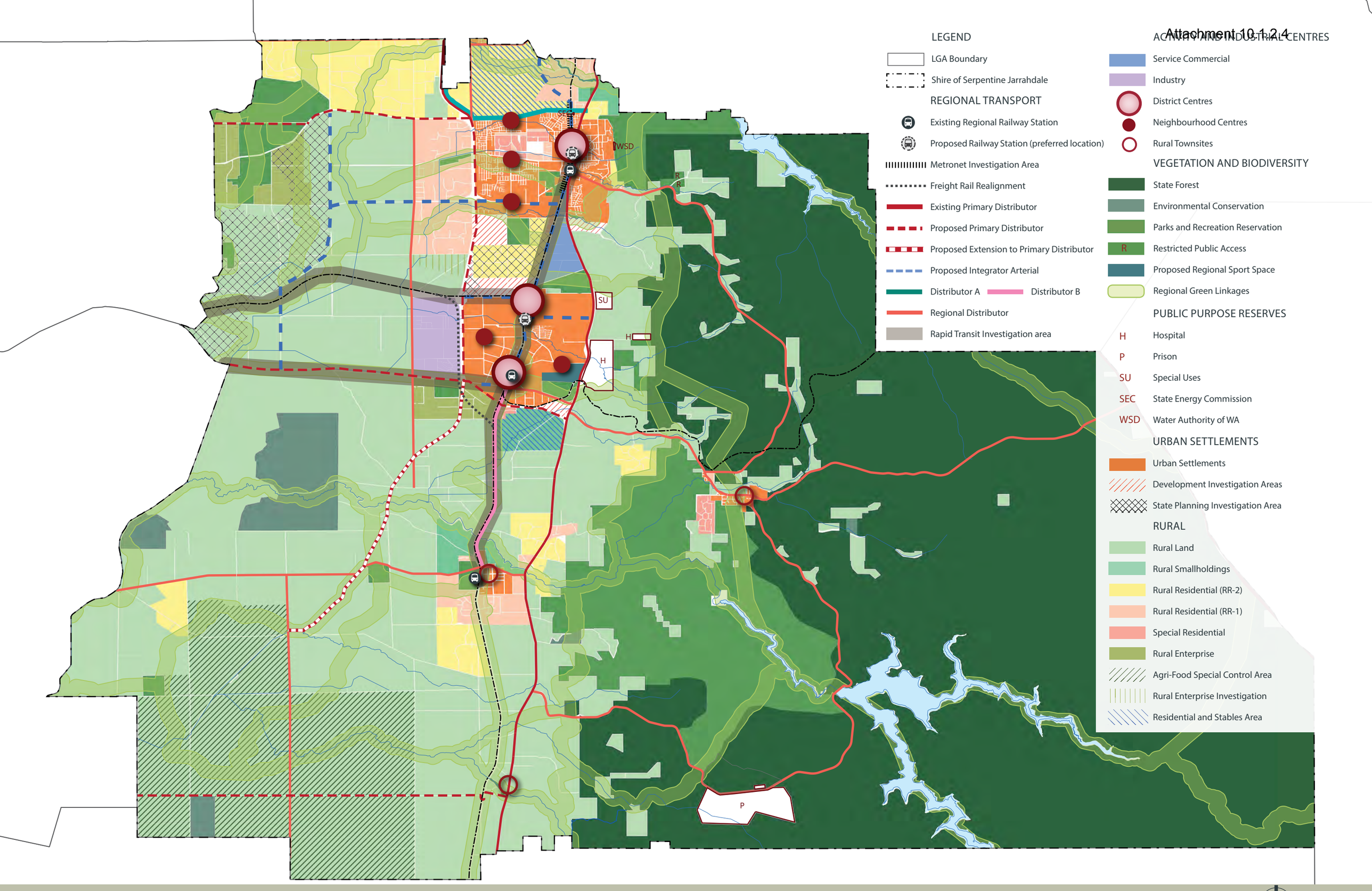


FIGURE 20: LOCAL PLANNING STRATEGY MAP



PART 2 - BACKGROUND INFORMATION AND ANALYSIS

APPENDIX 2

Shire of Serpentine Jarrahdale

Local Planning Strategy

Part 2 – Background Information and Analysis

DRAFT

July 2019

Document Control

Revision No.	Description	Date Issued
1	Preliminary draft for client review	12 September 2016
2	Part One draft issue for client review	21 October 2016
3	Part Two draft issue for client review	02 December 2016
4	Final Draft	31 July 2017
5	Revised Draft by Shire of Serpentine Jarrahdale	6 December 2018

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Contents

1 Introduction 5
1.1 Role and Purpose of the Strategy 5
1.2 Relationship to other Planning Mechanisms 5
2 State and Regional Planning Context 6
2.1 State Planning Framework 6
2.2 State Planning Strategy 6
2.3 State Planning Policies 7
2.4 Regional and Sub-Regional Strategies 15
2.5 Metropolitan Region Planning Scheme 18
2.6 Operational Policies 18
2.7 Other Relevant Strategies, Plans and Policies 20
3 Local Planning Context 24
3.1 Local Government Integrated Reporting Framework 24
3.2 Strategies and Plans 25
3.3 Local Planning Policies 35
4 Local Profile 38
4.1 Location 38
4.2 Population and Housing 39
4.3 Economy and Employment 47
4.4 Retail and Commercial 52
4.5 Tourism and Visitors 55
4.6 Parks and Open Space 56
4.7 Community Facilities 62
4.8 Heritage 66
4.9 Rural Areas 75
4.10 Natural Environment 82
4.11 Urban Design 95
4.12 Traffic and Transport 98
4.13 Infrastructure Services 107
5 Key Planning Issues 111
5.1 Housing and Population Growth 111
5.2 Economy 112
5.3 Environment 114
5.4 Rural 118

5.5 Transport....119
5.6 Utility Services....120
5.7 Heritage....121
5.8 Community Facilities....121
5.9 Recreation and Open Space....122
5.10 Urban Design....122
6 References....124

Table of Figures

Figure 2-1: South Metropolitan Peel Sub-Regional Framework....16
Figure 2-2: Extract Metropolitan Region Scheme....18
Figure 3-1: Relationship to Integrated Reporting Framework....24
Figure 3-2: SJ2050 Spatial Framework....25
Figure 3-3: Rural Strategy Map....27
Figure 4-1: Location Plan....38
Figure 4-2: Historic Population Snapshot and Growth Trends....39
Figure 4-3: Age Structure 2016....41
Figure 4-4: Weekly Household Income 2016....42
Figure 4-5: Household Composition 2016....43
Figure 4-6: Comparison of Population Projections for Shire of Serpentine Jarrahdale....44
Figure 4-7: Major Employment Industries in Serpentine Jarrahdale....48
Figure 4-8: Number and Types of Public Open Space....57
Figure 4-9: Positive Places POS Tool Classifications Comparisons....58
Figure 4-10: Catchment Population by Park Type....59
Figure 4-11: Park Function and Quality in the Shire....60
Figure 4-12: Lot Sizes within the Shire of Serpentine Jarrahdale....75
Figure 4-13: Annual Horticulture....85
Figure 4-14: Perennial Horticulture....86
Figure 4-15: Dryland Cropping....86
Figure 4-16: Grazing....87
Figure 4-17: Surface Water....88
Figure 4-18: Groundwater....89

List of Tables

Table 2-1: Current Development Control Policies....19
Table 2-2: Current Guidance Documents....19
Table 3-1: Current Local Structure Plans....32
Table 3-2: Current Subdivision Guide Plans....33
Table 3-3: Local Planning Policies....35
Table 4-1: Population Projection by Settlement Area....40
Table 4-2: Urban Land....45
Table 4-3: Activity Centre Hierarchy and Functions....53
Table 4-4: Types of Public Open Space....56

Table 4-5: Public Open Space in the Shire of Serpentine Jarrahdale 56
Table 4-6: Comparison of Positive Places POS Tool and DSR definitions 58
Table 4-7: Shire Parks and Catchment Populations 59
Table 4-8: Community Infrastructure Hierarchy 62
Table 4-9: Community Infrastructure Project Priorities 63
Table 4-10: Heritage Listings in Shire of Serpentine Jarrahdale 68
Table 4-11: Comparison of TPS 2 Zones and the Model Provisions 76
Table 4-12: Landform and Soil Classifications 84
Table 4-13: Threatened Ecological Communities 90
Table 4-14: Bush Forever Sites in the Shire of Serpentine Jarrahdale 91
Table 4-15: Travel to Work 2016 Census 98
Table 4-16: Shire of Serpentine Jarrahdale Road Hierarchy 99
Table 4-17: Austroads Bicycle Provision Rates 105
Table 4-18: End-of-Trip Facilities Provision 106

1 Introduction

1.1 Role and Purpose of the Strategy

The Shire is required by the *Planning and Development (Local Planning Schemes) Regulations 2015*[1] to prepare a planning strategy for each local planning scheme within its district. The Regulations state that a local planning strategy must:

(a) set out the long-term planning directions for the local government; and
(b) apply any State or regional planning policy that is relevant to the strategy; and
(c) provide the rationale for any zoning or classification of land under the local planning scheme.

This local planning strategy is prepared to inform Local Planning Scheme No. 3. There has been considerable change both within and affecting the Shire since Town Planning Scheme No. 2 was gazetted on 4 August 1989, and this strategy is based on an examination of the current situation and the trends and influences driving the changes to which the Shire's planning scheme must respond. The local planning strategy provides strategic direction and provides the framework for decisions on future proposals for rezoning, subdivision and development over the next ten to fifteen years.

Whilst primarily a spatial planning strategy, it addresses social, economic, environmental, and resource management factors that affect and are affected by land use and development. For this reason, the local planning strategy will also provide a reference for Council in relation to many of its other corporate functions, helping to identify priorities for investment in infrastructure such as community facilities and services, economic development initiatives, environmental management activities, and community building, for example. Similarly, other organisations will refer to the local planning strategy for guidance on their own activities within the Shire.

The local planning strategy will be reviewed along with the local planning scheme every five years, as required by the Regulations. However, should changes in local circumstances necessitate it, the strategy may be reviewed or amended sooner.

1.2 Relationship to other Planning Mechanisms

The local planning strategy is required to be consistent with State and regional planning policy, structure plans and strategic initiatives. The planning context of the local planning strategy at the State, regional and local levels is illustrated in Figure 2.1, which is derived from the *State Planning Strategy* (see section 2.2).

[1](Government of Western Australia, 2015)

2 State and Regional Planning Context

State and regional strategies and policies provide the framework for local planning. This section outlines the various strategies and policies and identifies how they influence the local planning strategy. The Shire is generally expected to implement the relevant State and regional policies and strategies at the local level although local adaptation may be required.

2.1 State Planning Framework

The State Planning Framework (SPF) is outlined in State Planning Policy 1 – State Planning Framework (SPP 1). The SPF includes regional strategies, regional and sub-regional structure plans, strategic and operational policies, strategies and guidelines prepared and endorsed by the Commission. Figure 2.1 shows how the local planning strategy fits within the overall planning framework for the State.

2.2 State Planning Strategy

The *State Planning Strategy 2050*[2] forecasts that by 2050, Western Australia will double its current population and will have a diverse range of well-connected and vibrant communities and regional centres. The Strategy focuses on economic and population growth as the key drivers of land use and land development. The Strategy can also be used to guide, inform and unite local community plans, growth plans and local planning schemes and local planning strategies.

As set out in SPP 1, if there is a conflict between a provision of the SPF and the State Planning Strategy, the State Planning Strategy shall prevail.

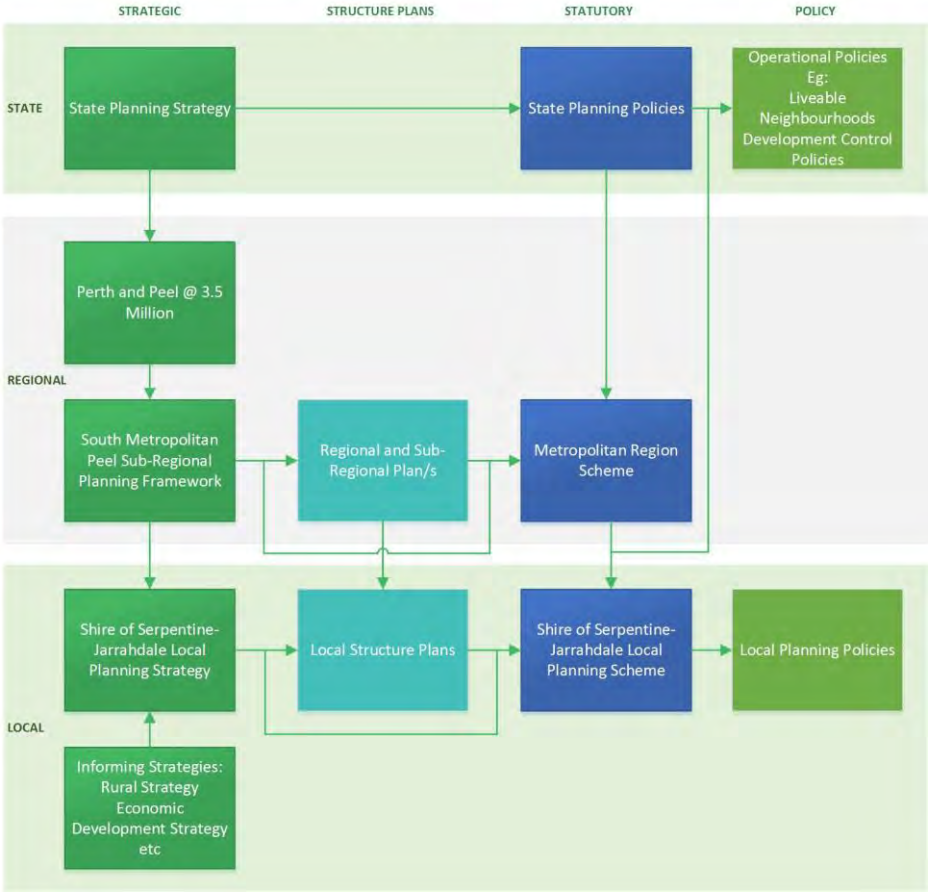


Figure 2.1 Planning Framework

[2] (Shire of Serpentine Jarrahdale, 2017) SPS

2.3 State Planning Policies

As outlined in the SPF, State Planning Policies (SPP's) are prepared by the WAPC using procedures set out in the *Planning and Development Act 2005*. The procedures include public consultation on draft policies, consideration by the Minister responsible for Planning, and the Governor.

SPP's have the following broad groupings, which are reflected in their numbering:

1. State Planning Framework
2. Environment and Natural Resources;
3. Urban Growth and Settlement;
4. Economy and Employment;
5. Transport and Infrastructure;
6. Regional Planning and Development.

SPP 1.0 – State Planning Framework

SPP 1 is the overarching State Planning Policy that specifies general principles for land use planning and development and identifies the primary aim of planning to provide for the sustainable use and development of land. It unites existing State and regional policies, strategies and guidelines within a central framework, which provides a context for decision-making on land use and development in Western Australia. SPP 1 identifies and expands on six general principles to guide land use and development: community; economy; environment; infrastructure; regional development and governance.

SPP 2.0 - Environment and Natural Resources Policy

The purpose of this policy is to integrate environment and natural resource management with broader land use planning and decision-making. Its objectives are to protect, conserve and enhance the natural environment, and to promote and assist in the wise and sustainable use and management of natural resources.

The Shire area is biologically diverse and home to a broad range of ecological communities and species, and natural landscapes. The Shire area's many natural assets include the Serpentine National Park, Jarrahdale State Forest, the Darling Scarp, and the Palusplain of the Swan Coastal Plain. While it is recognised that the Shire's population will continue to grow, associated development needs to occur in a manner that does not threaten these assets. As such, it is paramount that land use planning and decision making integrate the objectives of this policy for the benefit of the community.

SPP 2.1 – Peel-Harvey Coastal Plain Management

This Policy applies to all residential, commercial, industrial, rural and recreation land uses, and public sector undertakings within that portion of the Catchment of the Peel-Harvey Estuarine System that lies on the Swan Coastal Plain of Western Australia and within which part of the Shire is situated. The objectives of the policy are to improve the social, economic, ecological, aesthetic, and recreational potential of the Peel-Harvey Coastal Plain Catchment and to ensure that changes to land use within it are controlled so as to avoid and minimise environmental damage to the Peel-Harvey Estuarine system.

The policy area includes the Shire area west of the Darling Scarp. When considering proposed development, including subdivision, the Shire must take into account land capability and suitability and specific management practices (such as effluent treatment, red mud amendment, revegetation, and stocking rates). Land used for intensive agriculture that is likely to drain towards the Peel-Harvey Estuarine System must be managed to reduce or eliminate nutrient export from the land. The retention and rehabilitation of existing remnant vegetation is also encouraged.

SPP 2.3 – Jandakot Groundwater Protection

The objectives of the policy is to ensure that all changes to land use within the Policy Area are compatible with long-term protection and maintenance of groundwater for public supply and maintenance of associated ecosystems. It also includes guidance on the retention of native vegetation and wetlands that is beneficial in protecting and maintaining the quality of the groundwater resource. The Policy Area includes the north-western portion of the Shire area, where the zoning under the Metropolitan Region Scheme is 'Rural – Water Protection', 'Reserve – Water Catchment', and 'Reserve – Parks and Recreation'.

The policy limits lots sizes within the policy area to a minimum of 2 hectares, except where it can be demonstrated through the application of innovative designs that small lots will not risk contamination of the ground water. Land use suitability is based on land capability assessment to establish the risk of groundwater contamination. The policy identifies land uses that may be permissible within the area. All affected local governments were required to amend their local planning schemes soon after the gazettal in 1998 to reflect the policy requirements. The policy also outlines development control provisions applicable within the policy area, including when advice from the Department of Water is required.

SPP 2.4 – Basic Raw Materials

This policy sets out the matters which are to be taken into account and given effect to by the WAPC and local governments in considering zoning, subdivision and development applications for extractive industries (for the extraction of basic raw materials) and zoning, subdivision and development applications in the vicinity of identified basic raw material resource areas.

Basic raw materials means sand (including silica sand), clay, hard rock, limestone (including metallurgical limestone) and gravel and other construction and road building materials, located on privately owned land. The *Mining Act 1978* covers extraction of all other minerals and minerals located on Crown land.

As basic raw materials are important economic resources, particularly relating to the cost of housing and other construction, the local planning strategy must recognise and protect areas likely to contain significant quantities of these minerals from inappropriate or premature development. Key extraction and priority resource locations exist within the Shire of Serpentine-Jarrahdale boundaries, as discussed in section 4.10.3.

SPP 2.5 - Rural Planning

The purpose of this policy is to protect and preserve rural land assets due to the importance of their economic, natural resource, food production, environmental and landscape values. Ensuring broad compatibility between land uses is essential to delivering this outcome.

The policy applies to State and local government decision-making for region, sub-region and local schemes, strategies, structure plans, subdivisions and developments relating to rural land. Where there is no WAPC endorsed strategic or statutory planning instrument in place to guide WAPC decision-making, and where an endorsed strategy conflicts with the intent of State policy, this policy will prevail unless a regional variation has been approved by the WAPC.

Within the Perth and Peel Regions, it is recognised that rural land will become more contested as land is either required for urban purposes, identified for environmental protection, needed for infrastructure; or set aside for basic raw material extraction. SPP 2.5 contains the following WAPC positions with regard to rural land in the Perth and Peel planning regions:

- rural residential proposals for rural land that do not align with endorsed sub-regional planning frameworks are considered inconsistent with the policy objectives and will not be supported;

- rural smallholdings proposals for rural land will be considered by exception in planning strategies and schemes, where topography, biodiversity values, bushfire risk, environmental matters and servicing can be managed in accordance with this and other State policies;
- established rural land uses of State significance, including animal premises and food processing facilities, should be protected from urban and rural living encroachment due to their critical food production and economic roles;
- priority agricultural land is to be preserved for that purpose due to its proximity to major population centres; and
- conversion of land from priority agriculture to other uses must be appropriately planned in strategies or schemes, where such conversion is required as a matter of State significance.

The WAPC's decisions in relation to rural land will be guided by the need to provide economic opportunities for rural communities and to protect the State's primary production and natural resource assets. Therefore the WAPC will continue to promote rural zones in schemes as highly flexible zones that cater for a wide range of rural land uses that can support primary production and value adding, small-scale tourism, environmental protection and biodiversity conservation. The policy recognises the differing needs of the various regions within the State and regional variations may be considered where they meet the stated objectives of this policy, are evidence-based and are supported in strategies and schemes.

- SPP 2.5 also provides important guidance on rural living land uses, outlining rural living zones and lot size ranges. Various policy measures are contained within SPP 2.5 to guide decision-making on rural living proposals. This is particularly relevant to the Shire given the existence of a range of rural living areas within the Shire. More broadly, given the rural nature of much of the Shire, this policy provides key guidance. Variations from the principles outlined in the policy will be required to be justified with strong rationale and evidence.

SPP 2.7 – Public Drinking Water Source Policy

The objective of this policy is to ensure that land use and development within Public Drinking Water Source Areas (PDWSAs) is compatible with the protection and long-term management of water resources for public water supply. As population across the region increases, the demand for potable water increases.

The policy notes that local and regional planning strategies should identify PDWSAs based on advice from the Department of Water. There are extensive PDWSAs in the Shire on the Darling Plateau. Much of the affected land is reserved for State Forest, Parks and Recreation, and Water Catchment in the MRS. However any proposed activity within a PDSWA must be assessed for its potential to adversely impact on the quality and quantity of drinking water resources.

Planning needs to consider the options for 'fit for purpose' water, so that potable water is not used for purposes that do not require it. Water demand management and water re-use can also be influenced by planning strategies and policy.

SPP 2.8 – Bushland Policy for the Perth Metropolitan Region

This policy provides an implementation framework to ensure the protection and appropriate management of bushland within the Perth Metropolitan Region, as it relates to land use planning and decision-making. The policy addresses *'Bush Forever'* areas and local bushland. It provides a framework for decision-making as it relates to bushland within these two categories.

Within *Bush Forever* areas, the intention is to protect any regionally significant bush from adverse impacts of development within or near the *Bush Forever* site. Development may not be prevented if there is no adverse impact. The Shire's *Biodiversity Strategy* (see section3.3.4) provides a framework under this policy for consideration of local bushland. As natural bushland is a significant environmental, economic, and

landscape asset within the Shire, it is important to ensure that it is managed appropriately to ensure its retention.

SPP 2.9 – Water Resources

This policy relates to SPP 2.0 and provides clarification and additional guidance to planning decision-makers for consideration of water resources in land use planning. It does not impose changes to existing land uses that may be regulated through other legislation and processes. The objectives of this policy are to:

- protect, conserve and enhance water resources that are identified as having significant economic, social, cultural and/or environmental values;
- assist in ensuring the availability of suitable water resources to maintain essential requirements for human and all other biological life with attention to maintaining or improving the quality and quantity of water resources; and
- promote and assist in the management and sustainable use of water resources.

It seeks to ensure that local and regional planning strategies, structure plans, schemes, subdivisions and development applications adopt measures relating to the identification, protection, management and/or enhancement of water resources including surface and groundwater, wetlands, waterways and estuaries and consideration of total water cycle management. The policy recommends that the local planning strategy consider:

- Mapping of water resources in the area;
- Identify the significance of each type of water resource to provide a framework for addressing the resource;
- Identify appropriate setbacks and/or buffers to maximise protection of water resources that have been identified as significant in either a state, regional or local context from existing and future adverse impacts;
- Identify relevant environmental data that may influence water resources, where available;
- Drinking water source protection plans should be taken into account to ensure sources are protected in the future and strategies should address how such areas are to be protected and managed, and guide appropriate zonings and restrictions on the types of development and minimum requirements for subdivision or special control areas;
- Identify all floodplains and areas prone to surface flooding or groundwater inundation and ensure that no development is in a flood path that could carry an increased risk to public safety or property;
- Identify developable and non-developable areas based on environmental constraints;
- Identify and protect a public open-space network including remnant vegetation, natural drainage lines, recreational, cultural and environmental features and consider use of a multiple-use corridor approach that is responsive to local conditions; and
- Locate incompatible land uses an appropriate distance from water resources and consider potentially inappropriate land use practices such as clearing, stocking, fertilisation and effluent disposal.

Given the significant water resources within the Shire, including major drinking water catchment areas, responsible planning to protect the quality of these resources is imperative.

SPP 3.0 - Urban Growth and Settlement

This policy sets out the principles and considerations that apply to planning for urban growth and settlements. The aim of the Policy is to accommodate sustainable patterns of urban growth by setting out broad requirements for new development that can be implemented at regional and local levels. The policy also provides specific guidance in relation to establishing rural living estates or areas where rural living is to be developed. Policy measures address:

- Creating sustainable communities;
- Managing urban growth and settlement across Western Australia;

- Managing urban growth in Metropolitan Perth;
- Planning for liveable neighbourhoods;
- Coordination of services and infrastructure;
- Managing rural-residential growth; and
- Planning for Aboriginal communities.

This overarching policy is supported by other policies and strategies, such as the *State Planning Strategy* (refer to 2.2), *Perth and Peel @ 3.5 Million* (2.4.3), *Liveable Neighbourhoods* (2.6.1), *SPP 3.6 – Development Contributions for Infrastructure* (this section) and *SPP 2.5 – Rural Planning*, (this section).

SPP 3.1 - Residential Design Codes

The purpose of the Residential Design Codes (R-Codes) is to provide a comprehensive basis for the control of residential development throughout Western Australia. The R-Codes set out a range of density codes from low density (R2) to high density (R160) as well as codes that can be applied within mixed use or activity centres. The R-Codes apply to all residential and mixed use development throughout the State on any land to which a code is applied, with any exemptions and variations required to be specified in the local planning scheme.

The R-Codes outline standards that will be acceptable if met ('deemed-to-comply') and performance standards ('design principles') by which alternative design solutions can be considered. The broad objective in the Shire area is to maintain a 'rural feel' to urban development in the Shire area. It will be necessary to determine whether any local variations to the R-Codes will be necessary to achieve this objective, and to define just what would constitute appropriate development to realise it.

SPP 3.4 – Natural Hazards and Disasters

This policy encourages local governments to adopt a systematic approach to the consideration of natural hazards and disasters when performing statutory or advisory functions. Natural hazards and disasters include bush fires, floods, severe storms and storm surges. Whilst storm surges are a low risk within the Shire due to the distance from the coast and tidal areas, bush fire, floods, and severe storms are all a possibility if not a probability, and need to be considered. This policy is linked to *SPP 3.7 Planning in Bushfire Prone Areas* but where there is a conflict between SPP 3.4 and SPP 3.7 in relation to bushfire matters, SPP 3.7 prevails to the extent of any inconsistency.

SPP 3.5 – Historic Heritage Conservation

This policy sets out the principles of sound and responsible planning for the conservation and protection of cultural heritage other than Aboriginal heritage, which is the subject of separate legislation. The intent of the policy is to conserve significant cultural heritage including buildings, structures and man-made landscapes. As it applies to the Shire, its intent will ensure that new development does not adversely affect these identified places. This will be achieved by ensuring that heritage is given weight in planning decision making at both State and local levels.

The Shire has a rich post-settlement history that is reflected in a number of heritage listed places. Appropriate conservation of heritage places will ensure that the unique qualities of the Shire are retained and can be celebrated and interpreted in new development as part of the objective of achieving sustainable community and development.

SPP 3.6 - Development Contributions for Infrastructure

Land developers are responsible for providing standard infrastructure, including water supply, sewerage and drainage, roads and power, and for some community infrastructure, including public open space and primary school sites necessary for their development. Development contributions are usually by way of

land, works, or payments towards the provision of infrastructure. Requirements for development contributions are imposed through conditions on subdivision or development or, in areas of fragmented ownership where cost sharing arrangements are necessary, by development schemes or development contribution arrangements made under local government schemes. This policy provides guidance to local governments on the scope and framework for development contributions and provides greater consistency and transparency for the development industry. This is important given the potential impacts on housing affordability and to avoid inequities arising from new residents subsidising existing residents.

Infrastructure that can be included in development contribution schemes are identified in the policy. As well as standard infrastructure, development contribution schemes can also include structures and facilities which help communities and neighbourhoods to function effectively, such as sporting and recreational facilities, community centres, libraries and cultural facilities. An important principle of the policy is that of 'need and nexus', or the need for the infrastructure included in a development contribution plan to be clearly demonstrated (need) and the connection between the development and the demand created should be clearly established (nexus). The onus is on the local government for demonstrating the need for non-standard infrastructure, particularly new or upgraded community infrastructure in order to ensure that another policy principle – that of equity – is applied.

The policy provisions have already been applied to areas covered by the Byford District Structure Plan and the Mundijong District Structure Plan, which have both been identified as Development Contribution Areas (DCA). The policy has also been applied in the preparation of the Shire's Community Infrastructure Development Contribution Plan.

SPP 3.7 – Planning in Bushfire Prone Areas

In December 2015, the Planning in Bushfire Prone Areas *Bushfire Policy Framework* introduced a suite of reforms to help protect lives and property against the threat of bushfires throughout Western Australia. This included the release of SPP 3.7 and the associated *Guidelines for Planning in Bushfire Prone Areas*. The intent of this policy is to implement effective, risk-based land use planning and development to preserve life and reduce the impact of bushfire on property and infrastructure.

The majority of the Shire has been identified within a Bushfire Prone Area by the Fire and Emergency Services Commissioner and SPP 3.7 provides essential guidance on how the Shire can best protect its community and infrastructure from this natural hazard. Integration of bushfire mitigation and protection measures into the Shire's planning instruments at the structure planning, subdivision and development stages of planning is required. At the same time, this Policy introduces challenges in relation to other priorities such as conservation of bushland and providing high amenity urban areas and public open space, which includes the provision of vegetation and shade for visual and microclimatic purposes.

SPP 4.1 – State Industrial Buffer Policy

The purpose of this policy is to provide a consistent approach for the protection and long-term security of industrial zones, transport terminals, other utilities and special uses, as well as ensuring the safety and amenity of surrounding land uses. Encroachment of sensitive land uses such as urban development can jeopardise the viability of important economic activities. As well as the typically high capital investment required to relocate facilities if on-going operation is compromised by the introduction of incompatible land uses too close to these activities, the forced closure of such activities is likely to take away employment opportunities for Shire residents. On the other hand, uses that are potentially noisy, smelly, dusty, or generate other external impacts can adversely affect population health as well as enjoyment if the latter is located too close.

It is therefore in all best interests to ensure that buffers are applied and enforced that prevent the location of potentially impactful activities too close to sensitive populations and locations, and vice-versa. Uses to

which buffers apply that can be already be found in or near the Shire include poultry farms, mine sites and quarries, processing facilities, land fill sites, and abattoirs.

SPP 4.2 – Activity Centres for Perth and Peel

The intention of this policy is to provide guidance for the preparation and review of local planning strategies and schemes, structure plans and development to enable the provision of activity centres. The policy specifies broad requirements for the planning and development of new activity centres and the redevelopment and renewal of existing centres. It is mainly concerned with the distribution, function, broad land use and urban design criteria of activity centres, and with coordinating their land use and infrastructure planning. In addition, the policy addresses the integration of activity centres with public transport; inclusion of a range of activities to promote community benefits through infrastructure efficiency and economic benefits of business clusters; and lower transport energy use and associated carbon emissions. It also promotes the objective of encouraging and consolidating residential and commercial development in activity centres so that they contribute to a balanced network. The policy identifies the hierarchy of centres as:

- Perth Capital City;
- Strategic metropolitan centres;
- Secondary centres;
- Specialised centres;
- District centres; and
- Neighbourhood centres (supplemented by local centres).

Each type of centre is characterised by differing levels of size, land use mix, and specialisation. The Shire of Serpentine Jarrahdale contains only District and Neighbourhood/local centres and this is unlikely to change within the planning horizon of this local planning strategy. Byford and Mundijong-Whitby are the two District centres within the Shire. All other activity centres, such as Serpentine and Jarrahdale are neighbourhood centres. The challenge for the Shire is to ensure that all centres are sustainable and adequately serve their catchment areas with goods and services, and provide employment opportunities.

SPP 5.2 – Telecommunications Infrastructure

This planning policy aims to balance the need for effective telecommunications services and effective roll-out of networks, with the community interest in protecting the visual character of local areas. The policy intends to provide clear guidance on the siting, location and design of telecommunications infrastructure, with objectives to manage the environment, cultural heritage, visual and social impacts.

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

The key objectives of the policy are to protect people from unreasonable levels of transport noise by establishing a standardised set of criteria to be used in the assessment of subdivision and development proposals, and to protect major transport corridors and freight operations from incompatible urban encroachment. The Shire will need to address this policy in relation to existing and planned major transport routes within the Shire to ensure the community is not adversely affected by road and rail noise, particularly in residential areas. At the same time, it is essential for the efficient movement of freight and other vehicles that operation is not compromised by the encroachment of noise and vibration sensitive land uses. Freight movement is often a 24-hours-a-day activity, so the potential impacts on sensitive land uses are greater than regular traffic that is concentrated in daylight hours. The existing freight rail alignment in the Shire travels through the Mundijong Whitby urban area. There are plans to investigate the feasibility of realigning the freight rail adjacent to the West Mundijong Industrial Area.

SPP 7.0 – Design of the Built Environment (Draft)

This draft Policy was released in October 2016. It sets out the principles, processes and considerations that will apply to the design of the built environment in Western Australia and provides the overarching framework for those policies that deal with design related issues, to be used in conjunction on specific development types relating to the design matters of a proposal. The policy aims to achieve:

- Rigorous and consistent process for considering design quality;
- Good design outcomes that meet government and community expectations through a coordinated strategy of design quality mechanisms:
  Design Principles – Performance-based approach to policy
  Design Review – Skilled evaluation expertise
  Design Skills – Skilled design expertise;
- Consistency across jurisdictions; and
- Timely and efficient assessment of planning applications through a scalable design review process.

In summary, the draft policy lists the ten design principles of good design as:

1. **Context and character** – Good design responds to and enhances the distinctive characteristics of a local area, contributing to a sense of place.
2. **Landscape quality** – Good design recognises that together landscape and buildings operate as an integrated and sustainable system, within a broader ecological context.
3. **Built form and scale** – Good design provides development with massing and height that is appropriate to its setting and successfully negotiates between existing built form and the intended future character of the local area.
4. **Functionality and build quality** – Good design meets the needs of users efficiently and effectively, balancing functional requirements to deliver optimum benefit and performing well over the full life-cycle.
5. **Sustainability** – Good design optimises the sustainability of the built environment, delivering positive environmental, social and economic outcomes.
6. **Amenity** – Good design optimises internal and external amenity for occupants, visitors and neighbours, contributing to living and working environments that are comfortable and productive.
7. **Legibility** – Good design results in buildings and places that are legible, with clear connections and memorable elements to help people find their way around.
8. **Safety** – Good design optimises safety and security, minimising the risk of personal harm and supporting safe behaviour and use.
9. **Community** – Good design responds to local community needs as well as the wider social context, providing buildings and spaces that support a diverse range of people and facilitate social interaction.
10. **Aesthetics** – Good design is the product of a skilled, judicious design process that results in attractive and inviting buildings and places that engage the senses.

For the Shire, the implications of this new Policy will be:

- Potential need to review current design guidelines for relevance;
- Consideration of how to introduce a design review process;
- Depending on timing, possible provisions within LPS 3.

2.4 Regional and Sub-Regional Strategies

2.4.1 Perth and Peel @ 3.5 Million

The *Perth and Peel @ 3.5 Million* suite of documents comprises the overview document[3] and four sub-regional frameworks. They were developed to engage the community and industry in discussion about how the combined Perth and Peel regions should look in the future, how lifestyle can be maintained, and how a substantially increased population can realistically be accommodated.



The purpose of the frameworks is to respond to the challenges of rapid population growth, changing economic conditions, shifts in demographics and evolving needs of industry and the community to realise the vision set out in the *State Planning Strategy* (2.2). The vision for Perth and Peel is reframed in this strategy as:

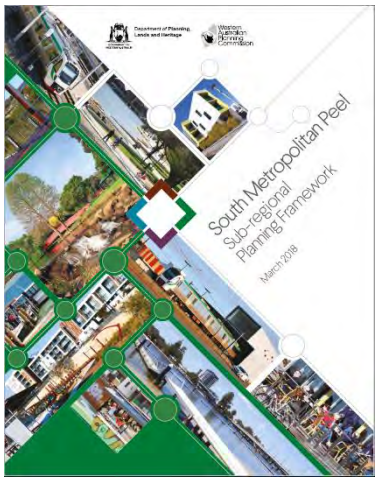
"A great, connected city that is globally competitive and technologically advanced; that is sustainable, resilient and respects its natural assets and heritage; that maximises the use of new and existing infrastructure; that offers a mix of housing and lifestyle choices and that respects and acknowledges the regions' sensitive natural environments and their respective ecosystems."

This strategy begins to define the future shape of Perth and Peel, by identifying the places where new homes and jobs will need to be created in order to accommodate the extra 1.5 million people anticipated in the metropolitan area. It seeks to consolidate the city by encouraging infill development in existing suburbs, steering away from the current outward sprawl trend.

The document includes a Spatial Plan which broadly sets out the parameters for growth within the metropolitan area. More detail is provided in the relevant sub-regional framework (see 2.4.2). Beyond this, *Perth and Peel @ 3.5 Million* document discusses the various challenges and issues to which planning needs to respond. Discussed under the headings of Growth Patterns, People and Society, Economy, Urban Environment, Environment and Landscapes, and Implementation, these are essentially the same matters required to be addressed in the local planning strategy.

2.4.2 South Metropolitan Peel Sub-Regional Planning Framework

The *South Metropolitan Peel Sub-Regional Planning Framework*[4] is one of four frameworks under *Perth and Peel @ 3.5 Million* intended to build upon the *State Planning Strategy* to consolidate the metropolitan region by increasing residential density and urban infill targets, thereby reducing dependence on new urban greenfields developments. The sub-regional frameworks represent a whole-of-State Government approach to managing future urban form within each sub-region.



The framework operates as a sub-regional structure plan to provide guidance to government agencies and local governments on land use, land supply, land development, environmental protection, infrastructure investment and the delivery of physical a community/social infrastructure for each sub-region. As such, this directly informs the local planning strategy. The key land use proposals are outlined in a spatial plan of the Framework, which indicates areas of growth, consolidation and investigation and those key locations that will become and continue to operate as activity centres. Within the

[3] (Department of Planning, Lands and Heritage, 2018)
[4] (Department of Planning, Lands and Heritage, 2018)

Shire, Byford and Mundijong are both identified as district activity centres. The Framework is reproduced in Figure 2-1. Relevant proposals contained in the framework will be discussed in further detail within specific subject headings elsewhere in this local planning strategy.

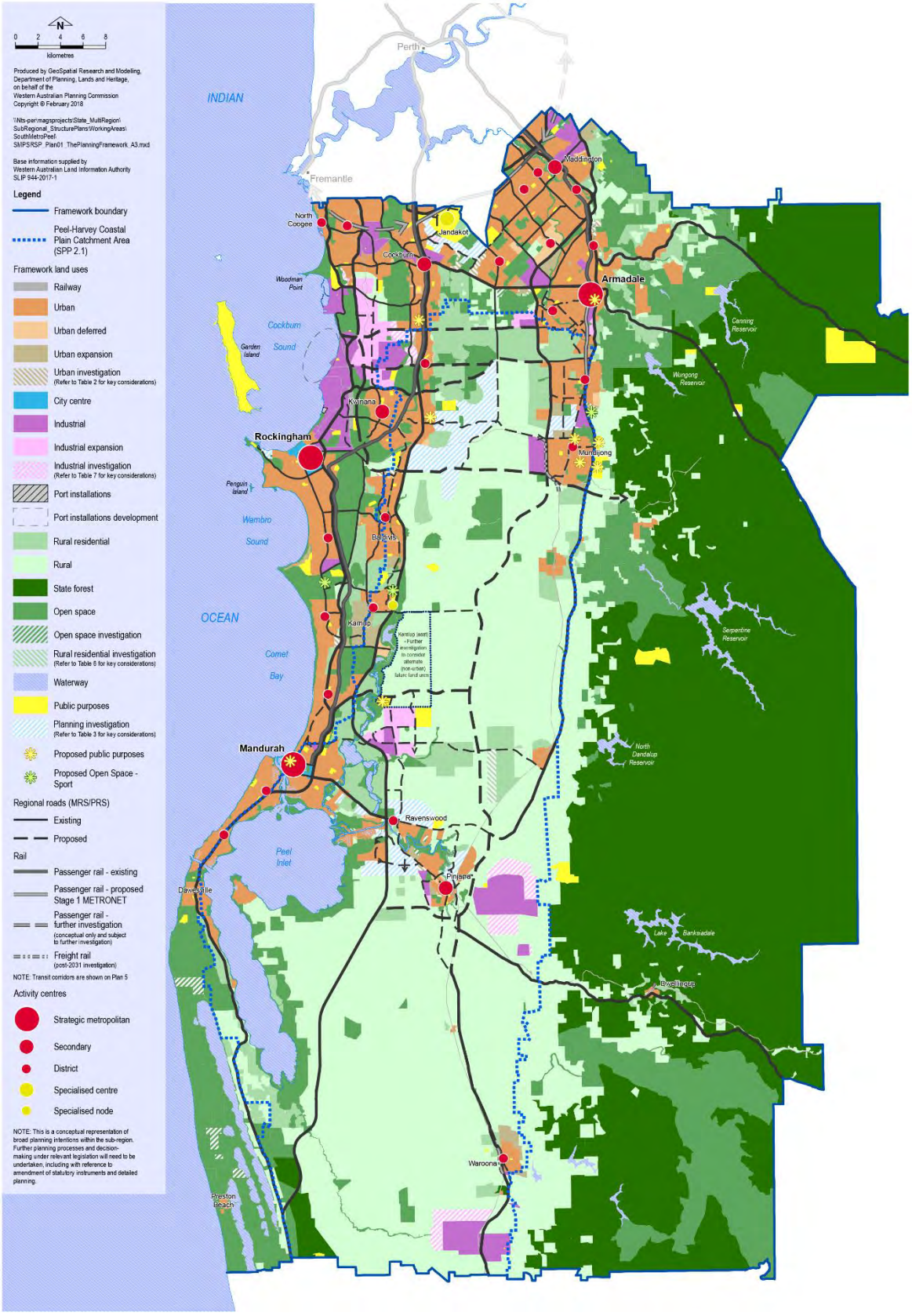


Figure 2-1: South Metropolitan Peel Sub-Regional Framework

2.4.3 Economic and Employment Lands Strategy

The *Economic and Employment Lands Strategy: non-heavy industrial: Perth metropolitan and Peel regions*[5] (EELS) was published in April 2012 in response to a recognised shortfall in the supply of industrial land supply. It was prepared by a taskforce with the co-operation of the former Department of Planning, the Department of State Development and the Department of Environment and Conservation, and Landcorp, with the aim to:

- Identify the areas, type and locations of general and light industrial land for the next 20 years;
- Review the existing industrial land development program and identify possible extension opportunities;
- Identify and evaluate the suitability of locations for new general and light industrial estates; and
- Develop a strategy to facilitate the delivery of general and light industrial land and assist in the restoration of the Government's long-term general and light industrial land bank.

General and light industrial areas are important for economic well-being, to accommodate demand from population growth and in response to demand for Western Australian resources. A shortage of unconstrained, serviced industrial land was identified during the most recent resources boom, and the strategy was an attempt to provide a rolling supply of industrial land to avoid such shortages in the future. EELS identified Byford, Cardup Brook (extractive industries and landfill) and Norman Road (Timber manufacture) as the main industrial employment centres within the Shire of Serpentine-Jarrahdale in 2010. EELS predicted that based on data available at the time, the South-East Sub-Region will have a surplus supply of industrial land by 2031, however identified a number of investigation areas within which additional industrial land might be located in the future as demand requires. Within the Shire, 455 hectares at West Mundijong and 208 hectares at Cardup were identified. These areas are identified as having potential in the medium term (4 – 10 years) at the time. West Mundijong was identified as a potential location for a future inter-modal freight terminal, due to its location near the intersection point of the rail system and primary road network.

2.4.4 Peel Regional Investment Blueprint

All regions in the State outside of Perth are preparing Investment Blueprints and this one[6] prepared by the Peel Development Commission describes Peel's vision and provides a roadmap for its achievement. It identifies short, medium and long term goals to be achieved through the implementation of a range of broad strategies. The strategies identifies key initiatives for focus and aspirational targets and strategies focused to 2050.

The Blueprint presents technological innovation, economic diversity and a highly skilled and flexible workforce as critical drivers of success. It states that traditional agriculture will continue to develop but greater attention will be paid to intensive, sustainable food production. The Blueprint also calls for a dramatic uplift in education and training, which it identifies as critical for an area challenged by unemployment and social disadvantage. The Blueprint presents the Shire as a key economic contributor to the region's agriculture, food and tourism industries. It outlines 2050 goals that include:

- the establishment of an agricultural and food processing precinct;
- the creation of opportunities for poultry and dairy farming industries; and
- colocation opportunities for industries that also maintains appropriate buffer areas from sensitive land uses.

[5] (Shire of Serpentine Jarrahdale, 2017) EELS
[6] (Shire of Serpentine Jarrahdale, 2017) Blueprint

2.5 Metropolitan Region Planning Scheme

The *Metropolitan Region Scheme* (MRS) is the statutory region planning scheme covering the whole of the Perth Metropolitan Region, within which the Shire is located. It was first gazetted in 1963 and defines the future use of land by dividing it into broad zones and reservations. Local government planning schemes fill in the detail of the broad zones with local zones and reserves, however all MRS reservations must be reflected in local planning schemes. is an extract of the MRS map as it relates to the Shire as at October 2018.

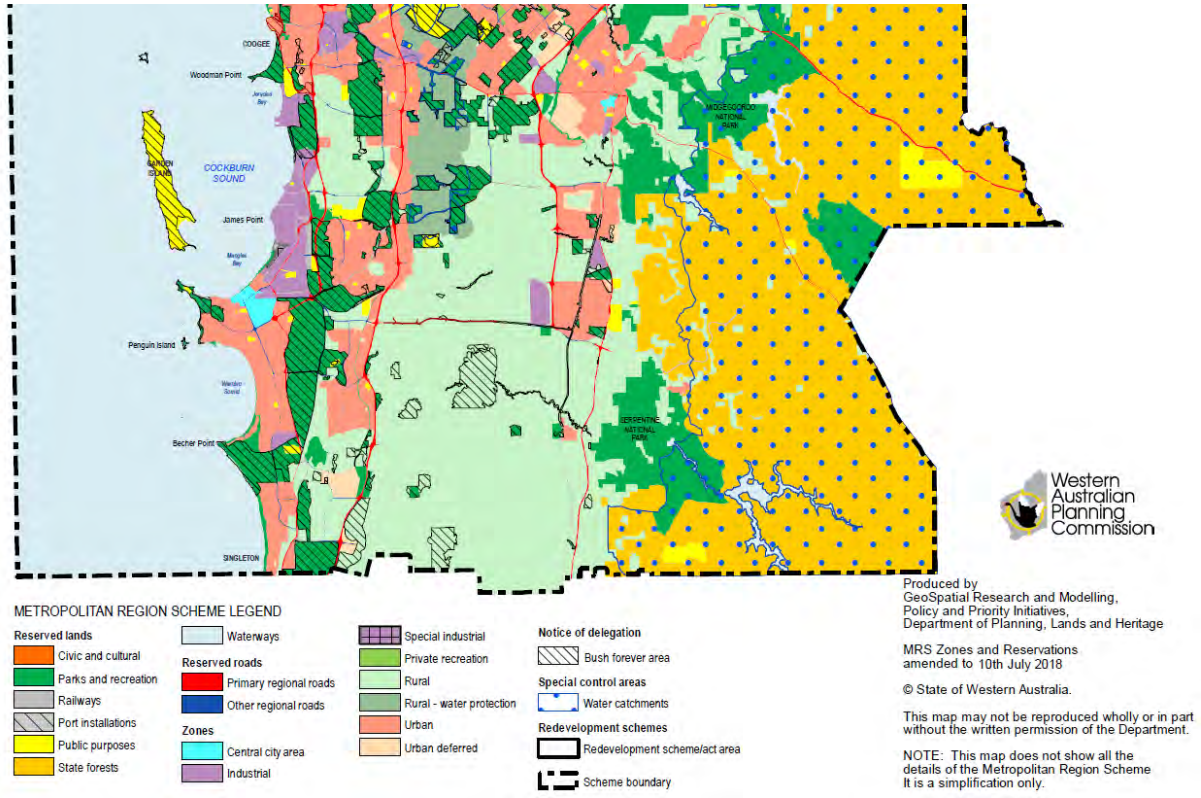


Figure 2-2: Extract Metropolitan Region Scheme

In addition to broad land uses zones and reserves, the MRS maps identify *Bush Forever* areas and areas subject to the *Metropolitan Redevelopment Act* or associated scheme areas. The WAPC administers the MRS, which is regularly amended, and where necessary these amendments are then reflected in local planning schemes. If development is proposed that does not fit within the applicable MRS zone or reserve, an amendment to the MRS would be required. Depending on whether the WAPC is prepared to contemplate the amendment in the first instance, the process for amending the MRS will vary depending on whether the amendment is considered to be basic, standard or complex.

2.6 Operational Policies

Operational policies are largely subdivision and development control policies adopted by the WAPC to guide its decision-making on subdivision and development applications. The operational policies are supported by a variety of planning guidelines and manuals to assist in a range of planning issues. For the most part they do not directly affect the preparation of the local planning strategy, however they do describe the WAPC expectations for development.

2.6.1 Liveable Neighbourhoods

Liveable Neighbourhoods is a strategic operational policy for the design and assessment of structure plans (region, district and local) and subdivision for new urban (predominantly residential) areas in the metropolitan area and country centres. The aims of the policy to achieve well-defined, sustainable and self-

sufficient urban communities are achieved by site-responsive urban design based on safe, sustainable, attractive neighbourhoods interconnected through a street layout that promotes greater use of public transport, walking and cycling, reducing dependency on private vehicles. Community needs, employment opportunities and economic sustainability are facilitated through a coherent hierarchy of mixed used main street activity centres. The expansion of urban areas within the Shire will need to take into account requirements specified under *Liveable Neighbourhoods* to ensure that neighbourhoods are suitably located and designed.

Liveable Neighbourhoods is an integral component of the State Planning Framework, delivering the objectives of the *Perth and* Peel @ 3.5 *Million* sub-regional frameworks. It plays a key role in the local planning framework including preparation of the local planning strategy, which will guide structure plans and subdivisions within the Shire.

2.6.2 Development Control Policies and Guidance Documents

Development Control Policies (DC Policies) are operational policies of the WAPC. As illustrated in Figure 2.1, DC Policies are part of the planning framework. They provide guidance for the WAPC and local government in relation to a range of planning issues. The current suite of DC Policies, which may be applicable within the Shire depending on circumstances, is listed in Table 2-1: Current Development Control Policies. Relevant guidance documents, which consist of fact sheets, manuals, and guidelines, are listed in Table 2-2: Current Guidance Documents.

Table 2-1: Current Development Control Policies

No.	Policy/Guideline	Date
1.	*General*	
1.1	Subdivision of Land - General Principles	June 2004
1.2	Development Control - General Principles	August 2004
1.3	Strata Titles	June 2009
1.5	Bicycle Planning	July 1998
1.6	Planning to Support Transit Use and Transit Oriented Development	January 2006
1.7	General Road Planning	June 1998
1.8	Canal Estates and Artificial Waterway Developments	May 2012
1.9	Amendment to region schemes	January 2017
1.10	Freeway Service Centres and Roadhouses, including signage	August 2016
2.	*Residential*	
2.2	Residential Subdivision	October 2017
2.3	Public Open Space in Residential Areas	May 2002
2.4	School Sites	October 1998
2.5	Special Residential Zones	June 1998
2.6	Residential Road Planning	June 1998
3.	*Rural*	
3.4	Subdivision of Rural Land	December 2016
4.	*Industrial and Commercial*	
4.1	Industrial Subdivision	July 1988
4.2	Planning for Hazards and Safety	June 1991
5.	*Land Reserved by Region Schemes*	
5.1	Regional Roads (Vehicular Access)	June 1998
5.3	Use of Land Reserved for Parks and Recreation and Regional Open Space	January 2017
5.4	Advertising on Reserved Land	January 2017

Table 2-2: Current Guidance Documents

Type	Subject	Date
Fact sheets	Bushfire Fact Sheets	December 2016

	Basic Raw Materials	December 2016
	Piggeries	December 2016
	Poultry Farms	December 2016
	Diverse City by Design	July 2015
Manuals	Local Planning Manual	March 2010
	Visual Landscape Planning in Western Australia	April 2008
	Coastal Planning and Management Manual	February 2005
	Basic Raw Materials Applicants' Manual	February 2009
	Enquiry-by-Design Workshop Process - A Preparation Manual	April 2004
Guidelines	Structure Plan Framework	October 2015
	Local Development Framework	October 2015
	Tourism Planning Guidelines	May 2014
	Local Government Guidelines for Subdivisional Development	November 2017
	Rural Planning Guidelines	December 2016
	Guidelines for Preparation of Integrated Transport Plans	May 2012
	Better Urban Water Management	October 2008
	Designing Out Crime Guidelines	June 2006
	Guidelines for the Lifting of Urban Deferment	December 2017
	Transport Impact Assessment Guidelines	August 2016
	The Design and Geometric Layout of Residential Roads	June 1998
	Acid Sulfate Soils Planning Guidelines	April 2009
	Planning in Bushfire Prone Areas	December 2015
	Holiday Homes Guidelines	September 2009
	Reducing Crime and Anti-Social Behaviour in Pedestrian Access Ways	October 2009
	Procedure for the Closure of Pedestrian Access Ways	October 2009
	Road and Rail Transport Noise and Freight Considerations in Land Use Planning	September 2009
	Guidelines for the Location, Siting and Design of Telecommunications Infrastructure	March 2004
	IPWEA Subdivisional Engineering Guidelines - Edition 2.2	August 2012

2.6.3 Planning Bulletins

Planning Bulletins are published from time-to-time by the WAPC and canvass proposed policy changes or highlight information about WAPC and Department of Planning practices on a variety of planning matters. These are helpful documents for providing background and interpretive assistance for some of the SPPs and DC policies, and other matters.

2.7 Other Relevant Strategies, Plans and Policies

2.7.1 Bush Forever

Bush Forever is a whole-of-government policy for the conservation of regionally significant bushland on the Swan Coastal Plain portion of the Perth Metropolitan Region. The aim is to foster a greater awareness and appreciation of urban bushland and to control threatening processes through active management. Biodiversity conservation must involve the combined efforts of state and local governments, the community and private landowners. Bush Forever identifies 51,200 hectares of regionally significant bushland for protection, covering 26 vegetation complexes. There is a package of planning instruments for Bush Forever that aim to ensure that bushland protection and management issues are appropriately considered and addressed in planning decisions. Bush Forever sites have been identified in the Metropolitan Region Scheme and the key implementation document is *SPP 2.8 – Bushland Policy for the Perth Metropolitan Region* (see section 2.3). The locations of Bush Forever sites within the Shire are listed in section 4.10.5.

2.7.2 State Affordable Housing Strategy

The *Affordable Housing Strategy 2010 - 2020*[7] is a State Government strategy overseen by the Department of Communities (formerly Department of Housing). Local government strategies encouraging more diversity in the size, nature and choice of dwellings offered in the marketplace are seen as an important complementary action in implementation of the strategy. The State Government will partner with the private sector to finance, develop and invest in affordable housing projects, with the not-for-profit sector to develop and manage more social and affordable housing, and with local government to develop and boost affordable housing options in local communities.

The State Government's *Affordable Housing Action Plan 2017-18 to 2019-20* builds on this Strategy, increasing the 2010-2020 target from 30,000 to 35,000 homes for people on low to moderate incomes[8]. It is important for the Shire to continue to look for opportunities to boost affordable housing options in their community and take advantage of the State Government's continuation of the strategy.

2.7.3 Government Sewerage Policy

The *Government Sewerage Policy - Perth Metropolitan Region* as reviewed in 1995, provides guidance on the provision of sewerage within the metropolitan region. The Government Sewerage Policy provides the Western Australian Government's position on the provision of reticulated sewerage in the State through the planning and development of land. The Policy states that reticulated sewerage remains the most reliable, efficient and environmentally acceptable means of sewage disposal that provides the flexibility to support the widest variety and changes of land use. The Policy allows unsewered development at densities not greater than Residential R5 as well as in some specific and defined circumstances. The need to review this Policy was identified in light of its age and changes in on-site sewage treatment and disposal technologies and management. In October 2016, the State government released a revised draft of the Government Sewerage Policy. The impact on the environment that may result from on-site sewage disposal, implications for the efficient supply and use of infrastructure, the need for evidence-based policy and the incorporation of *ANZS 1547 On-site domestic wastewater management* were other issues considered as part of the policy review. Consideration of both the current and draft Policy are important in planning and land development within the Shire, particularly given that many rural living areas are not connected to reticulated sewerage.

2.7.4 State Government Strategy for Tourism

The *State Government Strategy for Tourism in Western Australia 2020*[9] represents a whole of government approach to developing the Tourism Strategy for Western Australia, recognising the different roles that government agencies will be taking to progress the strategy. It draws from the Tourism Australia strategy, *2020 Tourism Industry Potential*. Some of the goals identified by Tourism WA are:

- A need to focus on the broader visitor economy, and not just leisure tourism. The visitor economy includes all short-term visitors who come to WA for business and education for example, as well as day trippers who support the local tourism and hospitality industries;
- It must act as a force for alignment across government agencies; and
- It must be a strong call to action for increased collaboration and alignment between government and industry, in order to address the issues and reap the benefits of the growth opportunities.

Tourism is an industry with much potential within the Shire. The relevance of State strategies of this type provide the high-level context for local initiatives to develop tourism opportunities. Strategies such as this will lend strength to any business case for funding of local tourism initiatives.

[7] (Department of Housing, 2010)
[8] (Department of Communities, 2018)
[9] (Tourism WA, 2012)

2.7.5 Western Australian Waste Strategy

The *Western Australian Waste Strategy*[10] is the blueprint for the way in which waste issues are managed in WA. The Strategy's success will be measured against its effectiveness in reducing the amount of waste generated, increasing the proportion of material recovered from the waste stream and reducing the proportion of waste destined for landfill. The Strategy builds on existing programs and initiatives such as the Regional Funding Program, Household Hazardous Waste Program, Data Program, Infinity Awards, and grants programs as well as strategic partnerships, to refocus the efforts of all those involved in managing Western Australia's waste. The Strategy identifies targets for diversion from landfill of material presented for collection through municipal, construction and demolition, and commercial and industrial waste sectors. The Strategy also identifies long-term waste and recycling infrastructure planning as a key strategic response to the challenges facing waste management in Western Australia. Local government planning policies and other initiatives can help encourage less waste generation and greater recycling.

2.7.6 METRONET

Working across WA State government, METRONET[11] provides a long-term plan to connect suburbs, reduce road congestion and meet Perth's future planning needs. The plan will improve significantly public transport in Perth with Stage One planned to deliver approximately 72 kilometres of new passenger rail and up to 18 new stations. Transport investment will provide a catalyst for land-use change in more than 5,000 hectares of land within walking distance of the new stations. The extension of the passenger rail from Armadale to Byford has been included within Stage One with planning currently in the preliminary stages.

2.7.7 WA Bicycle Network Plan 2014 - 2031

This document[12] provides principal shared path (PSP) initiatives and anticipated timing for the Perth and Peel regions to 2031. Of relevance to the Shire, the construction of a PSP with road upgrade on Tonkin Highway from Thomas Road to Mundijong Road is identified as a project in the PSP programme for 2023 – 2031. In addition to projects, the document identifies other proposed initiatives, with the following being of particular relevance to the Shire and preparation of the local planning strategy:

- Review of local bicycle routes (LBRs) to ensure that they meet the needs of cyclists by linking strategic destinations, such as activity centres. New LBRs identified by the review will become the responsibility of the local governments to initiate, co-fund and maintain.
- Review of traffic management on local roads to address local government traffic management measures, such as traffic calming, sometimes being incompatible to bicycles.
- Focus on bicycle connections to schools and passenger railway and bus stations.
- Consideration of the potential for cycle tourism.
- Development of end-of-trip facility guidelines for activity centres.

2.7.8 State Sustainability Strategy

In 2003, the State Government developed a Sustainability Framework and published *Hope for the Future; The Western Australian State Sustainability Strategy*[13]. The document was influential and many of its recommendations have been implemented. It remains a useful reference for approaches to a broad approach to sustainability including governance, natural resources, settlements, community, and business. In 2014 the *Local Government Act 1995* was amended to include the following:

> *"In carrying out its functions a local government is to use its best endeavours to meet the needs of current and future generations through an integration of environmental protection, social advancement and economic prosperity".*

[10] (Western Australian Waste Authority, 2012)
[11] (METRONET, 2018)
[12] (Department of Transport, 2014)
[13] (Del Marco, et al., 2004)

The Shire has a strong track record of promoting sustainability. Together with the Cities of Armadale and Gosnells, the Shire is part of the South East Regional Energy Group (SEREG) working to deliver the "Switch Your Thinking!" programme, and develop partnerships with business, industry and residents to encourage energy efficient, water-wise and waste reducing behaviour. The local planning strategy can reflect sustainability principles into planning practice at a high level.

3 Local Planning Context

3.1 Local Government Integrated Reporting Framework

Integrated planning and reporting is a nationally consistent approach to integrated planning endorsed by the Council of Australian Governments' (COAG) Local Government Planning Ministers' Council. It is intended to provide local governments with a framework for establishing local priorities and to link this information to operational functions. All local governments are required to produce a plan for the future under S5.56 (1) of *the Local Government Act 1995.* The *Local Government (Administration) Regulations 1996* outline the minimum requirements to adopt a Strategic Community Plan and a Corporate Business Plan. The Local Government Integrated Reporting Framework (LGIRF) recognises three major parties involved in the development of an integrated plan, each of which has a unique role and responsibilities:

- the local government administration,
- the Council; and
- the community.

A successful process will deliver a:

- Strategic Community Plan that clearly links the community's aspirations with the Council's vision and long-term strategy;
- Corporate Business Plan that integrates resourcing plans and specific council plans with the Strategic Community Plan; and
- Clearly stated vision for the future viability of the local government area.

The local planning strategy is one of several 'informing strategies' which will assist the Shire to implement the Strategic Community Plan. The relationship between them is illustrated in Figure 3-1.

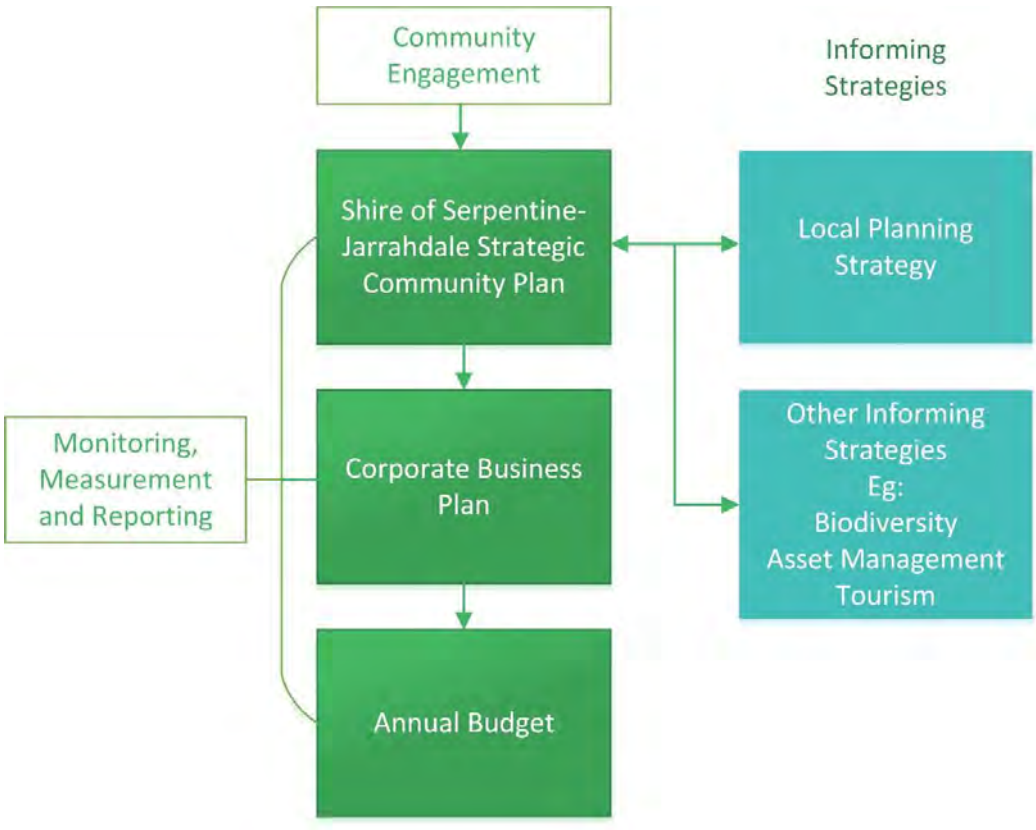


Figure 3-1: Relationship to Integrated Reporting Framework

3.2 Strategies and Plans

3.2.1 SJ2050

The Serpentine Jarrahdale 2050 Vision (SJ2050) process commenced in April 2016, in response to the draft *Perth and Peel@3.5 Million* document released by the State Government in 2015, which estimated a population of approximately 100,000 in the Shire by 2050. SJ2050[14] was developed through extensive consultation and engagement with the local community and key stakeholders. The document identifies the core values and guiding aspirations of the Shire's community. SJ2050 sets out a strategic growth framework that aims to accommodate rapid growth, without compromising the community's values and aspirations. SJ2050 established nine outcomes that are described under the following three key themes:

- People (Wellbeing, Connected Communities, Education);
- Prosperity (Economic Development, Agriculture, Natural Environment); and
- Place (Transport Infrastructure, Housing and Development, History and Heritage).

The vision statements within each theme and outcome are to be used as guidance in the development and implementation of the Local Planning Strategy. Figure 3-2 is a diagrammatic representation of how the vision is translated spatially at a conceptual level.



Figure 3-2: SJ2050 Spatial Framework

Image source: Hames Sharley for the Shire of Serpentine Jarrahdale

[14] (Hames Sharley, 2016)

3.2.2 Strategic Community Plan

As part of its responsibilities under *the Local Government (Administration) Regulations 1996*, the Shire has prepared the *Strategic Community Plan 2017 – 2027*[15] in consultation with the local community through various community consultation components. The *Strategic Community Plan* identifies the community's vision, aspirations, outcomes and priorities, and guides decision-making within the Shire. The vision for the Shire expressed within the Plan is '*City living offering a rural lifestyle with abundant opportunities for a diverse community*'. The plan identifies four key objectives, under the themes of People, Place, Prosperity and Progressive. These objectives include:

- A connected, thriving, active and safe community;
- A protected and enhanced natural, rural and built environment;
- An innovative, commercially diverse and prosperous economy; and
- A resilient organisation demonstrating unified leadership and governance.

The vision, themes, objectives and strategies contained within the *Strategic Community Plan* provide the overarching framework for the Local Planning Strategy. The vision from the *Strategic Community Plan* will be reflected spatially within the Local Planning Strategy and planning issues and aspirations related to each of the same themes People, Place, Prosperity and Progressive will be addressed within the Local Planning Strategy.

3.2.3 Rural Strategy

The original *Rural Strategy* was prepared in 1994 with minor modifications undertaken in 2003 and 2006, however the overall intent and structure remained largely intact. In 2013, the *Rural Strategy* was reviewed following significant community consultation. The 2013 review of the *Rural Strategy* was endorsed by the WAPC in 2017. The *Rural Strategy* focusses on the Shire's Rural Areas with the overall purpose of the Rural Strategy to preserve and enhance the Shire's rural character and its role as an important economic contributor to the Shire and broader region. Three 'key themes' emerged from significant community consultation undertaken during the latest review of the *Rural Strategy* which form the basis of the future direction and development of the Shire's rural areas. These themes are:

- Protection of natural assets (local natural areas);
- Protection of rural character; and
- Facilitate productive rural areas.

The Rural Strategy applies to the whole Shire but specifically excludes urban centres such as Mundijong and Byford. Also excluded are the Serpentine Townsite, West Mundijong Industrial Area, and Cardup Business Park. The *Rural Strategy* addresses seven policy areas, each of which includes a description, objectives, and subdivision and development guidelines that are important to inform the local planning strategy. The policy areas are:

- Town and Village Urban
- Rural Living
- Farmlet
- Rural
- Agricultural Protection
- Conservation
- Residential and Stables

The *Rural Strategy* map is reproduced in Figure 3-3.

[15] (Shire of Serpentine Jarrahdale, 2017)

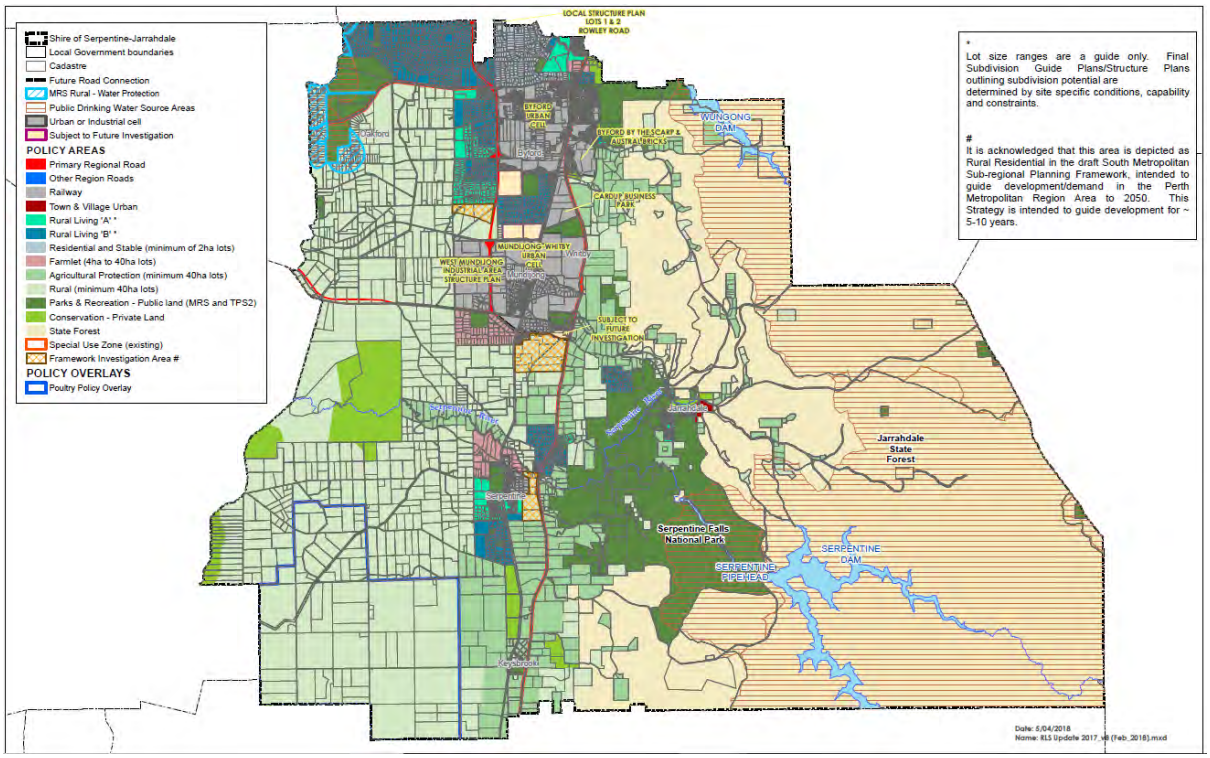


Figure 3-3: Rural Strategy Map

Image source: Land Insights for the Shire of Serpentine Jarrahdale

It should be noted that the policy areas do not necessarily relate to specific zones. Rather they may be applied as 'overlays' to zoning maps in the local planning scheme, with related planning provisions. The objectives for each policy area contained in the *Rural Strategy* are as follows:

Town and Village Urban Policy Area

- Accommodate urban growth sympathetic to rural lifestyle and in a healthy community;
- Encourage some infill residential development in existing towns and villages, while maintaining variety in lot sizes available;
- Provide for urban expansion of existing towns and villages where the capability and suitability for such expansion is identified;
- Encourage medium density urban development centrally located in the town and village environment;
- Service new urban development in towns and villages with small scale tertiary sewage treatment plants, or ensure that approved alternative domestic effluent disposal systems are used;
- Provide community facilities and social infrastructure to surrounding areas; and
- Optimise the use of public transport and in particular existing rail links to Perth. Allow for mixed land use zoning.

Rural Living Policy Area

- Provide for additional choice in style and location of residential land not available within the Shire's urban nodes;
- Maximise the provision, use and efficiency of infrastructure available in and around the Shire's urban nodes;
- Restrict rural land uses that are not generally compatible with maintaining residential amenity;
- Provide opportunities for development that maintains rural character and promotes appropriate land management;
- Provide for a diversity of lot sizes ranging from 0.4 and 4 hectares;
- Provide opportunity for low-key tourism, such as Bed and Breakfast accommodation; and

- Protect Local Natural Areas and encourage revegetation.

Farmlet Policy Area

- To provide for diversity of agricultural uses on smaller lots than those typically found in the Rural Policy Area;
- To locate farmlets in close proximity to existing towns and services;
- To provide opportunities for development that maintains rural character, commercial use of the land and appropriate land management;
- To provide for a diversity of lot sizes ranging from 4 to 40 hectares;
- To provide a location for the possible development of recreational and community facilities such as golf course, sport parks and other similar uses; and
- To protect Local Natural Areas and encourage revegetation.

Rural Policy Area

- To retain and maintain traditional agricultural uses in this Policy Area;
- To promote alternative agricultural uses, particularly those that have less land degradation and higher commercial viability;
- To prevent the further fragmentation of land through subdivision and thus retain the remaining large lots for future rural use;
- To retain and enhance the rural lifestyle and character of the area; and
- To protect Local Natural Areas and encourage revegetation.

Agricultural Protection Policy Area

- To retain and maintain the productive capability of land for agricultural enterprises in proximity to Perth and its markets;
- To ensure that productive agricultural enterprise remains the primary land use and to maintain the integrity of agricultural infrastructure;
- To adopt proactive and cooperative approaches with landowners to address catchment management and land degradation problems;
- To support and protect agricultural and horticultural industries though:
    - Reduced pressure for fragmentation of land to other uses;
    - Resource security for agricultural enterprise;
    - Maintenance of relative land values; and
    - Reduced pressure on agriculture from problems such as feral dogs and cats, stock straying into urban areas, competition for water rights and increased traffic problems; and
- To minimise or eliminate nutrient (particularly phosphorus) export into the Peel-Harvey estuarine System.

Conservation Policy Area

- Identify areas of conservation significance in the Shire;
- Identify land already zoned as Conservation in the Shire's planning scheme;
- To direct development away from this Policy Area to ensure the land use remains primarily for conservation except where it is clearly demonstrated that development is not in conflict with the objectives of managing and protecting conservation values on the property;
- To ensure that development or changes in land use do not adversely impact on the conservation values on the property;
- To develop management plans with long term guidelines for the management of these sites and to implement these through co-operative approaches with landowners and the Shire;
- Aim to create vegetated linkages through the Shire by connecting conservation zoned land or other protected land such as reserves; and
- Protect Local Natural Areas and encourage revegetation.

Residential and Stables Policy Area

- To recognise the importance of the equine industry to the Shire;
- To recognise the adverse impacts of some activities ordinarily carried out within Rural Living areas on the equine industry and to ensure that these are adequately planned for;
- To maintain and protect the rural living and equine dominated character of the Policy Area; and
- To protect Local Natural Areas and encourage revegetation.

3.2.4 Biodiversity Strategy

The *Serpentine-Jarrahdale Local Biodiversity Strategy*[16] was prepared in 2008 using an approach developed in the *Local Government Biodiversity Planning Guidelines for the Perth Metropolitan Region*.[17] The strategy recognises that the Shire is located within one of the world's 25 'biodiversity hotspots', with biodiversity values being particularly important in the corridor between Byford and Keysbrook.

The strategy proposes four goals to retain, protect, and manage Local Natural Areas, which are natural areas outside of Bush Forever sites, DPaW managed estate, and regional parks. The goals are:

- Prevent further loss of local natural areas. This goal aims to retain at least 4,000 hectares of Local Natural Areas within the Shire;
- Protect and manage a portion of each basis type of vegetation and ecosystem typical of the Shire. Approximately 690 hectares of local natural area would be protected to meet this goal;
- Protect specific ecological features and processes including rare species, threatened ecological communities, wetland vegetation, and ecological linkages throughout the Shire; and
- Manage and restore local natural areas and revegetate new areas to increase native fauna habitat.

Various implementation recommendations are made, with specific recommendations made in respect of the local planning strategy. It recommends that the local planning strategy may need to recognise the following:

- The concepts and values of native vegetation, natural areas, verified natural areas and biodiversity;
- The suggested local biodiversity goals and targets;
- The location of verified natural areas;
- The need to protect verified natural areas, and in some cases, native vegetation or parkland cleared areas;
- An assessment of the proposal to establish a natural areas special control area (NASCA);
- The concept of minimal loss of natural areas and an offsets policy;
- Defined criteria and general locations where subdivisions for conservation or strata-cluster subdivisions may be considered;
- Assess the need for a Local Planning Policy for biodiversity conservation; and
- Review the possible expansion of the Conservation Zone.

Biodiversity is discussed further in section 4.2.6.

3.2.5 Activity Centres Strategy

The *Serpentine Jarrahdale Activity Centres Final Report*[18] was prepared in 2012 to bring the Shire's approach to activity centre planning and development in line with *SPP 4.2 Activity Centres for Perth and Peel* (see section 2.3). Due to the peripheral metropolitan/rural interface location of the Shire and its current and forecast population, the Shire is expected to accommodate:

- Two District Centres (Mundijong and Byford); and

[16] (Ironbark Environmental, 2008)
[17] (Del Marco A. T., 2004)
[18] (Macroplan Australia, 2008)

- Neighbourhood Centres (e.g. Jarrahdale, small nodes around Byford/Mundijong)

The Strategy identifies approximate net lettable areas (NLA) for each of the identified activity centres in accordance with SPP4.2. The authors identified some key practical and commercial issues that must be considered in planning for activity centres:

- Sufficient critical mass and major anchors within district centres to be competitive with larger centres in surrounding areas and to encourage employment and expenditure retention within the Shire;
- A hybrid solution of 'main street' and 'big box' development that protects from weather but encourages worker, shopper and commuter movements is more likely to be viable in outer metropolitan district centres;
- To ensure that development can respond to changes in market size and preferences, any commercial development should be developed in accordance with desired urban forms, rather than for specific tenant purposes;
- Walkability and cycling are key drivers. Smaller networks of neighbourhood centres should be distributed at appropriate distances supporting major district nodes. These centres require minimum dwelling densities to be achieved to be functional/viable from the walkable catchment only (i.e. 15-20 dwellings per hectares net within an 800m radius);
- The network of centres within the Shire should be complementary with each other, creating a 'network' of centres that are connected by transport and industry supply chain linkages. This will ensure that employment and expenditure retention is maximised within the Shire; and
- Centres should be innovative and consider supply chains. Synergies between sectors should be encouraged.

3.2.6 Economic Development Strategy

The Shire's *Economic Development Strategy 2018 - 2023*[19] (EDS) is an economic development blueprint for the investment, social growth and prosperity of the Shire. The document is a five-year strategy and action plan to guide economic development activities that identifies specific competitive advantages, clusters and growth opportunities. The EDS also provides strategies and detailed actions to deliver on the community's aspirations and goals for future economic growth. It is important that strategic land use planning identifies and facilitates opportunities for economic development. The Local Planning Strategy must align with the EDS to ensure that the planning framework can accommodate and encourage economic development objectives.

3.2.7 Tourism Strategy

The Shire's *Tourism Strategy 2018-2023* provides direction for the sustainable development of tourism in the Shire. The Strategy identifies eight strategic tourism development priorities, which include branding and wayfinding, trails, food tourism, equine tourism, attractions, adventure tourism, tourist accommodation and events. It is important for the Local Planning Strategy to facilitate the development of these priorities through the planning framework.

3.2.8 Community Infrastructure and Public Open Space Strategy

The *Community Infrastructure and Public Open Space Strategy* (CIPOSS) was adopted by Council in 2016. The Strategy has been developed to provide a planning document for community infrastructure and public open space within the Shire. It primarily provides guiding principles and rationale for community infrastructure and public open space needs for the Shire in a complete built-out scenario of approximately 100,000 people by 2050. CIPOSS is supported by a *Community Infrastructure Implementation Plan* (CIIP) for the purposes of community infrastructure and sport space provision, which was adopted by Council in 2017. The CIPOSS and CIIP documents are directly related to land use planning and it will be the role of the

[19] (Lucid Economics, 2018)

Local Planning Strategy to ensure that community infrastructure and public open space is identified in alignment with these documents at all stages of the planning process.

3.2.9 Equine Strategy

The *Shire of Serpentine Jarrahdale Equine Strategy 2018*[20] seeks to understand the nature of the equine sector in the Shire, its position in relation to the Peel Region and the State, and to establish goals and strategic actions to ensure there is continued support and development of the sector into the future. Through examination of statistics provided by associations such as Racing and Wagering WA (RWWA) and Equestrian WA, the Strategy has uncovered that not only is the equine sector strong within the Shire but that the Shire is the leading equine hub in both the Peel and the State. The Strategy has uncovered that the strength of the equine sector in the Shire lies within the diversity of the sector, the location and accessibility of strategic facilities, available land and a genuine commitment from horse owners, enthusiasts and businesses across the sector. It is important for this to be supported and facilitated through the Local Planning Strategy.

3.2.10 Urban and Rural Forest Strategy

The Shire's Urban and Rural Forest Strategy guides actions to maintain and improve tree canopy coverage and vegetation within the Shire. The Strategy contains goals and strategies to retain canopy coverage in urban, per-urban and rural areas, maintain rural character, increase community support for trees and vegetation, enhance community wellbeing and health and encourage environmental sustainability. Implementation of the Strategy at all stages of planning will be necessary to achieve these goals and strategies.

3.2.11 District Structure Plans

A district structure plan (DSP) may apply to several suburbs or all or part of a townsite. Generally, a DSP provides for the major structural elements, including major roads, open space network, commercial and industrial areas, and environmental conditions. A DSP usually provides a basis for zoning and lead to more detailed structure planning through the preparation of a local structure plan. There are currently four DSPs applicable within the Shire. These are:

- Byford District Structure Plan;
- Mundijong-Whitby District Structure Plan;
- West Mundijong Industrial Area District Structure Plan; and
- Jandakot Structure Plan.

The Shire is currently reviewing the Byford DSP and the Mundijong DSP. The revised Mundijong DSP will incorporate both the Mundijong-Whitby DSP and the West Mundijong Industrial Area DSP. Local structure plans are required to provide more detailed guidance prior to subdivision and development.

Byford District Structure Plan

The Byford DSP outlines the requirements for public open space, major road improvements, pedestrian and cycle networks, bridle trails, multiple use corridors, and protection of the Byford Trotting Complex. A town centre and two neighbourhood centres are identified. The revised Byford DSP includes a greater area surrounding the Byford urban area, incorporating rural living estates and the Cardup Business Park. It also specifies local structure plan areas that identify where a local structure plan is required prior to subdivision and development and the matter that need to be addressed for each area.

Mundijong District Structure Plan

[20] (Shire of Serpentine Jarrahdale, 2018)

Mundijong and Whitby were zoned Urban under the MRS in 2006, prompting various background studies including an enquiry by design exercise, which culminated in the preparation of the Mundijong-Whitby District Structure Plan[21]. The DSP was informed by principles and objectives developed during the enquiry-by-design, and has a focus on creating a sustainable new town which retains its historic rural links. The West Mundijong DSP was prepared for the West Mundijong Industrial Area, comprising approximately 474.34 hectares west of the existing Mundijong urban area. The DSP identified general industry within the centre of the structure plan area with light industry adjacent to Mundijong urban area and Mundijong Road. A multi-use corridor incorporating drainage functions was identified along Kargotich Road. The revised Mundijong DSP incorporates the two DSPs described above, identifying land use, movement networks, public open space, community facilities and infrastructure. A district level retail centre is identified in Whitby and a governance precinct is identified in Mundijong. The relocation of the existing freight rail line, which currently travels through the urban area, is identified adjacent to the Tonkin Highway extension.

Jandakot Structure Plan

This DSP was prepared by the WAPC in 2007. The structure plan area is situated in the south-west corridor in the Town of Kwinana and Shire of Serpentine Jarrahdale and includes the localities of Oakford, Mandogalup, Casuarina, Wellard, Anketell, Wandi, Bertram, Oldbury and The Spectacles. A principal reason for the structure plan being prepared was the requirement to protect groundwater resources and manage other environmental assets. The structure plan area corresponds with the southern part of the *Jandakot Land Use and Water Management Strategy* boundary and within the Shire is entirely within the boundaries of *SPP 2.1 - The Peel - Harvey Coastal Plain Catchment*.

The structure plan provided a guide to the future development of the area and management of key environmental issues. It included potential development areas, road networks, major community facilities, conservation and Bush Forever areas, and a neighbourhood structure. The land use designations shown on the Jandakot Structure Plan were indicative only and subject to further detailed investigation and design. Most of the recommendations, such as minor extensions to already existing Rural Living areas have already been implemented. The structure plan proposed:

- urban development along the Kwinana Freeway (outside of the Shire boundaries);
- a small 'rural village' in Oakford (although this not shown on the structure plan map); and
- a reinforced rural character in the east of the study area.

3.2.12 Local Structure Plans

A local structure plan (LSP) deals with road layout, land use, public open space, community infrastructure, servicing and residential density, and the coordination of infrastructure on a neighbourhood or smaller scale. Table 3-1 shows the LSPs that have currently been prepared to guide development in their respective areas. There are also numerous Subdivision Guide Plans within the Shire that are considered to have the function of a LSP under the *Planning and Development (Local Planning Schemes) Regulations 2015*.

Table 3-1: Current Local Structure Plans

LSPs	Status
Byford	
• Area A – Byford Town Centre	Approved
• Area B – Marri Park Estate - Lot 3 Larsen Rd and Lot 3 Alexander Road, Byford	Approved
• Area C – Byford Central	Approved
• Area E – Lots 59-62 Briggs Road Byford	Approved

[21] (Masterplan, 2010)

• Area F – Byford Meadows Estate, Lot 9500 Thomas Road, Briggs Road	Approved
• Area G – Redgum Brook Estate	Approved
• Area H – Kalimna Estate	Approved
• Area I – Grange Meadows, Lot 6 and Lot 27 Abernethy Road, Byford	Approved
• Area J – Byford West	Approved
• Area K – The Glades	Approved
• Area L – Doley Road Precinct	Approved
• Area N – Lots 1, 3 and 128 South Western Highway, Byford	Approved
• Area O – Lot 806 South Western Highway, Byford	Approved
• Area Q – Lot 2 Nettleton Road, Byford (The Brook)	Approved
• Area S – Stanley Road Precinct	Approved
• Area U – Lots 1 and 2 Rowley Road, Darling Downs	Approved
• Area W – Cardup Business Park (subject to modifications)	Draft
Mundijong	
• Area A – Whitby	Approved
• Area E1 – Taylor Road and Adams Street, Mundijong	Approved
• Area E2 – Lot 50 Cockram Street and Lot 119 Sparkman Road, Mundijong	Approved
Serpentine	
• Serpentine Townsite	Draft

Table 3-2: Current Subdivision Guide Plans

Subdivision Guide Plan	TPS2 Zone	Status
Byford		
• Lot 204, 205 and 206 Abernethy Road	Rural Living B	Approved 18/06/1990
• 239, 240, 241 Hopkinson/Gossage Roads	Rural Living B	Approved 7/07/1992
• Lots 40 and 41 Abernethy Road	Special Residential	Approved 22/07/1991
• Lot 40 Abernethy Road	Special Residential	Approved 22/06/1992
• Lot 529 Thomas Road	Special Rural	Approved 27/04/1993
• Lot 3 Thomas Road	Rural Living A	Approved 28/06/1999
• Lot 27 Nettleton Road	Rural Living A	Approved 7/05/1996
• Pt Lot 8 Bradshaw and Lot 701 Beenyup Road	Special Residential	Approved 25/03/1997
• Lot 434 Thatcher Road	Rural Living A	Approved 3/12/1996
• Pt Lot 80 Thomas Road	Rural Living A	Approved 17/04/2003
• Lot 216 Nettleton Road Byford	Rural Living A	Approved 26/03/2002
• Pt Lot 7 Thomas Road	Rural Living A	Approved 1/11/2003
• Lot 24 Beenyup Road	Special Use	Approved 28/03/2011
• Lot 161 Racy Prince Court	Special Residential	Approved 24/09/2009
Cardup		
• 1/116 Soldiers Road	Special Rural	Approved 5/11/1993
• Lot 236 - 238 Hopkinson and Orton Road (Coolabar Estate)	Special Rural	Approved 24/06/1991
• Lot 32 Karbro Drive	Special Rural	Approved 19/04/1994
• Lot 8 - L15 & former L34 Hopkinson Road	Special Rural	Approved 22/10/2007
• Lots 4 - 7, 16 - 27, 32, 34, 35 & 36 Karbro Drive and Lots 8 - 15 & 34 Hopkinson Road (Soldiers Road Special Rural Estate)	Special Rural	Approved 19/06/1995 Modified 22/10/2007
• Lots 5 and 230 Gossage Road (Peel Estate)	Rural Living A	Approved 21/12/1998
• Lot 5 and 239 Gossage Road (Part)	Rural Living A	Approved 21/12/1998

• Lot 4 Kargotich Road (Peel Estate)	Rural Living A	Approved 25/05/1999
• Lots 11, Pt 235, Pt 236 and 1264 Orton Road	Rural Living A & B	Approved 12/05/1998
Darling Downs		
• Lot 13 Wungong South Road/Keenan Street	Rural Living A	Approved 23/08/1999
• Lots 65 & 66 South Western Highway	Rural Living A	Approved 24/01/2005
• Pt Lot 13 South Western Highway	Rural Living A	Approved 29/09/1998
• Lot 15 Keenan Street	Rural Living A	Approved 26/03/2007
• Lots 5, 10 and 13 Hopkinson Road	Special Rural	Approved 16/03/1992
Jarrahdale		
• Cnr Atkins and Chestnut Roads (Chestnuts Estate)	Special Residential	Approved 23/08/1993
Mundijong		
• Lot 49 Mundijong Road	Farmlet	Approved 27/11/1995
• Lot 4 Adams Road	Farmlet	Approved
• Pt Lot 2 Kargotich & Lot 6 and 9 Scott Road	Farmlet	Approved 22/04/2005
• Lots 1 Webb Road and 499 Mundijong Road	Farmlet	Approved 27/09/2005
Oakford		
• Lot 191 - 194 Corner Kargotich and Thomas Roads	Special Rural	Approved 26/03/1993
• Lot 222 and Pt. Lot 221 Abernethy Road	Special Rural	Approved 13/02/1995
• Lot 175, 176, 180 and Pt Lot 3, Corner Kargotich Road and Rowley Road	Special Rural	Approved 26/04/1996
• Rowley and Nicholson Roads (Oakford Country Estate)	Special Rural	Approved 04/03/1996
• Lots 1 & 182 Kargotich Road, Oakford	Rural Living B	Approved 19/12/1995
• Lot 183 Kargotich Road, Oakford	Rural Living B	Approved 08/04/1997
• Lot 2 Kargotich Road, Oakford	Rural Living B	Approved 13/07/1999
• Lot 220 Abernethy Road and Lot 1253 Orton Road	Rural Living A	Approved 22/07/2003
• Lot 224 Orton Road	Rural Living A	Approved 24/01/2011
• Lot 1254 Abernethy Road	Rural Living A	Approved 23/08/2010
• Lot 223 Orton Road (Amblefield Estate)	Rural Living A	Approved 28/11/2000
• 187 Thomas Road, Byford (Peel Estate)	Rural Living B	Approved 24/10/1994
Serpentine		
• Lot 825 Utley Road	Special Rural	Approved 23/08/1993
• Pt Lot 825 Utley Road	Special Rural	Approved 22/11/1999
• Lot 106 Selkirk Road / South Western Highway	Rural Living A	Approved 11/04/1995
• Lots 789 & 790 Hall Road	Rural Living A	Approved 28/04/1995
• Lots 786, 787, 788 Karnup & Walker Roads	Rural Living A	Approved 26/10/1995
• Loc 793 Wattle Road, Serpentine	Rural Living B	Approved 27/03/1995
• 792 Walker & Wattle Road, Serpentine	Rural Living B	Approved 25/01/1996
• Lot 785 Karnup Road	Farmlet	Approved 9/01/1996
• Lot 6 & Pt. Lot 305 Hardey Road	Rural Living A	Approved 02/07/1997
• Lot 6 & Lot 305 Hardey Road (Serpentine Falls Estate)	Rural Living A	Approved
• Lot 5 Karnup Road	Farmlet	Approved 26/10/2009
• Lot 9 Hall Road	Farmlet	Approved 13/01/2006
• Lot 12 Gull Road	Farmlet	Approved 28/04/2008
• Lot 8 Hardey Road	Rural Living A	Approved 23/01/2012
• Lot 782 Walker Road	Farmlet	Approved 29/09/2011

• Lot 791 (84) Walker Road	Rural Living A	Approved 9/01/2015
• Lot 304 Hardey Road	Rural Living A	Approved
• Lot 27 Feast Road	Special Rural	Approved
• Lot 2 Selkirk Road	Rural Living A	Approved 16/04/2004

3.2.13 Local Development Plans

Local Development Plans (LDPs) set out specific and detailed guidance for future development including site and development standards that are to apply, and/or exemptions from the requirement to obtain development approval in the area to which the plan relates. LDPs can be required by structure plans or subdivisions to provide greater detail on particular sites or stages within a development estate. LDPs should generally only be applied to constrained lots within a subdivision plan.

3.2.14 Bicycle and Shared Path Plan

A Local Area Bicycle Plan is a planning tool to consider and develop the integration of bicycle infrastructure within Local Government areas throughout Western Australia. Local Bicycle Networks complement the Perth Bicycle Network and contain a finer network of bicycle routes to better serve local communities and local destinations.

The Shire's *Local Area Bicycle and Shared Path Plan*[22] was developed in line with the Department of Transport (then Department of Planning and Infrastructure) document "Guidelines for Preparing Bicycle Plans" in keeping with the *Austroads Guide to Traffic Engineering Practice Parts 14 (Bicycles)*, the Australian Standards relating to bicycles - AS1742.9 and AS2890.3 and *Liveable Neighbourhoods*[23]. The Plan examines cycling needs associated with both internal and external trip generators and attractors by providing assessment and recommendation of the following components:

- Recommended bicycle route network;
- Works required implementing the bicycle plan incorporating priorities and cost estimates;
- Maintenance Standards and priorities;
- Promotion of cycling as an alternative mode of transport / recreational activity; and
- Processes for timely review of the agreed plan.

The Plan includes pedestrian routes considered to be vital in Mundijong, Serpentine, Jarrahdale and Byford town sites, with a focus on providing linkages to services such as schools and business centres which will ensure the safety of pedestrians.

3.3 Local Planning Policies

The Shire has several Local Planning Policies that supplement the Local Planning Scheme and regulate land uses in the local government area. Local Planning Policies must be consistent with State Planning Policy. Once adopted they inform proponents and decision makers of the Shire's preferred approach to dealing with the relevant issues, and the local government or Development Assessment Panel (DAP) has regard to them when determining applications for planning approval made under the scheme. The policies are grouped into three classifications: Operational; Planning Frameworks; Design Guidelines; and Land Use. Table 3.3 shows the Shire's current Local Planning Policies.

Table 3-3: Local Planning Policies

Local Planning Policies	Status
Operational	
• LPP 1.1 - Development Assessment Unit	Approved

[22] (Shire of Serpentine-Jarrahdale, 2012)
[23] (Western Australian Planning Commission, 2009)

• LPP 1.2 - Development Applications Information	Approved
• LPP 1.3 - Amendments and Extensions to Existing Approvals	Approved
• LPP 1.4 - Public Consultation for Planning Matters	Approved
• LPP 1.5 - Other Exempt Developments	Approved
• LPP 1.6 - Public Art for Major Developments	Approved
• LPP 1.7 - Road Naming	Approved
• LPP 1.8 - Cash-in-lieu for Parking	Approved
• LPP 1.9 - Bonds and Bank Guarantees	Approved
• LPP24 – Designing Out Crime	Approved
• LPP40 – Local Development Plans	Approved
Planning Frameworks	
• LPP 2.1 - Structure Plan and Subdivision Standards	Draft
• LPP 2.2 - Local Development Plan Guidelines	Draft
• LPP 2.3 - Development Standards for Development Applications	Approved
• LPP 2.4 - Water Sensitive Design	Approved
• LPP 2.5 - Activity Centres	Approved
• LPP 2.6 - Stanley Road Precinct Planning Framework	Approved
• LPP 2.7 - Biodiversity Planning	Approved
• LPP 2.8 - Public Open Space	Approved
Design Guidelines	
• LPP 3.1 - McNeil Grove Design Guidelines	Approved
• LPP 3.2 - Woodlot Subdivision Jarrahdale Design Guidelines	Approved
• LPP 3.3 - Wellard and Richardson Street Serpentine Design Guidelines	Approved
• LPP 3.4 - Paterson Street Design Guidelines	Approved
• LPP 3.5 - Byford Town Centre Public Realm Guidelines	Approved
• LPP 3.6 - The Glades Village Centre Guidelines	Approved
• LPP 3.7 - George Street Design Guidelines	Approved
• LPP 3.8 - Byford Town Centre Built Form Guidelines	Approved
• LPP51 - Oakford Rural Economic Living Area Planning Framework	Approved
Land Use	
• LPP 4.1 - Ancillary Dwelling	Approved
• LPP 4.2 - Sea Containers	Approved
• LPP 4.3 - Landscape Protection	Approved
• LPP 4.4 - Dams and Lakes	Approved
• LPP 4.5 - Temporary Accommodation	Approved
• LPP 4.6 - Telecommunications Infrastructure	Approved
• LPP 4.7 - Placement of Fill in Non-Urban Areas	Approved
• LPP 4.8 - Land Sales Offices	Approved
• LPP 4.9 - Fast Food Premises	Approved
• LPP 4.10 - Extractive Industries	Approved
• LPP 4.11 - Advertising	Approved
• LPP 4.12 - Horticulture	Approved
• LPP 4.13 - Revegetation	Approved
• LPP 4.14 - Rural Worker's Dwellings	Approved
• LPP 4.15 - Bicycle Facilities	Approved
• LPP 4.16 - Landscape and Vegetation	Approved
• LPP 4.17 - Multiple Use Trails	Approved
• LPP 4.18 - Street Trees	Approved

4 Local Profile

4.1 Location

The Shire of Serpentine Jarrahdale is one of the largest local governments in the greater Perth and Peel Metropolitan Region, having an area of 905 km^2. It is situated approximately 45 kilometres and 45 minutes' drive south of Perth city centre and 13 kilometres inland from the Indian Ocean. It is less than 100 kilometres or just over an hour's drive (on the existing network) from Bunbury and its port. Figure 4-1 shows the location of the Shire in relation to key locations.

The Shire is bordered by the local governments of Wandering to the east, Murray to the south, Rockingham and Kwinana to the west, and Armadale to the north. The main population centres are the historic towns of Byford, Mundijong, Jarrahdale, and Serpentine. The South Western Highway is the main road transport link that traverses the Shire in a north-south direction, passing though Byford. Albany Highway is adjacent on the eastern boundary and Kwinana Freeway runs parallel to the western boundary of the Shire. Tonkin Highway currently terminates at Thomas Road in Oakford but is planned to extend through to Mundijong Road and South Western Highway.



Figure 4-1: Location Plan

Background image source: ©Google Earth

4.2 Population and Housing

4.2.1 Historic Population and Growth

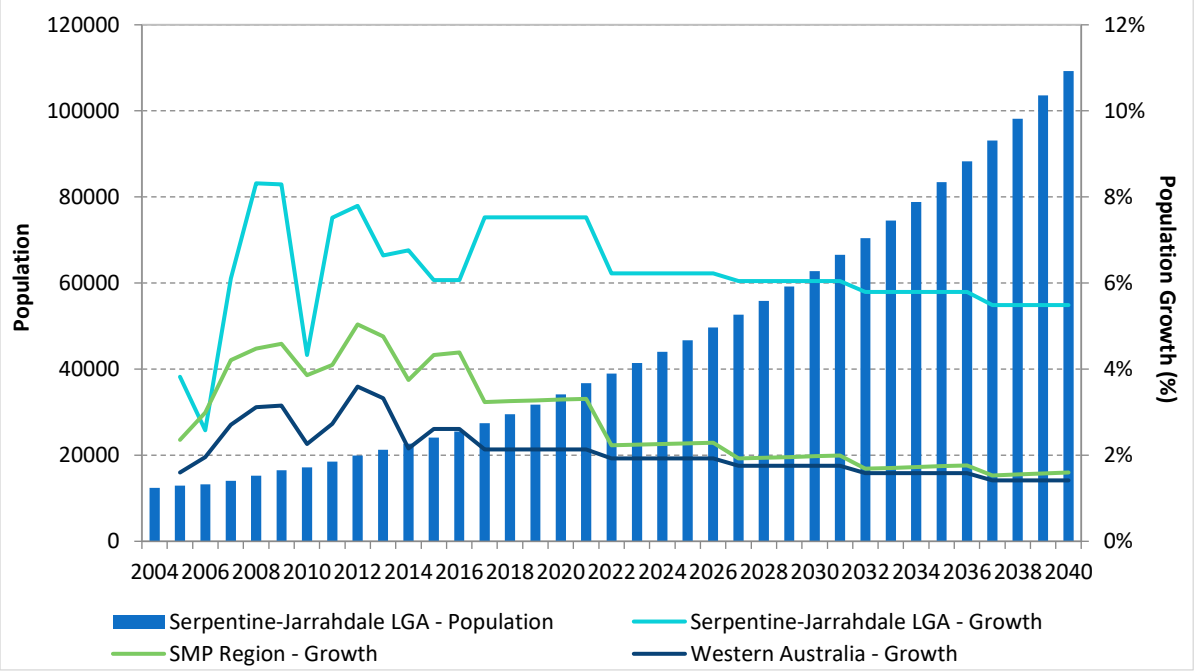
Population Analysis

The officially accepted and most accurate measure of Australia's population is the estimated resident population (ERP) statistic produced by the Australian Bureau of Statistics (ABS). The ABS Estimated Resident Population of the Shire in 2017 was 29,361 persons[24]. The ERP statistic takes into account factors in an estimate that may have been missed through the Census. The population of the Shire at the ABS 2016 Census was 26,833 persons, which has more than doubled since the ABS 2006 Census where the Shire's population was 12,893 persons[25]. Since 2006, population has grown at a higher rate than the South Metropolitan Peel Region and Western Australia overall. Figure 4-2 outlines the historical population growth across the Shire from 2004 to 2040. Population growth has been influenced by both supply and demand elements.

Land Supply and Demand

Serpentine Jarrahdale is part of the overall Perth and Peel metropolitan area and meets general demand for accommodation in the South Metropolitan Peel Sub-Region. From 2004 to 2014 the Perth and Peel area accounted for 83% of all growth in the State, growing by 497,762 to 2,011,676 in June 2014, an annual growth rate of 2.9%. On the supply side, the Shire has had a supply of serviced urban zoned land in Byford, to meet this demand.

Figure 4-2: Historic Population Snapshot and Growth Trends



Source: ABS (2015),WAPC (2015) in AEC Group 2016

Population Distribution and Density

Not surprisingly, the majority of residents are located in Byford, Mundijong, Serpentine and Jarrahdale, as well as in rural residential areas in Oakford and Darling Downs. These are the most densely subdivided and

[24] (.id community, 2018)
[25] (Australian Bureau of Statistics, 2016)

developed areas of the Shire. Growth in the Byford and Mundijong Whitby urban areas will continue to be significant.

Table 4-1: Population Projection by Settlement Area

Area	2016	2036	Total change
Shire of Serpentine Jarrahdale	27,654	68,335	+40,682
Byford area	15,375	35,399	+20,025
Cardup area	1,849	1,979	+130
Darling Downs area	2,859	3,722	+863
Hopeland - Keysbrook area	516	636	+121
Jarrahdale area	2,440	2,524	+84
Mundijong area	1,979	20,961	+18,982
Oakford - Oldbury area	703	830	+127
Serpentine area	1,933	2,284	+350

Source: id.forecast

The population density data identifies that persons per square kilometre in the Shire area compared to the South Metropolitan Peel Region is significantly less, but that over time the gap is projected to narrow. In 2004 the average number of people per square kilometre in the Shire was 13.8, compared to 26.6 in 2015. This is projected to increase to 120.9 by 2040[26]. This data further emphasises the potential challenges that the Shire will face in relation to a growing population within a confined urban boundary.

4.2.2 Demographic Profile

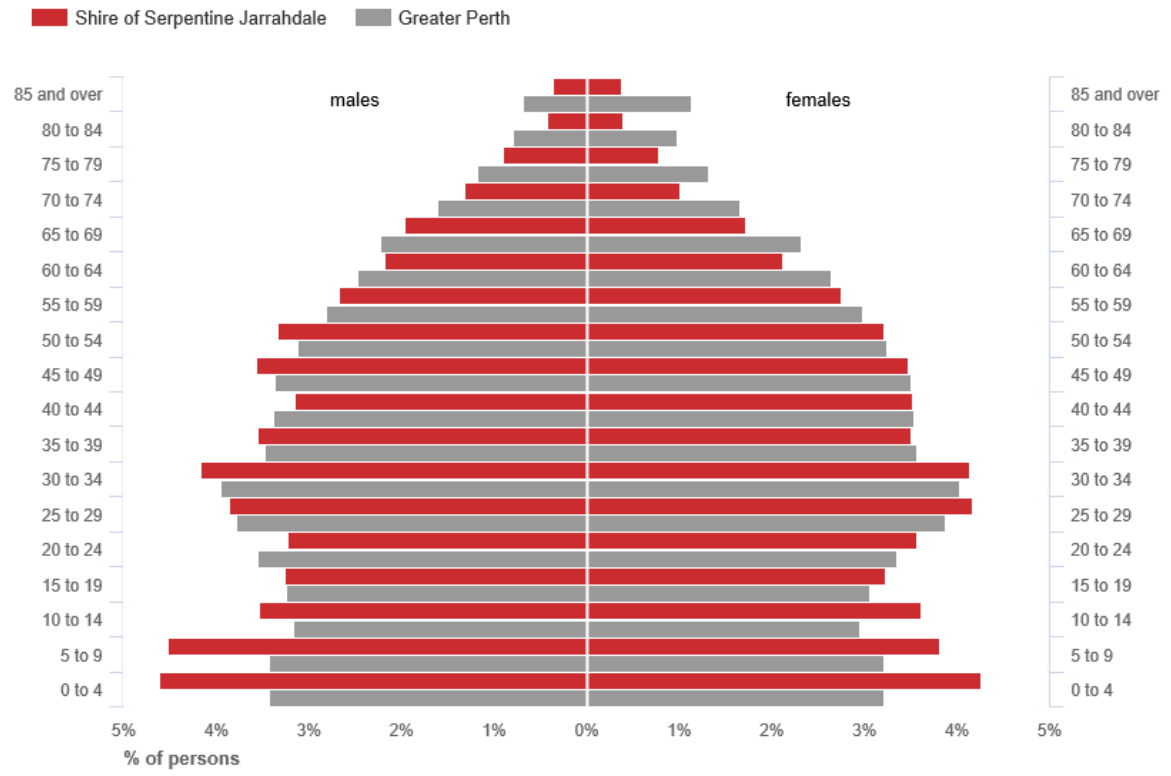
The 2016 ABS Census indicated that the median age of persons within the Shire was 32 years and the average household size was an average of three people[27]. In 2016 the highest numbers of people in the Shire are represented in the 0 to 9 years (16.9%) and 25 to 34 years (16.7%) age brackets. These age brackets have a proportionately greater representation within the Shire in comparison with the greater Perth area where the 0 to 9 years age bracket accounts for 13% of the population and the 25 to 34 age bracket accounts for 15.7% of the population. From the combined ages of 55 to 85 and over, the Shire is proportionately underrepresented in comparison to the Greater Perth area. The proportion of the Shire's population in this age range is 18.9%, while the proportion for Greater Perth is 24.8%. This may reflect the limited range of retirement lifestyle villages and aged-care facilities in the Shire. Figure 4-3 shows the age structure of the Shire compared with the Greater Perth population at the 2016 Census. The data confirms that the Shire is dominated by families with young and school aged children compared with Greater Perth, which is typical of an urbanising area on the fringe.

The cultural diversity data at the 2016 ABS Census indicates that the Shire has a higher percentage of people born in Australia (68.3%) compared to the Greater Perth Region (57.3%)[28]. The data indicates that 83.7% of people in the Shire only speak English at home, which is significantly higher than the proportion of people within Greater Perth that only speak English at home, which is 73.5%. This suggests that there is less cultural diversity within the Shire, however this may change as the urban population continues to increase. With respect to religion, the Shire has a similar proportion of people who nominate as some form of Christianity, with 48.3% in comparison the Greater Perth region with 49.7%. There is a greater proportion

[26] (AEC Group, 2016)
[27] (Australian Bureau of Statistics, 2016)
[28] (Australian Bureau of Statistics, 2016)

of people within the Shire (36.8%) who state no religion compared to Greater Perth (32.1%) and a notably smaller proportion of people within the Shire who nominate as Catholic[29].

Figure 4-3: Age Structure 2016



Source: ABS (2016) in profile.id

Byford

Byford has a higher propensity of younger family units (parents between the ages of 25-54 years and children 0-19 years). This may indicate that families choose to live within Byford for the opportunity to purchase house and land packages, which offer an affordable housing option. The proximity to other social and commercial hubs such as Armadale may also be a factor in attracting families. Oakford has a higher propensity of older family units (parents between the ages of 35-54 years and children 5-19 years). This indicates that these families choose to live within Oakford for the opportunity to live on larger rural living lots that are still within proximity to other social and commercial hubs and transport networks.

Mundijong

There is a diverse age population within Mundijong with a high propensity of family units from young to old (parents between the ages of 25-64 years and children 0-19 years). Mundijong is a rural townsite with most of the community support facilities located within one central strip and the large rural residential blocks located within close proximity. As the Mundijong urban centre develops, this may result in additional young families in the area, as more dwelling product catered to first homebuyers becomes available.

Serpentine

Serpentine is seen as a rural townsite with many open space features within the town that caters for a diverse age range. It is considered to have a slightly higher ageing demographic to that of other town settlements within the Shire. This can be attributed to the existence of established rural living estates and larger lots within Serpentine that appeal to the second and third homebuyer market.

[29] (Australian Bureau of Statistics, 2016)

Jarrahdale

In Jarrahdale there is a higher propensity of older family units (parents between the ages of 35-54 years and children 5-19 years). There is a relatively higher numbers of seniors (55 to 74 years). Jarrahdale is seen as a rural townsite, with most of the facilities located within one central area.

Education and Income

The proportion of persons within the Shire to have completed year 12 is 44.5%, which is significantly less compared to 57.3% for Greater Perth. Of the persons with an educational qualification, 19.3% have a bachelor degree of higher within the Shire, which is significantly lower the 37.0% within the Greater Perth region. A certificate level qualification was attained by 47.7% of those with an educational qualification in the Shire and 31.4% of those with an educational qualification in Greater Perth[30]. These statistics show that the Shire generally has lower levels of educational attainment with the population. Subject to the types of jobs created as the population grows, lower levels of education attainment have the potential to create skills shortages and the need for businesses to bring in employees from outside of the Shire. The lower levels of educational attainment could also have socio-economic implications if not balanced out. The median total household income in the Shire ($1,859/week) is higher than the median for Greater Perth ($1,643/week). The median personal income for the Shire ($773/week) is also higher than the Greater Perth region ($728/week). Figure 4-4 illustrates weekly household income for the Shire.

Figure 4-4: Weekly Household Income 2016



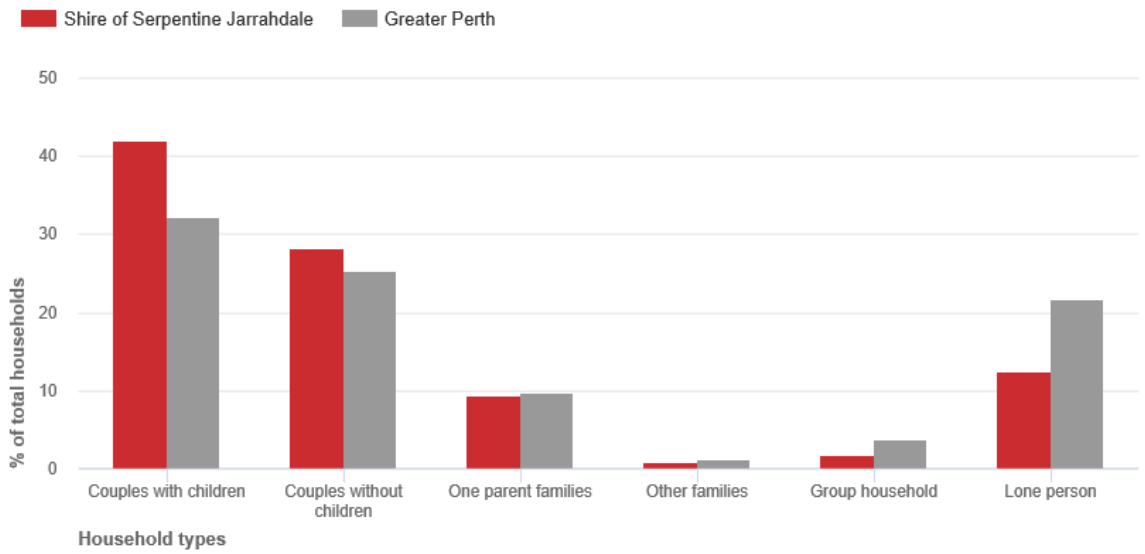
Source: ABS (2016) in profile.id

Household Composition

The total number of households in the Shire at the 2016 ABS Census was 8,849, comprised of 7,127 family households and 1,720 non-family households[31]. This has grown from 4,259 households in 2006, and is projected to grow to 42,240 by 2050 under the WAPC's South Metropolitan Sub-Regional Planning Framework[32]. As illustrated in Figure 4-4, the household and family composition within the Shire at the 2016 Census was structured toward the traditional family household made up of a couple either with or without children. This reflects the fact that there is rapid suburban growth taking place within Byford and Mundijong that is characterised by first homebuyers with young families.

[30] (Australian Bureau of Statistics, 2016)
[31] (Australian Bureau of Statistics, 2016)
[32] (Department of Planning, Lands and Heritage, 2018)

Figure 4-5: Household Composition 2016



Source: ABS (2016) in profile.id

4.2.3 Projected Population Growth

There are three main sources for population projections for the Shire:

- WA Tomorrow (WAPC), which forecasts a population of between 41,000 and 57,650 by 2026;
- forecast.id, which projects a Shire population of 63,300 by 2036; and
- Perth and Peel @ 3.5 million, which projects a Shire of Serpentine Jarrahdale population of 113,058 in 2050, with 42,242 dwellings.

None of these population projections are inevitable. Many factors are relevant including:

- Overall Demand: The Shire's role in meeting overall housing demand in Perth and Peel generally;
- Employment and employment access; and
- Land supply and competing land demand.

WA Tomorrow

The current *WA Tomorrow* series published by the WAPC (2015) is based on the 2011 Census. The forecasts represent the best estimate of future population size if trends in fertility, mortality and migration continue. The forecast range is known as bands from which a median forecast is derived along with two upper forecasts and two lower forecasts. Users have five forecasts or bands from which to choose. Bands A and B contain the lower forecasts, B and C is the median forecast and Bands D and E the higher forecasts. Forecasts for the Shire shows the population growing to between 41,000 and 57,650 by 2026.

forecast.id

Population drivers considered by .id consultants[33] include migration patterns and housing and land supply. Forecasts are available for the Shire and small areas for each year from 2011 to 2036. The population for the Shire is estimated by to increase to approximately 68,335 persons by 2036, representing a 120.16% change from the estimated population in 2018 of 31,039 persons.

Perth and Peel @ 3.5 Million

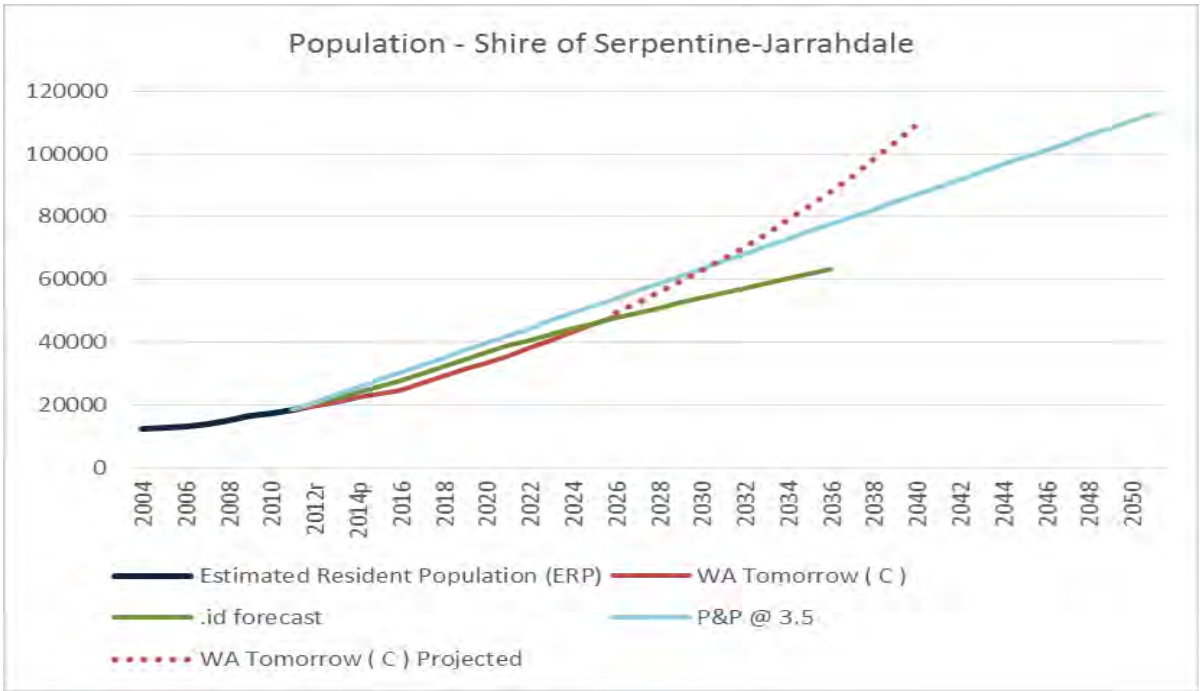
The WAPC's Perth and Peel @ 3.5 million suite of documents includes a population projection for the Shire at 2050. This projection shows the Shire population at 2050 in the context of a total population in Perth

[33] http://forecast.id.com.au/serpentine-jarrahdale

and Peel of 3.5 million. The Perth and Peel @ 3.5 Million South Metropolitan Peel Sub-regional Planning Framework projects the Shire's population to be 113,060 in 2050, with 42,242 dwellings.

A comparison of the three population projections discussed is shown in Figure 4-, which is taken from the Shire's Socio-Economic Profile[34].

Figure 4-6: Comparison of Population Projections for Shire of Serpentine Jarrahdale



Source: various sources and AEC projections (2016)

4.2.4 Housing Types and Density Trends

Housing Diversity

The number of residential building approvals has steadily increased from 274 in 2005-06 to a peak of 890 in 2014-15. The value of building approvals has also increased during this time period from $52.8 million to $216.8 million. This growth is reflective of the population growth across the Shire. The Shire presently accommodates very little housing diversity. The 2016 Census indicated that separate houses comprise 90.2% of dwellings, compared with 68.4% in Perth generally, while the remaining 9.8% of dwellings was comprised of semi-detached, flats or apartments and other dwelling types[35]. This dwelling mix within the Shire is significantly lower than for Greater Perth. Housing diversity is also represented by the number of bedrooms and once again the Shire has a much higher proportion of four-and five bedroom dwellings compared with Perth, and far fewer two and one bedroom dwellings. This indicates a strong bias towards 'family' accommodation, with few options for other dwelling types.

According to id.forecast, the most mobile age groups in the population are young adults. They tend to move to attend educational institutions, seek work and express a change in lifestyle. Market research has shown that empty nesters are more likely to move to smaller accommodation when appropriate and affordable alternative housing is supplied in the local area that is accessible to established social networks. Migration patterns differ for each area across the Shire depending on their housing markets and stage in the suburb life cycle. Significant new housing opportunities across the Shire, particularly in Byford and Mundijong is resulting in a major gain of young and established families (0-14 and 20-44 years) and a minor

[34] (AEC Group, 2016)
[35] (Australian Bureau of Statistics, 2016)

gain of older adults, empty-nesters and retirees (45-64 years). However as these newer areas age, so too will their populations and if suitable housing is not available to accommodate changing household needs, residents may be forced to look elsewhere for housing.

Clearly there is capacity for far greater housing diversity within the Shire if housing choice to accommodate a range of lifestyles and household types is to be achieved. This will become increasingly important as the population ages. A recent report on housing affordability in Western Australia[36] found that 26.5% of retired households still had to cover mortgage or rental costs and 15% of retired households were paying over 30 per cent of their income in housing costs. In addition:

- 16% of 55-64 year olds and 25% of those aged 65 years of over had already downsized with a further 31% and 29% respectively having thought about downsizing;
- Among those who had not already downsized, 80% stated they would certainly downsize in the future; and
- The most common reason for downsizing was to live in a smaller house that is easier to run.

The same report also found that Perth has the lowest housing diversity in the study that compared Perth, Sydney and Brisbane, and that on a state-wide basis, Western Australia also has the lowest housing diversity. It found that a housing market that offers diversity in housing stock can help improve perceptions of affordability despite high price and rents, as households are able to exercise more choice in their selection of dwellings. The availability of different forms and sizes of housing will be essential if a diverse population is to be accommodated within the Shire, as children seek to leave home and older adults seek to downsize. Nation-wide trends of smaller household sizes and more single person households can also be expected to be reflected within the Shire, further increasing the need for more diverse and adaptable housing types.

Housing Density

The number of dwellings in the Shire in 2016 was 9,606. Across the whole Shire area of 905 square kilometres, this equates to only one dwelling for every 9.3 hectares. Obviously, a large portion of the Shire is State Forest and rural land, and the vast majority of houses are located in urban areas. If this same number of dwellings is applied to just the currently zoned urban and urban deferred land it equates to approximately three dwellings per hectare. The WAPC's Perth and Peel @ 3.5 Million Framework projects that the Shire's population will increase to 113,058 persons and 42,242 dwellings by 2050. The Framework identifies little additional land for urban development in addition to the existing urban and urban deferred zoned land to accommodate this population increase. Therefore, structure planning for the urban centres of Byford and Mundijong needs to allow for more medium and high density development to accommodate this population increase. Residential development should include a range of housing types, from single bedroom to family and share housing, in detached, grouped and multiple housing forms as well as aged persons housing and lifestyle villages. Table 4-2 shows the currently identified urban land within the Shire.

Table 4-2: Urban Land

MRS Zone	Total Area (ha)
Urban	2,905
Urban Deferred	240
TOTAL	3,145

The Shire will need to take a strong stand to ensure that land is not underdeveloped and that housing typologies are provided to meet a range of housing needs and price points. If current patterns of residential development continue with a predominance of single detached dwellings, the currently identified urban

[36] (Duncan A, 2016)

land will not be able to accommodate a population of over 100,000. This would not only fail to deliver a diversity of housing options but also go against the clearly expressed community desire to retain the prevailing rural character of the Shire. It is clear that a strong stand must be taken to prevent the shire being consumed by unchecked, low density urban expansion, which would not only destroy the landscape and lifestyle qualities so characteristic of the Shire and so highly valued by the existing community, but would not support a diverse and sustainable community.

4.2.5 Social Challenge

Regional SEIFA[37] data indicates that new development in Serpentine Jarrahdale will be in a region with many suburbs with comparatively low levels of education and occupation and comparatively high levels of disadvantage, including those in the highest decile on an Australia-wide comparison. Given its location at and beyond the urban development front, one scenario is that this pattern will be repeated as Byford and Mundijong Whitby are further developed, with housing at relatively low cost attracting a high proportion of people on low incomes, with low levels of educational attainment and in lower skilled jobs. The data indicates that this also is correlated with high levels of disadvantage (high levels of youth unemployment is a regular feature) and consequent high needs for support services. A critical planning task is therefore to minimise the risk of this scenario and to ensure measures are in place to deal with any of its effects as they arise.

[37] SEIFA, or Socio-Economic Indexes for Areas is a product developed by the ABS that ranks areas according to relative socio-economic advantage and disadvantage, based on information from the 5-yearly Census. SEIFA 2011 consists of four indexes which are reported at suburb level for the region and show an important element of the development context for the projected large population expansion for the Shire. The indexes are Relative Socio-Economic Disadvantage; Relative Socio-Economic Advantage and Disadvantage; Education and Occupation; and Economic Resources.

4.3 Economy and Employment

4.3.1 Employment

Labour Force and Unemployment

The total labour force of the Shire in 2016 was 13,855 and the unemployment rate was 7.1%.[38] The unemployment rate for the Shire is lower than that unemployment rate for Greater Perth (8.1%). It is noteworthy that the South East region, which includes the local government areas of Serpentine Jarrahdale, Armadale, Gosnells, Canning, Belmont, Kalamunda, South Perth and Victoria Park has a higher rate of unemployment at 8.9% compared to just the Shire and Greater Perth. The Shire therefore has one of the lower unemployment rates within South East region. There is a relatively high proportion of people not within the workforce indicating that family/carer support could be an issue in the area.

Industry and Occupation

Overall, there were 4,571 people employed within the Shire, regardless of where they live, at the 2016 Census. Of those people employed within the Shire, 54% also live within the Shire. The major employment industries within the Shire include:

- Construction (16.2%)
- Education and Training (13.3%)
- Agriculture, Forestry & Fishing (10.4%)
- Public Administration and Safety (6.8%)
- Health Care and Social Assistance (6.1%)

The construction industry being the highest employment industry within the Shire can be attributed to the rapid residential growth within Byford and more recently in Whitby. The education and training industry has increased significantly from 9.7% in 2011 to 13.3% in 2016, reflective of the additional schools, including Byford Secondary College, which have opened during this time. The agriculture, forestry and fishing industry has declined 1.7% since 2011, which is likely to be indicative of the Shire's economy diversifying with increased urban development. Another notable decline since 2011 was the manufacturing industry, which declined from 9.5% in 2011 to 5.3% in 2016. The industries where the Shire is significantly behind Western Australia include retail trade and health care and social assistance and professional and technical services. Figure 4-7 shows the employment industries within the Shire compared to WA.

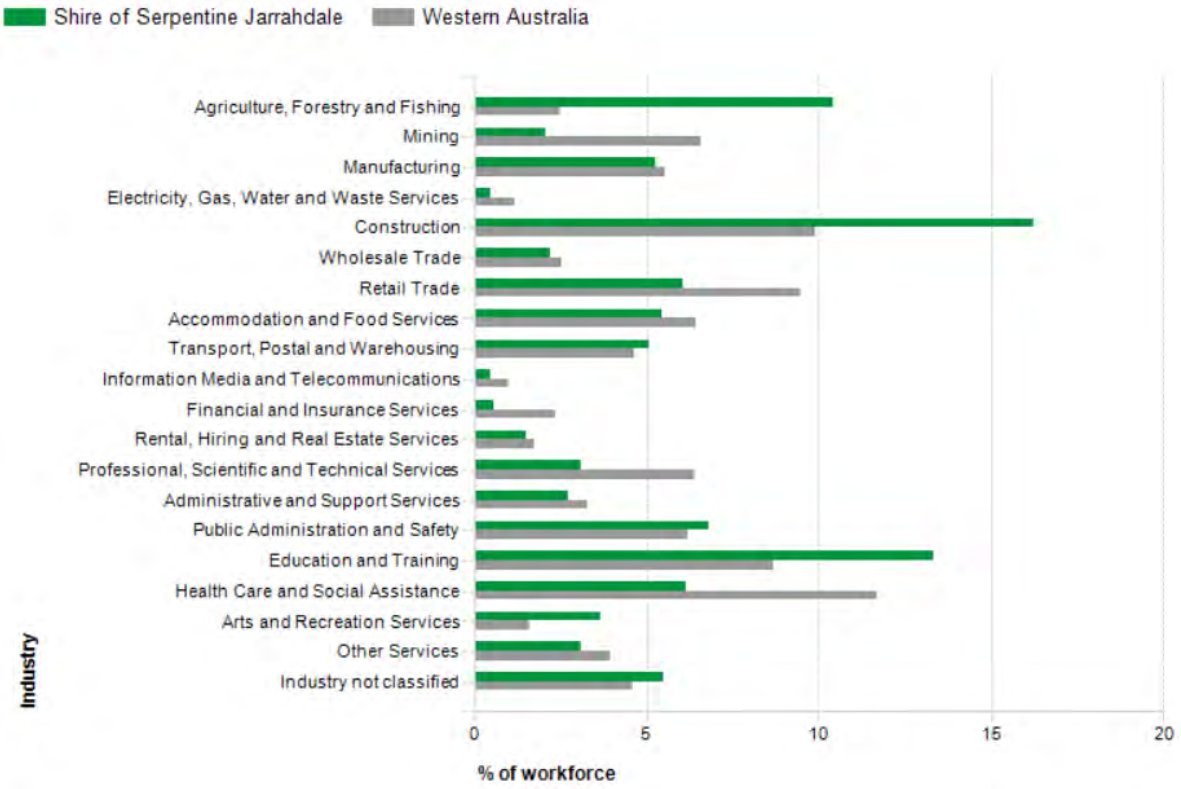
At the 2016 Census there were 12,832 resident workers within the Shire. Of those 12,832 people, 2,473 people were employed within the Shire, with the other 10,359 or 80.7% of people travelling to other local government areas for work. This means the Shire has a 19.3% rate of employment self-containment, which measures the proportion of resident workers who are employed within the local government area. This highlights the need to increase and diversify the number of local jobs available within the Shire to retain spending within the local economy. The largest proportions of the 80.7% of people who work outside of the Shire travel to the local governments of Armadale (13.7%), Canning (9.2%), Cockburn (6.6%), Gosnells (6.6%) and Perth (5.3%). This shows that many workers living in the Shire currently travel north to other south east local government areas for employment. There is also an opportunity to improve transport connections east west, to provide access to employment opportunities in Kwinana and Rockingham, which combined employ 5.6% of workers living in the Shire.

The most common occupations of the those employed within the Shire, though not necessarily living in the Shire, was Technicians and Trade Workers (16.9%) and Labourers (14.9%). The most common occupations

[38] (Australian Bureau of Statistics, 2016)

of workers that live in the Shire, though not necessarily working in the Shire, is Technicians and Trade Workers (21.0%) and Clerical and Administrative Workers (14.2%).

Figure 4-7: Major Employment Industries in Serpentine Jarrahdale



Source: ABS (2016) in economy.id

Employment Trends

Population growth will increase demand and thereby generate employment opportunities across the health, education and local construction sectors to accommodate future needs (population based employment) but this will not generate all the jobs required. Increased employment needs to be driven by economic expansion and diversification in the Shire as well as the wider Peel region through intensification of the following activities:

- Industrial estates at West Mundijong, Cardup, Armadale, Rockingham/Kwinana and Mandurah/Murray;
- Activity centres: Byford, Whitby, Mundijong, Mandurah, Rockingham, Armadale; and
- Mining and minerals processing.

The proximity to commercial centres may influence employment factors, together with the localised service demands. Improvements in transportation will therefore be critical in supporting the future employment and economic base of the Shire. The Peel Development Commission has a target of 80% self-sufficiency in the region by 2036. Two of the sectors that are important to the Shire and its region, both now and for future employment, are agriculture (in the Shire area) and manufacturing (in the region) and data showed a net decline Australia-wide in these areas. Future planned developments in Nambeelup, Pinjarra Industrial estate and the Kwinana outer harbour are also likely to generate future employment opportunities in the future within the economic sectors of manufacturing and construction.

4.3.2 Economy

The Gross Regional Product (GRP) for Serpentine Jarrahdale steadily increased, from $320 million in 2001 to $903 million in 2016, before slightly declining to 881 million in 2017[39]. The industries that contributed the most value in the Shire in 2016-17 included:

- Construction (23.3%)
- Agriculture, Forestry and Fishing (16.2%)
- Education and Training (8.5%)
- Professional, Scientific and Technical Services (6.8%)
- Public Administration and Safety (6.6%)

Location Quotient[40] analysis indicates that the most suitable pathways for future economic development in the Shire are in the sectors of agriculture, forestry and fishing; arts and recreation (peri-urban tourism) and construction industries, showing the most promise for future employment growth. Concerted effort by the Shire will be required to maximise the economic potential of these industries.

Supply chain analysis[41] indicates that:

- The sector which exports the highest proportion of its production is Construction, which exports $119.7 million of its production, followed by Agriculture, Forestry and Fishing exporting $111.7 million of its production.
- Agriculture, Forestry and Fishing sources the majority of its inputs (approximately 54.3%) from outside the region, suggesting there may be opportunities to fill this need locally.
- Construction sources the majority of its inputs (approximately 64%) from local providers.
- On average, (excluding Manufacturing) approximately 26% of industry production is sold to local industry, 19% is consumed locally and a further 42% is exported outside the region.
- Within the Manufacturing industry the sector that exports the highest proportion of production is the Food and Beverage Manufacturing sector ($42.7 million), the next highest is Wood and Paper Manufacturing at $16.5 million.
- The Food and Beverage Manufacturing sector sources the majority of its inputs from local providers. This indicates a sector that should be considered for further expansion.

Economic Opportunities

Economic opportunities for the Shire will arise from its relative strengths. These include:

- Proximity to the Perth metropolitan marketing hubs;
- Good agricultural soils on the lower slopes of the Darling Range;
- Extensive and flat lands in the palusplain giving opportunities for controlled intensive food, algae and fish production using hydroponic and similar (glass house) production systems; Extensive feedstock (bio-solids, animal waste, urban green waste, timber residues) for bio-industrial and renewable energy enterprises;
- Supporting infrastructure;
- Availability of housing, community services and facilities, and a workforce for the enterprises;
- Underdeveloped equine industry;

[39] (Economy.id, 2018)

[40] Location quotients demonstrate the degree to which a local or regional economy is specialized by examining the proportion of employment (by industry sub-sector) compared to a larger economy (Australia). Location quotients can be used to indicate strengths and weaknesses of a local or regional economy (ie: its natural competitive advantage).

[41] Supply chain assessment identifies both the upstream and downstream activities engaged in by an industry. Upstream inputs to production are either sourced locally or imported to the region. Downstream sales of product may be sold direct to local industry (and used elsewhere in value adding production), consumed by the local economy (population based consumption), or exported from the region. This identifies potential targets for economic development.

- Mining – mineral sands deposits; and
- Peri-urban tourism development opportunities.

Economic opportunities can be identified in several sectors, such as:

- Agriculture;
- Equine;
- Peri-urban tourism;
- Freight and logistics;
- Food processing;
- Manufacturing/fabrication.

Agriculture

The expansion, intensification and diversification of the agricultural industry presents one of the main opportunities for Serpentine Jarrahdale. Agriculture, which includes farm production through the aquaculture, cropping, horticulture, livestock and viticulture sectors, supplies the food processing and manufacturing industry and is serviced and supported by agribusiness. Agriculture is a critical contributor to the Peel's economy. Based on current global and national trends, the industry has enormous potential for growth. Increased demand for food across the world will create new export opportunities for the Australian food industry. Asian food demand in particular is expected to outpace local food production, leading to higher imports to the region. The combination of good agricultural soils (especially on the lower slopes of the Darling Ranges) and palusplain soils (on the Coastal Plain) provides a mix of agricultural opportunities to the Shire including:

- Meat protein (including beef, pork and chicken);
- Intensive horticulture;
- Aquaculture (including controlled intensive food, algae and fish production using hydroponic and similar production systems); and
- Cut flowers.

Preservation of the opportunities for expansion of agriculture and associated pursuits (e.g. the equine industry and rural-oriented tourism discussed below) is a key challenge for the next stage of planning. A number of measures are possible to assist this:

- Manage urban growth boundaries: Land values match the markets expectation of future use. If land is identified as permanently zoned for non-urban use with no prospect of rezoning, land values will be at a level that will make agricultural and related uses viable. It is important to avoid the practice of land-banking with the expectation of a future urban zoning. This effectively takes land out of productive use for an extended period.
- Retain large lots: in general agriculture requires scale to be economically viable. Even intensive agriculture (e.g. closed-system horticulture requires relatively large land parcels and further subdivision of land will make access to well positioned land for productive use more difficult.

The Murdoch University development at Whitby is intended to be a centre for teaching and research in veterinary and agricultural sciences, as well as other disciplines such as environmental science and conservation – all subjects that are admirably aligned to key strengths and characteristics of the Shire area. This represents an excellent opportunity to develop and attract businesses in these fields.

Equine Industry

The equine industry (both racing and non-racing) is an important one in the Shire and it will expand. The region already has a number of key equine industry facilities. The current strategy of Racing and Wagering Australia (RAWA) is to focus growth in the Peel region (as opposed to the areas north of Perth). The equine opportunity in the Peel region is further supported by:

- A significant lack of available unallocated ground water extraction licences north of Perth;
- A major growth of population in the south-western corridor and the south-eastern corridor; and
- The availability of rural and rural residential land between these two corridors.

The common economic activities that support the equine industry, such as fodder, adjustment, veterinarian, stabling, saddlery, etc. will be focussed in the region. The relocation of the Murdoch University school of veterinary science to Whitby is in part a reflection of the predominance of equine activity in the area and can be seen as an opportunity for further economic development in this industry.

Peri-Urban Tourism

The Peel region offers a highly diverse tourism base ranging from beaches, water activities, walking trails, national parks, nature reserves and wineries all of which are supported by a variety of accommodation options from camping through to deluxe hotels. The tourism industry in the Peel region is largely fuelled by the day visitor and overnight domestic tourism markets, with increasing demand from international markets. A long-term decline in visitor numbers to the region over the period 2000 to 2009 appears to have reversed, buoyed by good tourism product offerings and varied (and competitive) accommodation options. The peri-urban areas of the Shire have a unique relationship with the tourism centres in the Peel region (such as Mandurah and Rockingham) and both influence each other's growth and change. Planning for the future will need to consider how development is managed in peri-urban areas to ensure natural assets are protected and local communities continue to prosper.

Industrial Land and Location Opportunities

Two significant industrial areas are identified within the Shire, the West Mundijong Industrial Area and the Cardup Business Park. The intention for the Cardup Business Park is for a wide variety of lot sizes to accommodate various types of industrial uses. The current draft Local Structure Plan for the Cardup Business Park identifies general industrial land uses for the area. The Cardup Business Park is well located on South Western Highway between the Byford and Mundijong urban areas and will have close access to the future Tonkin Highway extension. This site is conveniently situated between the two district activity centres and largest urban areas within the Shire, which are both projected to accommodate approximately 50,000 people each at capacity. The Shire has limited land identified for service commercial land uses. The location of the Cardup Business Park between Byford and Mundijong makes this area optimal for providing service commercial land uses for the growing population. As the demand for service commercial increases with the growing population, there is a need to identify land for this purpose. Service commercial land uses are strongly encouraged within the Cardup Business Park, including furniture, appliances and electronics sales, motor vehicle, boat or caravan sales, bulky goods showrooms, hardware stores, home improvement stores, offices, storage facilities and warehouses and exhibition centres.

The West Mundijong Industrial Area is comprised of around 440 hectares and is intended to accommodate up to 880 industrial lots. The West Mundijong industrial precinct will facilitate future development of light and general industrial land uses that will generate employment opportunities to benefit the wider South-Eastern corridor of the metropolitan region as well as the Peel Region. The West Mundijong Industrial Area incorporates the future realignment of the freight rail and has been identified as a potential intermodal facility site.

There are several existing and missing transport connections for the Shire, which will provide a number of location advantages for the Shire once in place. These include the extension of Tonkin Highway from Byford to Pinjarra, the extension of the freight rail to the Outer Harbour, east-west connections, and the Perth-Bunbury passenger rail. These transport connections could facilitate industries within the Shire such as, freight and logistics (possibly including an intermodal terminal), food processing (taking advantage of access to inputs and to labour) and manufacturing/fabrication.

4.4 Retail and Commercial

4.4.1 Existing Activity Centres

Activity centres are a key focus for employment and economic activity particularly in the early stages of the Shire's evolution towards metropolitan or urban scale of activity.[42] In addition, the role of activity centres in providing for local employment opportunities is critical in establishing sustainable journey patterns and has implications for the evolution of the Shire's economy to reflect its urban nature/ settlement characteristics. The long established and historic centres of Byford, Mundijong, Serpentine and Jarrahdale will form the basis for the future hierarchy of activity centres as identified within *Perth and Peel @ 3.5 Million*.

Byford is currently the major commercial centre within the Shire at present. The intersection of the South Western Highway and Abernethy Road accommodates several restaurant/take-away premises, supermarkets and shops. Two other supermarkets accompanied by specialty stores, conveniences and cafes have more recently developed within the Byford Town Centre, north of Abernethy Road and west of George Street. Retail and commercial activity within the existing Mundijong Town Centre is limited with an IGA, post office, deli, service station and cafes. The limited range of stores in this centre reflects the current small consumer catchment in Mundijong There is a general store in Serpentine as well as several other non-retail business premises. Jarrahdale also accommodates a small general store and the Jarrahdale Tavern, which includes a bottle shop.

4.4.2 Future Activity Centres

The *Shire of Serpentine Jarrahdale Activity Centres Strategy*[43] was prepared in order to bring the Shire's approach to activity centre planning and development in line with *SPP 4.2 Activity Centres for Perth and Peel*. The following principles are intended to guide the implementation of activity centres:

- Development Framework Principle - To provide for the effective delivery of long term requirements of centres by the planned provision and securement of the land resources at the commencement of the development cycle, and a clearly defined program for the funding and progressive development of infrastructure requirements during the development cycle.
- Ecological Framework Principle - To provide for the effective and sustainable development and operation of activity centres where planning respects, maintains and incorporates identified ecological resources and values as integral elements.
- Place Making Principle - To provide for the aesthetic values, community identity, amenity and effectiveness of activity centres by encouraging planning and design to focus on achieving a unique sense of place.
- Street Based Activity Centres Principle - To provide street-focussed activity centres that facilitate active and safe streets, assisting in place making and community identity and provide a greater diversity of investment and trading opportunities for existing and new businesses.
- Unity of Purpose Principle - To ensure wherever possible the active contribution and participation of stakeholders and the community. This participation will be most productive if it is developed on the basis of a shared vision for the Activity Centres Strategy, and a shared understanding and commitment to the underlying principles of the Strategy.
- Economic Sustainability principle - To ensure that the potential trade, investment and employment growth and capacity of the Shire's activity centres will be optimised and sustainable for the long term. The physical planning and development must provide a geographic distribution of centres and physical forms which maximise opportunities for the widest diversity of stores, services, industries and trades and particularly for the accommodation of new business entrants.

[42] (Collie Pty Ltd, 2008)
[43] (Macroplan Australia, 2008)

The *Activity Centres Strategy*[44] states that the Shire is expected to accommodate two types of activity centres:

- District Centres x 2 (Mundijong and Byford); and
- Neighbourhood Centres (e.g. Serpentine and Jarrahdale and small nodes around Byford/Mundijong)

Under *SPP 4.2*, district centres are planned to accommodate a population of 20,000 – 50,000 persons. Both Byford and Mundijong are projected to accommodate 50,000 persons once developed. Mundijong is in a centralised location within the Shire, servicing a broad area and positioned between the West Mundijong Industrial Area and the Cardup Business Park. The centre is a further distance from major competitive centres to the north in Armadale. As such, the retail floor space allocation under the Activity Centres Strategy for Mundijong is greater than that for Byford. The exact retail floor space allocations will be determined as these centres develop and evolve. The first district centre to develop will be Byford, in line with current population levels and short to medium term growth projections.

A smaller network of neighbourhood centres will be delivered in accordance with the structure plans for Byford and Mundijong and development proposals should be considered on merit based upon achieving principles of sustainable walkable catchments. In the neighbourhood centres of Serpentine and Jarrahdale, retail development will evolve according to demand, servicing local needs. These designations can be made in the short term and would be best located around railway stations and/or existing commercial/retail premises. Some local/neighbourhood centre development was identified within Oakford at the intersection of Thomas Road and Nicholson Road, under the Activity Centres Strategy.

Activity centres should contain a mix of uses with a priority for retail and shopfront development along the main streets within the core of the centre area, with mixed-use and residential areas located to the periphery. Centres should be serviced by an effective movement network that is well-connected to the catchment. Community and recreational facilities and public open space should also be incorporated within activity centres, dependent on the scale and function of the centre. The existing heritage and local character of the place should be reflected within the design of the centres. Where an existing historical townsite is established, the structural, cultural and built heritage of the townsite should be incorporated into the design as the centre expands. Structure plans within Byford, Mundijong and Serpentine will provide guidance for the future of each of these centres. There is no centre plan for Jarrahdale but its heritage status will necessitate design guidance for its future development. Table 4-3 identifies the proposed activity centres, their roles and functions including the indicative retail floorspace as identified by the Activity Centres Strategy.

Table 4-3: Activity Centre Hierarchy and Functions

Activity Centre	Role and Function
Byford Town Centre (District Centre)	• Indicative retail floor space 15,500 m^2. • Provides at least two full line supermarkets, a discount department store and a variety of specialty shops, offices. • Will anchor activity along the main street that connects the main town centre to the train station. • Forms part of a larger Transit Oriented Development built around the planned site for the Byford Town centre rail station and bus terminus. • The development of this area also allows for opportunities to maximise the intensity of development on this important parcel of land.

[44] (Masterplan, 2010)

Activity Centre	Role and Function
	• The opportunity exists in the medium to longer term to develop additional retailing that complements the cultural, tertiary education and leisure uses of the area.
Whitby Activity Centre (District Centre)	• Indicative retail floor space 22,500 m^2. • Anchored by at least two full line supermarkets and discount department store with potential for a small secondary retail anchor and supported by specialty shops. • Make provision for public health and other community facilities, private medical and allied medical services. • Include provision for the development of non-retail commercial uses which include office and small office/home office development. • Forms part of a larger Transit Oriented Development built around the planned site for the Mundijong/Whitby rail station. • The development of this area also allows for opportunities to maximise the intensity of development on this important parcel of land. • The opportunity exists in the medium to longer term to develop additional retailing that complements the cultural, tertiary education and leisure uses of the area.
Neighbourhood Activity Centres: • Redgum North/Lot 9500 • The Glades Village Centre • Mundijong Whitby West • Mundijong Whitby East • Mundijong Townsite • Jarrahdale • Serpentine • Oakford	• Anchored by a smaller format supermarket up to 3,000 square metres, medical rooms, commercial office and a provision of local shops and conveniences. • Typical total floor space allocation of approximately 4,500 square metres. • Includes a range of weekly convenience and take away food. • The centre has a strong bike and walking link to the proposed State Primary School and active open spaces.

4.5 Tourism and Visitors

The Peel region offers a highly diverse tourism base ranging from beaches, water activities, walking trails, national parks, nature reserves and wineries all of which are supported by a variety of accommodation options from camping through to deluxe hotels. The tourism industry in the Peel region is largely fuelled by the day visitor and overnight domestic tourism markets, with increasing demand from international markets. A long-term decline in visitor numbers to the region over the period 2000 to 2009 appears to have reversed, buoyed by good tourism product offerings and varied (and competitive) accommodation options. The peri-urban areas of the Shire have a unique relationship with the tourism centres in the Peel region and both influence each other's growth and change. Planning for the future will need to consider how development is managed in peri-urban areas to ensure natural assets are protected and local communities continue to prosper. Peri-urban tourism as an important economic opportunity for the Shire. The Shire's abundant natural assets, together with equine-related tourism, is likely to boost demand. Providing for the business, conference, weddings and event market sectors has the potential to increase visitors' length of stay and therefore economic contribution to the Shire.

Recognising that tourism is an important and growing industry in the Shire, which focuses on its unique rural character, historic features and natural beauty, is important for planning in the Shire. Tourism and recreation land uses should be located close to existing towns, near existing services and infrastructure and ensure that landscape, rural character and lifestyle is not compromised. One of the policy measures of SPP 2.5 Rural Planning is to support small scale tourism opportunities, such as bed and breakfast, holiday house, chalet, art gallery, micro-brewery and land uses associated with primary production, within the MRS Rural zone. The attractiveness of the area as a tourism destination in the first instance arises from the character of the landscape – both natural and rural, the heritage of the settlements and primary production. The success of tourism as an economic activity within the Shire will be influenced by the approval process for tourist facilities and accommodation, and the availability of information and access to locations. The local planning scheme is one mechanism that should facilitate suitable tourism development. Tourism potential has been recognised in the in the following areas:

- Jarrahdale townsite and surrounding area;
- Serpentine historical precinct;
- Improved access to sites and day use facilities including picnic facilities and bushwalking tracks;
- Provision of information for tourists, accommodation, entertainment and food outlets; and
- Opportunities for the establishment of craft communities and holiday chalets.

It is important to facilitate the development of a variety of activities to support the growth of the tourism industry through the planning system. This could include:

- Identification of tourism precincts at a strategic level;
- A vibrant and diverse retail and service offering including restaurants, cafés and shops within activity centres to support residents and visitors, with a particular emphasis on maintaining character;
- Establishment of tourist activities as an adjunct to primary production activities – eg: roadside stalls for sale of seasonal produce, 'farmer direct' and cellar sales, restaurants and function centres at wineries, etc, where they can be established without adverse impacts on the environment, landscape character, or the viability of primary rural activities;
- Processing of and value-adding to local primary produce, particularly food products;
- Low key tourist accommodation such as bed-and-breakfast;
- More intensive tourist accommodation types such as farm-stay cottages, hotels, caravan parks and camping grounds where they can be established with minimal environmental or amenity impact;
- Bespoke tourism activities (eg: adventure activities, off-road vehicle courses, horse riding schools, tours of production facilities, classes within artists' studios, etc.); and
- Short-term events such as concerts, markets, etc.

4.6 Parks and Open Space

Parks benefit the community in a number of ways, both through active use and through passive exposure. Benefits include physical and mental health benefits (exercise, relaxation, exposure to nature, etc), social benefits (community pride, awareness of biodiversity, social connection), environmental benefits (habitat, air quality, heat diffusion, drainage), and economic benefits (property values, business opportunities within parks, etc).

The Positive Places POS Tool[45] is a database that provides information on the provision and location of public open space (POS) in Perth and Peel. Data was gathered from a variety of sources and was current at December 2011, so although there has been some new POS created since this time the database still provides a good overview of POS provision within the Shire. Positive places describes POS as "*all land reserved for the provision of green space and natural environments that is freely available and intended for recreation purposes (active or passive) by the general public.*"[46] It categorises POS as parks, natural, school grounds and residual green spaces, which are described in Table 4-4, which is a summary from the Positive Places database for the Shire.

Table 4-4: Types of Public Open Space

Parks	Natural	School Grounds	Residual Green Spaces
Prepared grass areas catering for a range of active and passive recreational needs. Includes: parks, landscaped or ornamental gardens, grassed open spaces, playing fields, ovals, reserves and other freely accessible sports surfaces that allow for more structured sports activities.	Natural environments such as bushland, wetlands and coastal habitats as well as areas set aside for conservation and to preserve biodiversity and wildlife habitats.	Playing fields and sports surfaces/ equipment adjacent to and/or owned by the school. May or may not be accessible for public use.	Green areas of land that do not function as a park due to their poor location, incompatible land uses, poor access and/or lack of infrastructure.

Source: CBEH Positive Places POS Tool

Table 4-5: Public Open Space in the Shire of Serpentine Jarrahdale

POS Type	*Count*	*Area (ha)*	*% Park Area*	*% Total POS Area**	*% LGA Area*
Parks	32	97.51	100	0.15	0.11
Pocket Park	8	1.55	1.59	-	-
Small Neighbourhood Park	5	2.42	2.48	-	-
Medium Neighbourhood Park	7	9.58	9.83	0.01	0.01
Large Neighbourhood Park 1	8	25.16	25.8	0.04	0.03
Large Neighbourhood Park 2	-	-	-	-	-
District Park 1	1	5.17	5.31	0.01	0.01
District Park 2	1	10.4	10.66	0.02	0.01
Regional Park	2	43.22	44.33	0.07	0.05
Natural	118	64099.1		99.84	70.94
Residual Green Space	8	5.97		0.01	0.01
*Total POS**	158	64202.57			71.06
School Grounds+	7	12.22			0.01

[45] (Centre for the Built Environment and Health, 2013)

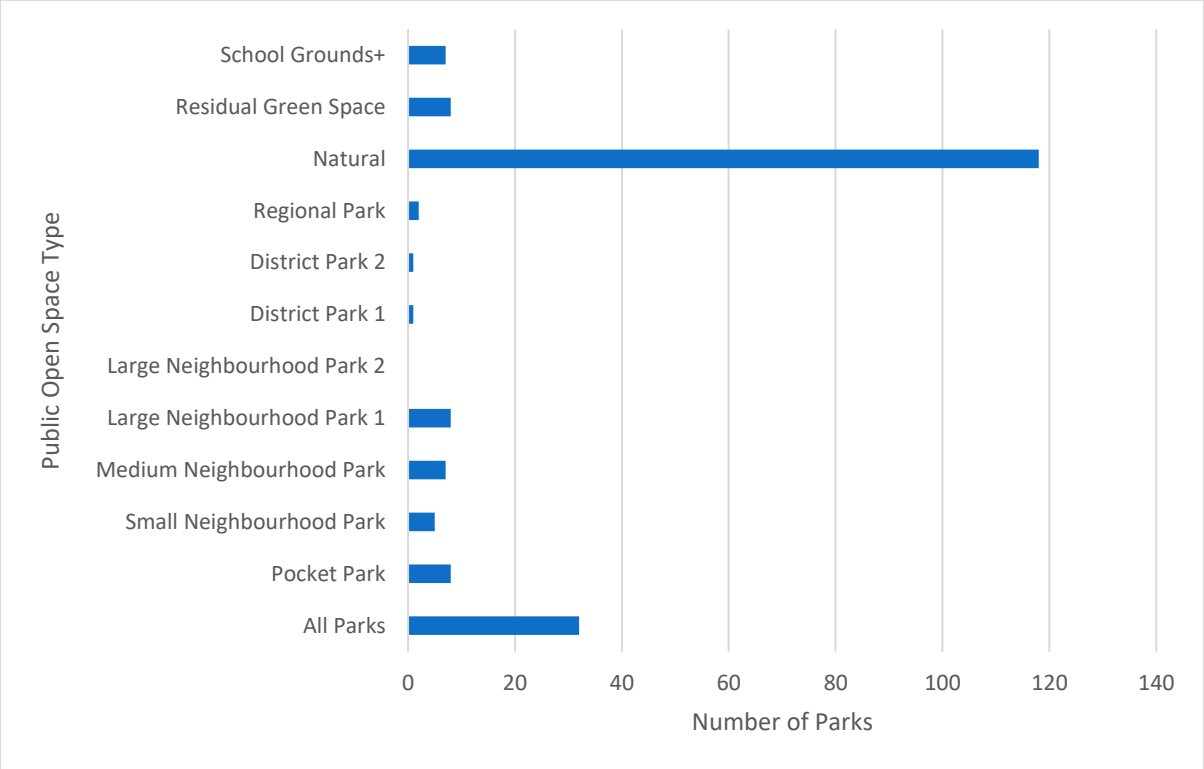
[46] http://www.postool.com.au/cbeh/pos/faq/#tabs-2 accessed 9/8/16.

POS Type	*Count*	*Area (ha)*	*% Park Area*	*% Total POS Area**	*% LGA Area*
Total POS + School Grounds*	165	64214.79			71.07

* POS is the public open space including categories of Parks, Natural and Residual Green Space;
\+ Access to School Grounds unknown/unverified
Source: CBEH 2013

The type and number of public open spaces from Table 4-5 is shown graphically in Figure 4-8, which makes it clear that by far the largest number of open spaces in the Shire are natural areas. This is reflective of the high value placed upon conservation of natural areas, but also reflects an under supply of other types.

Figure 4-8: Number and Types of Public Open Space



Data source: CBEH 2013

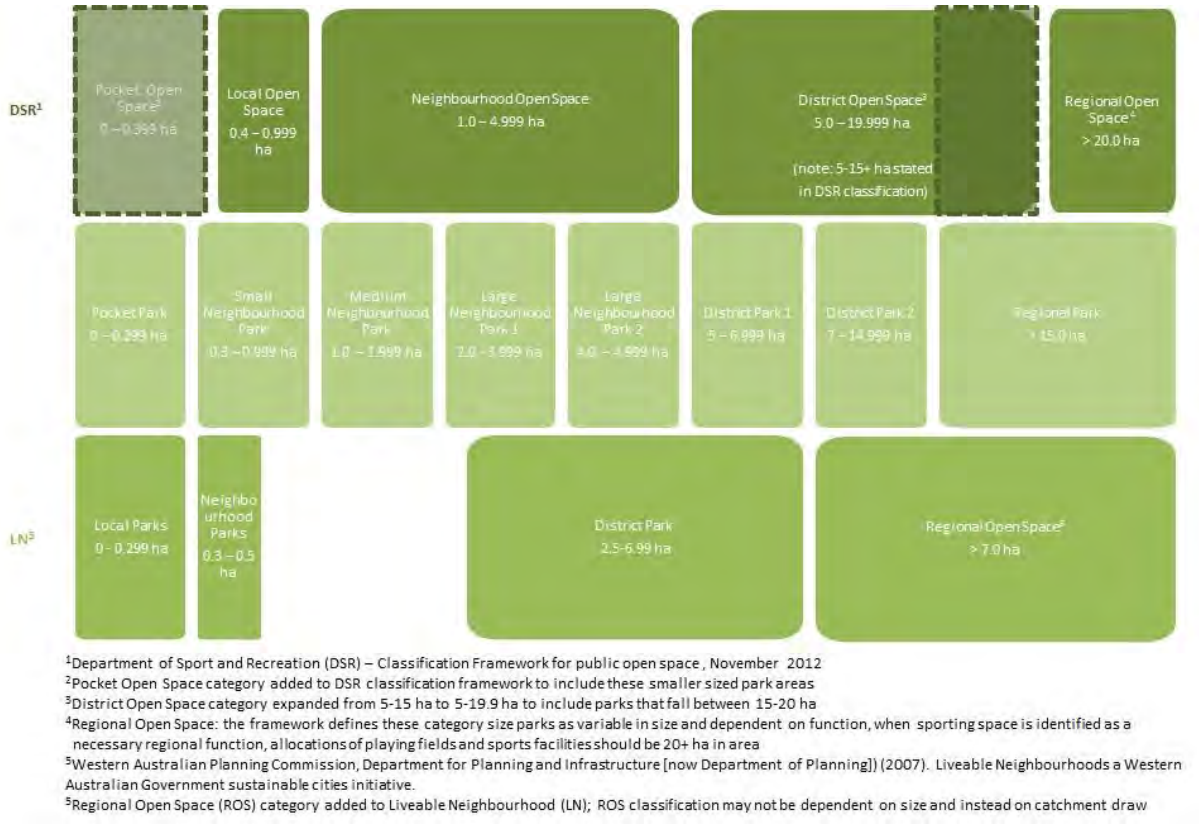
Parks are categorised by the DSR according to their catchment and function. Catchment relates to typical size and how far a user might travel to visit it. Function relates to the expected primary function of the park and the categories are:

- Recreation;
- Sport; and
- Nature.

Figure 4-9 and Table 4-6 provides a comparison between the park classifications used by the Positive Places tool, and the standard definitions used in planning, as provided by the Department of Sport and Recreation (DSR)[47], and *Liveable Neighbourhoods*[48].

[47] (Department of Sport and Recreation, 2012)
[48] (Western Australian Planning Commission, 2009)

Figure 4-9: Positive Places POS Tool Classifications Comparisons



[1]Department of Sport and Recreation (DSR) – Classification Framework for public open space, November 2012
[2]Pocket Open Space category added to DSR classification framework to include these smaller sized park areas
[3]District Open Space category expanded from 5-15 ha to 5-19.9 ha to include parks that fall between 15-20 ha
[4]Regional Open Space: the framework defines these category size parks as variable in size and dependent on function, when sporting space is identified as a necessary regional function, allocations of playing fields and sports facilities should be 20+ ha in area
[5]Western Australian Planning Commission, Department for Planning and Infrastructure [now Department of Planning]) (2007). Liveable Neighbourhoods a Western Australian Government sustainable cities initiative.
[5]Regional Open Space (ROS) category added to Liveable Neighbourhood (LN); ROS classification may not be dependent on size and instead on catchment draw

Source: CBEH 2013

Table 4-6: Comparison of Positive Places POS Tool and DSR definitions

Positive Places POS Tool Park Type Categories		DSR Open Space Categories	
Pocket Park	0 - 0.299 ha	*Pocket Open Space^*	0 - 0.399 ha
Small Neighbourhood Park	0.3 ha - 0.999 ha	*Local Open Space*	0.4 - 0.999 ha
Medium Neighbourhood Park	1.0 ha - 1.999 ha	*Neighbourhood Open Space*	1.0 - 4.999 ha
Large Neighbourhood Park 1	2.0 - 3.999 ha		
Large Neighbourhood Park 2	4.0 - 4.999 ha		
District Park 1	5.0 - 6.999 ha	*District Open Space*	5.0 - 19.999 ha
District Park 2	7.0 - 14.999 ha		
Regional Park	> 15.0 ha	*Regional Open Space*	> 20.0 ha

^ Pocket Open Space category added to DSR classification framework to include these smaller sized park areas; ° District Open Space category expanded from 5-15 to 5-19.9 hectares to include parks that fall between 15-20 hectares.

DSR suggests that the following approximate travel distances (catchments) are appropriate for the categories of parks listed in Table 4-6:

- Local open space – within 400 metres or 5 minutes walk;
- Neighbourhood open space – within 800 metres or 10 minutes walk;
- District open space – within two kilometres or 5 minutes drive (metropolitan); and
- Regional open space – within about five kilometres, connected to major roads and public transport.

Positive Places analysed the proportion of the population within the recommended catchment of each type of park by age group. The results are shown in Table 4-7. This information allows analysis of how much of each age group is within the catchment of each park type.

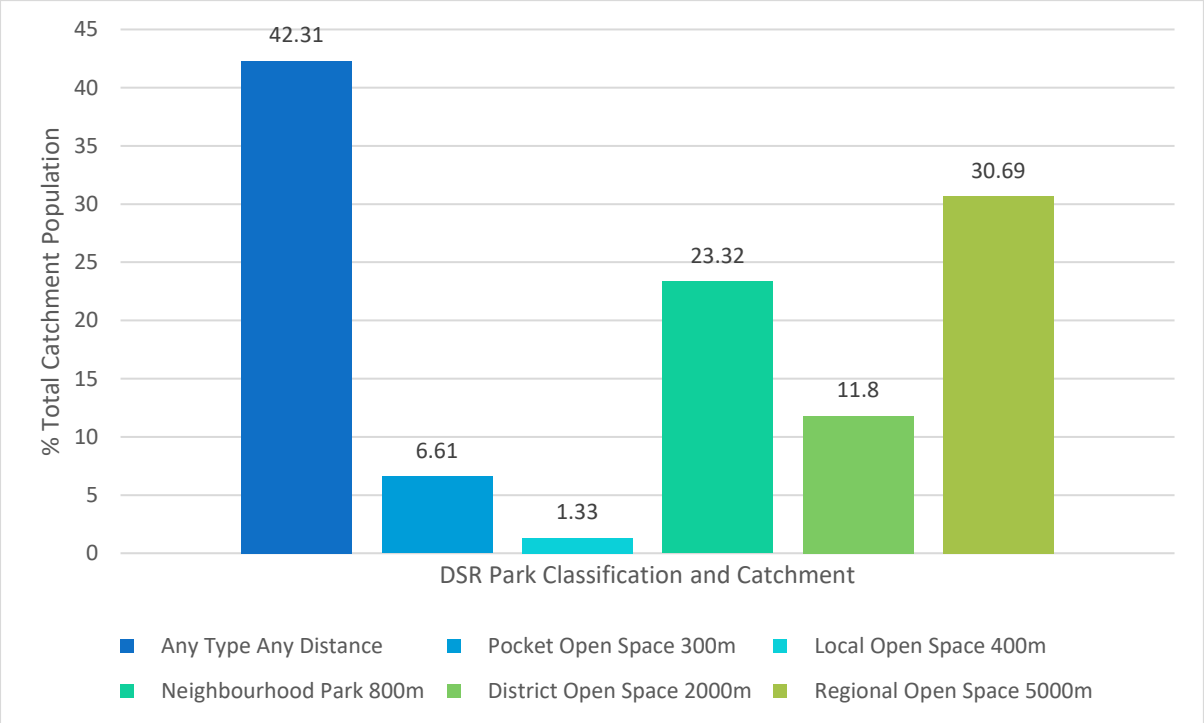
Table 4-7: Shire Parks and Catchment Populations

	Catchment		Age (years)										
	Distance (m)	Total Pop'n	0-4	5-14	15-19	20-24	25-34	35-44	45-54	55-64	65-74	75-84	85+
POS Type		%	%	%	%	%	%	%	%	%	%	%	%
Parks	Any	42.4	52.9	44.3	40.7	48.5	52.5	41.1	36.2	36.6	33.0	37.0	36.3
Pocket Park	300	5.2	7.1	5.2	4.8	7.24	6.73	4.8	4.11	4.23	4.0	4.9	4.2
Small Neighbourhood Park	400	4.6	7.4	5.0	3.6	6.0	7.6	4.4	3.2	2.8	3.2	2.9	1.1
Medium Neighbourhood Park	800	7.8	9.1	7.9	7.0	7.9	8.3	7.2	7.3	7.1	9.1	10.0	9.9
Large Neighbourhood Park 1	800	16.1	23.3	18.0	13.6	20.4	23.3	15.9	11.8	11.5	9.3	11.6	5.8
Large Neighbourhood Park 2	800	0	0	0	0	0	0	0	0	0	0	0	0
District Park 1	2,000	3.1	3.8	3.3	3.3	3.3	4.1	3.4	2.5	2.5	1.9	2.4	4.5
District Park 2	2,000	10.0	11.9	10.0	10.0	12.5	11.1	9.5	8.6	9	8.1	11.8	19.4
Regional Park	5,000	30.7	40.3	31.2	29.4	38.4	40.5	28.7	25.6	26.2	23.2	24.4	25.6

Source: CBEH 2013

Similarly to Table 4-7, Figure 4-10 shows the proportion of the population within the recommended catchment of each type of park, as classified by the DSR park types instead of the Positive Places POS Tool classifications. It shows that less than half the population is within the catchment of any park. The Shire's generally rural character and larger lot sizes is a partial explanation for this, however reasonable access to parks for both informal and organised recreation is still important, even for people living on large lots.

Figure 4-10: Catchment Population by Park Type

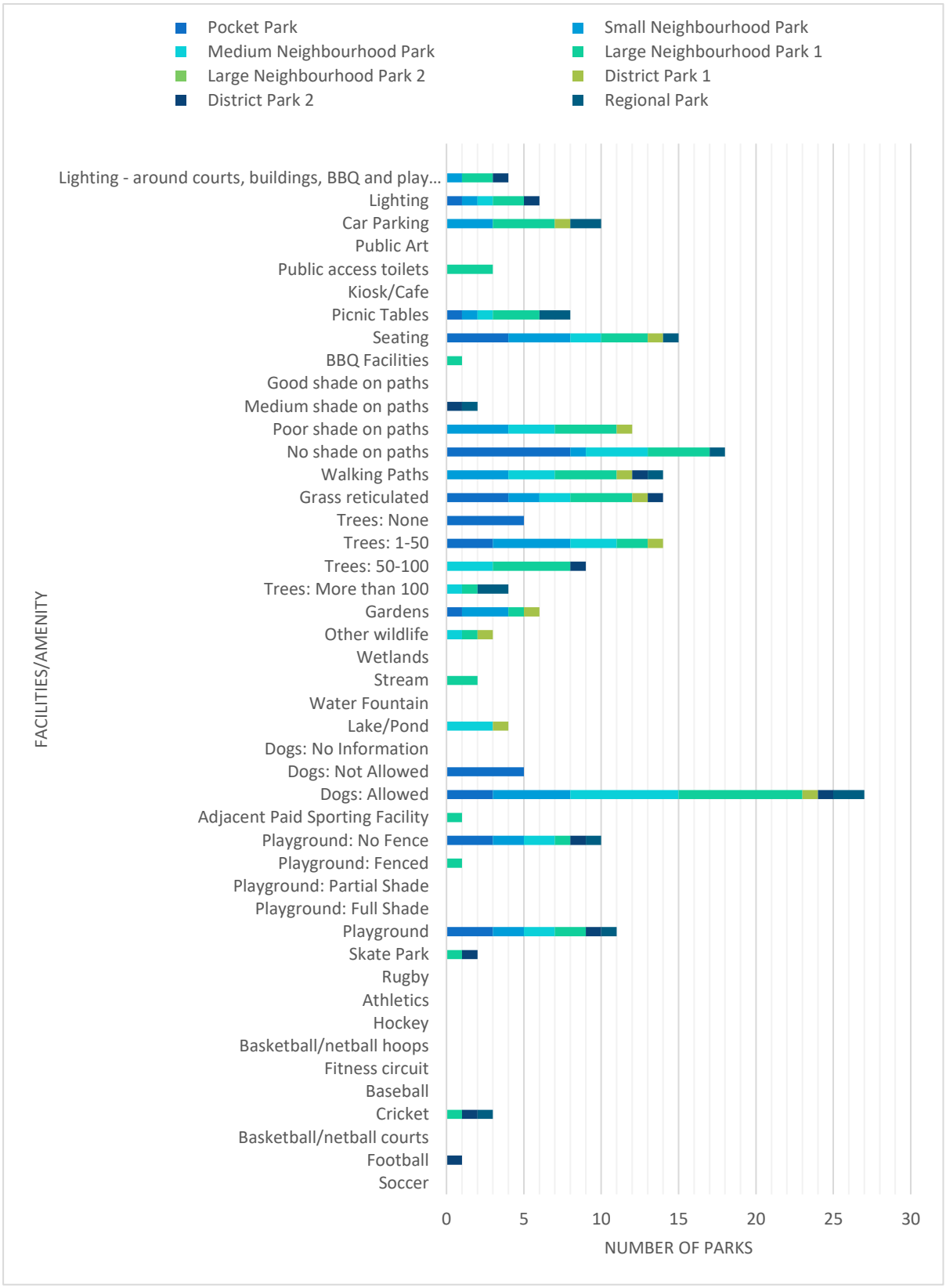


Data source: CBEH 2013

Finally, the Positive Places database provides information about the types of facilities available in the identified parks and open spaces, and allows for an indicative assessment of the quality and function of the parks. The data is illustrated in Figure 4-11. As it was based on examination of 2011/2012 aerial photography it may not be completely accurate but it does still provide an indication of the general nature

of the Shire's parks. The graph shows the types of park and the facilities or qualities in each type. Each bar represents the total number of parks with that type of facility or quality.

Figure 4-11: Park Function and Quality in the Shire



Data source: CBEH 2013

Trails

The unique landscape and rural character of the Shire have given growth to both the equine and tourism industries, and there are significant opportunities for further development of both. An integrated bridle and walking trail network will further develop these industries and attract a greater amount of tourists and equestrians to the Shire. Opportunities for off-road cycling to complement the Munda Biddi Trail could also be explored. Further development of the trails network within the Shire should be progressed, and the network promoted as one of the many attractions of the Shire for both residents and visitors.

4.7 Community Facilities

Community infrastructure is the term used to describe facilities, which accommodate services that support, contribute and respond to the needs of people living, working and studying in an area, as well as the needs of those who are visiting. There is sometimes overlap with the provision of public open space and other community facilities, with some community facilities being located on or adjacent to public parks.

4.7.1 Community, Civic and Recreation

The Shire commissioned preparation of a *Community Infrastructure and Public Open Space Strategy* (CIPOSS)[49], which focussed its analysis on the existing provision and facility usage of all public open space and Shire owned community buildings in meeting the needs of the community. Community facilities are often also provided by the not-for-profit sector; religious groups, and/or other organisations (including State Government), but Shire owned infrastructure that can be hired or licensed to a variety of community groups was the focus of analysis in the CIPOSS. CIPOSS contained the following guiding principles that form the basis of future planning for community infrastructure:

- A co-ordinated network of facilities
- Central to catchment and equitable access
- Location to promote visibility and accessibility
- Integrated/co-located
- Resilient and multiple use
- Serving identified social needs
- Contribute to public domain and sense of place
- Connected to public transport, pedestrian and cycling networks
- Sufficient size and design to enable expansion and adaptation
- Financial viability and environmental sustainability
- Safety and security
- Master planned and staged strategy

Like public open space, community facilities function at different levels with different catchments hierarchies, which are described in Table 4-8.

Table 4-8: Community Infrastructure Hierarchy

Level	Catchment	Description
Regional	Services a catchment of the entire Shire, surrounding local governments and portions of the Perth and Peel catchment.	A facility and or service that provides extensive opportunities for participation and use.
District	Services a catchment of a mid-size township and surrounding smaller residential areas.	Provides facilities and open space to facilitate social and cultural activities and cohesion. District open space must be of adequate size to accommodate the function.
Neighbourhood	Services a catchment of a small township and or residential area.	Provides for local children's play and as resting places, designed as small intimate spaces, where appropriate, and to allow pedestrian connectivity, and create a sense of place.
Local	Services a catchment of the immediate residential population.	Provides for local children's play and as resting places, designed as small intimate spaces, where appropriate, and to allow pedestrian

Source: CCS Strategic 2017

[49] (CCS Strategic, 2017)

The Shire prepared a *Community Infrastructure Implementation Plan* (CIIP) in 2017 that contains the community infrastructure and public open space needs of the Shire for the complete built-out scenario of approximately 100,000 people by 2050. New developments and the growing populations in Byford and Mundijong-Whitby urban cells will create significant demand for new facilities. State policy and population projections anticipate approximately 50,000 people in each of Byford and Mundijong-Whitby in a built-out scenario. Serpentine and Jarrahdale by comparison have significantly less projected absolute growth. For equitable planning and provision, each urban cell (Mundijong and Byford) has identified locations for a library and community centre, an additional district community centre, two to three district sports spaces, sports pavilions at each district sporting space, an indoor recreation centre and a skate park. Table 4-9 identifies the community infrastructure project prioritisation, as identified in the CIIP.

Table 4-9: Community Infrastructure Project Priorities

Priority	Project	Facility Type	Indicative Timing	Estimated Cost ($)
1	Briggs Park Lower Oval Upgrade (Briggs Park Stage 1)	Sport	2018/19	3,827,802
2	Keirnan Park Recreation Precinct (Land Acquisition)	Sport	2018/19	*tbd
3	Byford Library & Multi agency Service Centre	Community	2019/20	10,500,000
4	BMX Facility (Relocation)	Recreation	2019/20	1,000,000
5	Byford Fire Station (Relocation)	Emergency	2020/21	2,000,000
6	Serpentine Courts (Reactivation)	Sport	2020/21	35,000
7	Dog Park Development	Recreation	2020/21	200,000
8	Visitors Centre and Heritage Museum	Tourism	2021/22	1,000,000
9	Briggs Park Pavilion	Sport	2021/22	2,500,000
10	Multi Use Indoor Sporting Facility including basketball courts	Sport	2022/23	6,000,000
11	Jarrahdale Oval Facility	Tourism	2022/23	650,000
12	Briggs Park Youth Centre	Community	2023/24	2,500,000
13	Keysbrook Rest Area and Toilets	Tourism	2023/24	500,000
14	Oakford Fire Station	Emergency	2024/25	2,000,000
15	Orton Road District Sport Space	Sport	2025/26	5,000,000
16	Mundijong Whitby Library & Community Centre	Community	2026/27	10,500,000
17	District Equine Facility	Sport	2026/27	500,000
18	Netball Courts	Sport	2027/28	1,375,000
19	Keirnan Park Recreation Precinct (Development)	Sport	2027/28	7,500,000
20	Mundijong Fire Station (Relocation)	Emergency	2028/29	4,000,000
21	Shire Depot (Relocation)	Shire	2029/30	3,200,000
22	Kalimna Sporting Reserve	Sport	2029/30	500,000
23	Whitby District Sporting Space	Sport	2030/31	5,000,000
24	Shire Administration Building Expansion	Shire	2032/33	15,000,000
25	District Community Centre (at Shire offices)	Community	2032/33	5,000,000
26	Mundijong Whitby District Skate Park	Recreation	2033/34	1,250,000
27	Byford Skate Park – Stage 2	Recreation	2033/34	250,000
28	Mundijong District Sporting Space	Sport	2034/35	5,000,000
29	Tennis Courts & Facility	Sport	2035/36	1,320,000
30	Aquatic Centre	Recreation	2050/51	20,000,000
Total Cost				**118,107,802**

**tbd – to be determined*

Source: CCS Strategic 2017

4.7.2 Education and Training

The WAPC's Development Control Policy 2.4 – School Sites (DC 2.4) and *Liveable Neigbourhoods* provide guidance on the provision of education facilities. These guidance documents identify the following rules of thumb for provision of education facilities:

- Primary Schools - one site for between 1,500 and 1,800 housing units for government schools.
- Secondary Schools - one site for every four or five primary schools for government schools.
- While the basis for providing non-government schools will be different from government schools, their provision at the average ratio of one non-government to three government primary schools and one to two for secondary schools may be an appropriate basis for planning.
- For technical colleges there is a general correlation between population and the need for college sites. The general requirement is one site for every 60,000 to 70,000 population.

In 2018, the Shire is home to seven public and three private primary schools, and one public and one private secondary school. In addition to existing schools within the Shire, new public schools are proposed within structure plan areas for Byford and Mundijong. Given the population projections for Byford and Mundijong, it is important that an adequate number of primary and secondary schools be planned for at the structure plan stage and land set aside for this purpose to ensure education requirements will be met in the future. The level of education achieved by any population is linked to its economic prosperity, and as identified in section 4.2.2, at present the population of the Shire has lower levels of tertiary qualification than either the south west metropolitan sub-region or the State. It will be important for the population to have access to tertiary education to ensure that current levels of economic and social disadvantage are not exacerbated.

The establishment of a campus for Murdoch University at Whitby Falls Farm will provide some tertiary education opportunities. The Murdoch University development at Whitby is intended to be a centre for teaching and research in veterinary and agricultural sciences, as well as other disciplines such as environmental science and conservation – all subjects that are aligned to key strengths and characteristics of the Shire area. Additionally, a site for a technical college is identified in structure planning for Mundijong-Whitby. It will also be important to ensure that public transport can efficiently transport students to tertiary education opportunities in other areas.

Byford

Byford currently accommodates four government primary schools and one government secondary school, Byford Secondary College. Two private primary schools also currently exist, Byford John Calvin School and Salvado College, which will eventually cater for secondary students. Structure Planning for Byford identifies the need for three new primary schools and another secondary school, in addition to the existing schools in this area. There may be a need for even more schools given the development investigation areas surrounding Byford.

Mundijong Whitby

The Mundijong-Whitby District Structure Plan[50] identifies that a total of two public high schools and eight public primary school sites will be necessary to serve the proposed population. There is already one existing primary school, included within the eight required, and one existing private primary and secondary school, Serpentine Jarrahdale Grammar School. The Department of Education has also purchased a 10 hectare site on Keirnan Street, Mundijong which will be the location of one of the two required public high schools.

4.7.3 Places of Worship

Places of public worship were traditionally provided within residential areas as required by the denomination concerned and served a local or neighbourhood population within walking distance. Today

[50] (Masterplan, 2010)

they often have a wider catchment and may always not be compatible within residential areas. Some groups meet in public halls and community centres, whilst others have permanent meeting places. Some of these contemporary places of public worship can attract very large congregations from a wide area.

There is no rule-of-thumb for provision of places of public worship but planning for new residential communities should consider the likely requirements for purpose built places of public worship. In considering applications for places of worship, the proposed location should be well served by the regional road network and public transport. It should also be ensured that large gatherings of people will not result in adverse impacts such as excessive traffic on local roads, or parking, noise and light overspill.

4.8 Heritage

The Shire has a rich history and contains many places of cultural heritage value to both Aboriginal and non-Aboriginal people. Recognising, respecting and celebrating heritage is a way of adding meaning to place, helping people to connect to and value the places they occupy, and to learn from the past. Aboriginal and non-Aboriginal heritage is managed by different legislation, although some 'post-contact' sites may have some cross-over. While heritage is primarily managed through State and Commonwealth legislation, opportunities exist to protect and promote both Aboriginal and European cultural heritage through joint management arrangements with traditional owners and optimise opportunities for Indigenous training, employment and businesses. This should include effective engagement with the Gnaala Karla Boodja Aboriginal people of the Noongar nation.

4.8.1 Aboriginal Heritage

The original inhabitants of the Serpentine Jarrahdale area are the Gnaala Karla Boodja Aboriginal people of the Noongar group of south-west Western Australia. The Gnaala Karla Booja region encompasses the towns of Capel, Donnybrook, Balingup, Wickepin, Narrogin, Williams, Mundijong, Kwinana, Brookton, Pingelly, Wagin, Harvey, Collie, Pinjarra, Mandurah and Boddington.[51] The area around Mundijong is also within Aboriginal country known as Beeliar. Ethnohistorical evidence shows that rivers, creeks and wetlands in this region were most intensively occupied, given the availability of fresh water and food resources. In particular, the alluvial plains and associated warran or native yam grounds and riparian resources such as Typha were of crucial economic importance to Aboriginal people (McDonald & Thomson, 2012)[52].

The Department of Planning, Lands and Heritage maintains a register of known Aboriginal sites, which records the places and objects of significance that the *Aboriginal Heritage Act 1972* (WA) applies to. The presence of an Aboriginal site places restrictions on what can be done to the land. Anyone who wants to use land for research, development or any other cause, should investigate whether an Aboriginal site is present. There are currently 30 registered Aboriginal Heritage sites and over 50 other heritage places in the Shire of Serpentine-Jarrahdale. The Serpentine River is the largest registered site with particular cultural significance. The Barragup mungah fish weir on the Serpentine River is recognised by local Noongar people as one of the most important traditional meeting places for Noongar from the Swan, Peel and Darling Ranges areas.[53]

On 8 June 2015, Indigenous Land Use Agreements (ILUAs) were executed across the South West by the Western Australian Government and six Aboriginal groups, including the Gnaala Karla Boodja. The ILUAs bind State Government departments to enter into a Noongar Standard Heritage Agreement (NSHA) when conducting Aboriginal Heritage Surveys in the ILUA areas, unless they have an existing heritage agreement. The *Aboriginal Heritage Due Diligence Guidelines*[54], which are referenced by the NSHA, provide guidance on how to assess the potential risk to Aboriginal heritage.

As part of the South West Native Title Settlement, a maximum of 300,000 hectares of reserve land and a maximum of 20,000 hectares of freehold land will be allocated to the Noongar Boodja Trust as part of the Noongar Land Estate. The land being allocated primarily includes land that is currently Unallocated Crown Land, Unmanaged Reserves and Aboriginal Lands Trust properties in the South West. Government agencies may also identify currently held freehold land and reserves for which they hold management orders as surplus to their needs and eligible for transfer.

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[51] http://www.noongarculture.org.au/gnaala-karla-booja/ accessed 20/05/16
[52] Cited in (Essential Environmental, 2016)
[53] http://www.noongarculture.org.au/gnaala-karla-booja/ accessed 20/05/16
[54] (Department of Aboriginal Affairs and Department of Premier and Cabinet, 2013)

The Department of Planning, Lands and Heritage will engage with local governments as required under section 14 of the *Land Administration Act 1997* after the South West Land and Sea Council (SWALSC) or the Trustee has selected land, at the Assessment stage of the land transfer process.[55] Local governments cannot veto a proposal but will be invited to advise the Department of Planning, Lands and Heritage with regard to:

- Whether there are existing local interests in the same land that cannot be met elsewhere;
- Whether there are future proposals for the same land or land within the same general location;
- Whether there are planning schemes that could affect future use of the land;
- Whether there are other relevant land management issues; and
- Any other advice they may wish to provide about the allocation of the land to the Noongar Boodja Trust.

4.8.2 Non-Aboriginal Heritage

European settlement in the Shire dates from the 1830s, with land cleared and used primarily for farming and obtaining timber. A large number of historic heritage sites are located within the Shire, and registered with both the Heritage Council of WA and the Shire of Serpentine Jarrahdale Municipal Inventory. A number of key sites, including the Mill Brook Historical Cottage, Lowlands Homestead (Serpentine Farm), Brickwood Bushland, and Serpentine National Park, are also part of the Register of National Estate and recognised by the National Trust. In 1997 the entire Jarrahdale townsite, including the mill office, timber stores and worker's cottages, was entered on the National Trust's List of Classified Heritage places, the seventh Western Australian town to be so classified.

Table 4-10 shows the State Heritage Office listings for the Shire of Serpentine-Jarrahdale.[56] It identifies which heritage list each place is registered on, with references in the table to 'Municipal Inventory' relating to places identified within a local heritage survey, as required by the *Heritage Act 2018.* Local heritage surveys may include places rather than just buildings. The purposes of local heritage surveys are:

- Identifying places of cultural heritage significance to the local district;
- Assisting the local government in making and implementing decisions that respect cultural heritage values;
- Providing a cultural and historical record of the district;
- Providing an accessible public record of places of cultural heritage significance to the district; and
- Assisting a local government in preparing a heritage list or list of heritage areas under a local planning scheme.

Local governments will still be required to refer planning applications and other proposals that 'may affect' a place on the State Register to the Heritage Council, and the Heritage Council must provide its advice. The tenure of heritage properties varies, with many significant buildings in private ownership. Deemed provisions from the *Planning and Development (Local Planning Scheme) Regulations 2015* set out the requirements for considering proposals that affect places on the Shire's Heritage List. This list should be reviewed and updated as necessary, including an audit of the current condition and management of places on the list.

[55] (Department of Premier and Cabinet, 2015)

[56] http://inherit.stateheritage.wa.gov.au/Public/Search/Results?newSearch=True&placeNameContains=&streetNameContains=&suburbOrTownContains=&lgaContains=serpentine-jarrahdale&isCurrentlyStateRegistered=false accessed 29/05/16

Table 4-10: Heritage Listings in Shire of Serpentine Jarrahdale

Heritage Place Name	Location	Listings	Custodian
Lowlands Homestead (Serpentine Farm)	509 Lowlands Rd Mardella	Municipal Inventory	Shire of Serpentine-Jarrahdale
		Register of the National Estate, Heritage List, Classified by the National Trust	Heritage Council
Bodhinyana Buddhist Monastery	216 Kingsbury Dr Serpentine		Heritage Council
		Municipal Inventory	Shire of Serpentine-Jarrahdale
Mundijong Honour Roll, Mundijong Community Hall	Paterson St Mundijong	Statewide War Memorial Survey	Heritage Council
Railway Cottage (fmr)	68 Roman Rd Mundijong		Heritage Council
		Municipal Inventory	Shire of Serpentine-Jarrahdale
Jarrahdale Inn (fmr) (Whitby Falls Coach House)	Cnr South Western Hwy & Kiernan St Mundijong	Heritage List, Classified by the National Trust	Heritage Council
		Municipal Inventory	Shire of Serpentine-Jarrahdale
Serpentine National Park	South Western Hwy Serpentine	Register of the National Estate	Heritage Council
Mundijong Post Office (fmr) (Dot's Teagarden)	26 Paterson St Mundijong	Municipal Inventory	Shire of Serpentine-Jarrahdale
			Heritage Council
Naval Armament Depot	Nettleton Rd Byford		Heritage Council
Jarrahdale Cemetery	Atkins Rd Jarrahdale	Classified by the National Trust	Heritage Council
		Municipal Inventory	Shire of Serpentine-Jarrahdale
Old Serpentine Settlement (Serpentine Conservation Area, Serpentine Townsite Precinct)	Gordon Rd, Falls Rd, Karnup Rd & South Western Hwy Serpentine	Municipal Inventory	Shire of Serpentine-Jarrahdale
			Heritage Council
Jarrah Road Swamp, Serpentine West	Jarrah Rd Serpentine	Municipal Inventory	Shire of Serpentine-Jarrahdale
		Heritage List	Heritage Council
Manjedal Brook Road Bridge (Bridge 121)	Old South West Hwy Whitby Falls		Heritage Council
Kargotich Dairy (Fremnells Dairy)	681 Hopkinson Rd Byford		Heritage Council
		Municipal Inventory	Shire of Serpentine-Jarrahdale
Olive & Carob Trees, Wungong Farm	South Western Hwy Byford	Classified by the National Trust	Heritage Council
Perretts Bushland	Jarrahdale		Heritage Council
Cardup Bushland	3 km south of Byford	Classified by the National Trust, Register of the National Estate	Heritage Council
Manjedal School (fmr) (Mundijong School)	12 Paterson St Mundijong	Municipal Inventory	Shire of Serpentine-Jarrahdale
			Heritage Council
Jarrahdale General Store	81 Jarrahdale Rd Jarrahdale	Municipal Inventory	Shire of Serpentine-Jarrahdale

Heritage Place Name	Location	Listings	Custodian
		Classified by the National Trust	Heritage Council
Jarrahdale Railway Cutting	Alcoa Rd Jarrahdale	Classified by the National Trust, Register of the National Estate	Heritage Council
Serpentine Honour Roll, Clem Kentish Community Hall	Wellard Rd Serpentine		Heritage Council
Jarrah Road Reserve	Jarrah Rd West off Punrak Rd Serpentine		Heritage Council
		Municipal Inventory	Shire of Serpentine-Jarrahdale
Karnet Prison Farm	Keysbrook		Heritage Council
Two Residences	1409 Karnup Rd Serpentine		Heritage Council
		Municipal Inventory	Shire of Serpentine-Jarrahdale
Whollogan's Bakers	50 Paterson St Mundijong		Heritage Council
		Municipal Inventory	Shire of Serpentine-Jarrahdale
Old Serpentine Cemetery	Cnr South Western Hwy & Gordon Rd Serpentine	Classified by the National Trust	Heritage Council
		Municipal Inventory	Shire of Serpentine-Jarrahdale
Old Serpentine Inn	Cnr Richardson and Wellard Sts Serpentine	Heritage List	Heritage Council
		Municipal Inventory	Shire of Serpentine-Jarrahdale
Yangeddi Swamp (Yangedi Swamp)	Jarrahdale	Heritage List	Heritage Council
		Municipal Inventory	Shire of Serpentine-Jarrahdale
Italian Prisoner of War Camp (Site of POW Camp)	Balmoral Rd Jarrahdale	Heritage List	Heritage Council
		Municipal Inventory	Shire of Serpentine-Jarrahdale
Jarrahdale Honour Rolls, Bruno Gianetti Memorial Hall	Munro St Jarrahdale	Statewide War Memorial Survey	Heritage Council
Longbottom's Cottage (Ruins) (Serpentine Falls Farm)	Gordon Rd Serpentine	Heritage List	Heritage Council
		Municipal Inventory	Shire of Serpentine-Jarrahdale
CALM House	Jarrahdale Rd Jarrahdale		Heritage Council
Jarrahdale Townsite & Heritage Park (Jarrahdale Townsite)	Millars, Jarrahdale & Staff Rds Jarrahdale	Heritage List	Heritage Council
		Municipal Inventory	Shire of Serpentine-Jarrahdale
Old Post Office Museum Washhouse and Out-house (Old Post Office and Telegraph Office)	Jarrahdale Rd Jarrahdale	Municipal Inventory	Shire of Serpentine-Jarrahdale
		Classified by the National Trust	Heritage Council
Millrace Farmhouse	Nettleton Rd, beside Beenyup Brook Byford	Municipal Inventory	Shire of Serpentine-Jarrahdale
		Heritage List	Heritage Council
Mundijong Railway Station (Jarrahdale Junction, Mundijong Junction)	Paterson St Mundijong	Heritage List	Heritage Council
		Municipal Inventory	Shire of Serpentine-Jarrahdale
St Maria Goretti Catholic Church	Cnr Atkins & Cousens Sts Jarrahdale	Catholic Church Inventory, Heritage List	Heritage Council

Heritage Place Name	Location	Listings	Custodian
		Municipal Inventory	Shire of Serpentine-Jarrahdale
St Aidan's Anglican Church & Church Hall	19 Clifton St Byford	Municipal Inventory	Shire of Serpentine-Jarrahdale
		Anglican Church Inventory	Heritage Council
Mundijong Hotel (Mundijong Tavern, George Worner's Mundijong Hotel)	32 Paterson St Mundijong	Municipal Inventory	Shire of Serpentine-Jarrahdale
		Statewide Hotel Survey, Heritage List	Heritage Council
Brooklyn Farm	Lowlands Rd Mardella	Municipal Inventory	Shire of Serpentine-Jarrahdale
			Heritage Council
Jarrahdale School	Wanliss St Jarrahdale	Municipal Inventory	Shire of Serpentine-Jarrahdale
		Classified by the National Trust	Heritage Council
Residence	Mundijong Rd nr Adonis Rd Mundijong		Heritage Council
		Municipal Inventory	Shire of Serpentine-Jarrahdale
Percy's Place (Naval Depot, RAN Depot 40)	Lot 316 South West Hwy Byford		Heritage Council
Butcher Shop (Post Office)	19 Richardson St Serpentine		Heritage Council
		Municipal Inventory	Shire of Serpentine-Jarrahdale
Anglican Rectory	86 Paterson St Mundijong	Anglican Church Inventory	Heritage Council
Railway House (fmr)	Turner Rd Byford		Heritage Council
Whitby Falls Hostel (Whitby Falls Estate, Whitby/Whitby Falls Home, /Hospital for the Insane/Lunatic Asylum)	South Western Hwy Whitby	Heritage List	Heritage Council
Two CALM Houses	Lot 29,30 Brady St Jarrahdale	Municipal Inventory	Shire of Serpentine-Jarrahdale
			Heritage Council
Jarrahdale Tavern (Murray Arms Hotel)	Jarrahdale Rd Jarrahdale	Municipal Inventory	Shire of Serpentine-Jarrahdale
		Heritage List, Statewide Hotel Survey, Classified by the National Trust	Heritage Council
Eight CALM Houses	Forrest Av Jarrahdale		Heritage Council
Serpentine Falls Hotel (The Old Serpentine Tavern)	Cnr Richardson & Wellard Sts Serpentine		Heritage Council
		Municipal Inventory	Shire of Serpentine-Jarrahdale
Bateman Homestead	Cnr Kargotich & Thomas Rds Byford	Heritage List	Heritage Council
		Municipal Inventory	Shire of Serpentine-Jarrahdale
St Stephen's Anglican Church	Serpentine Falls Rd cnr South Western Hwy Serpentine	Anglican Church Inventory, Classified by the National Trust, Heritage List	Heritage Council
		Municipal Inventory	Shire of Serpentine-Jarrahdale

Heritage Place Name	Location	Listings	Custodian
St Kevin's Church	Richardson St Serpentine	Catholic Church Inventory	Heritage Council
Monadnocks Conservation Park	Albany Hwy Gleneagle Via Jarrahdale	Register of the National Estate	Heritage Council
Serpentine Dam	Serpentine		Heritage Council
Hopeland School (Hopeland Community Hall)	Hopeland Rd Keysbrook		Heritage Council
		Municipal Inventory	Shire of Serpentine-Jarrahdale
Reserve	Cnr South Western Hwy & Gordon Rd Serpentine	Classified by the National Trust	Heritage Council
CALM Houses	Brady St, Forrest Av, Jarrahdale Rd Jarrahdale	Classified by the National Trust	Heritage Council
		Municipal Inventory	Shire of Serpentine-Jarrahdale
Mundijong Uniting Church (Mundijong & District Community Church)	18 Paterson St Mundijong	Municipal Inventory	Shire of Serpentine-Jarrahdale
		Uniting Church Inventory	Heritage Council
Brickwood Bushland	South Western Hwy Byford	Register of the National Estate, Classified by the National Trust	Heritage Council
Karnet Prison Farm Staff Housing	13-18 Kingsbury Dr Serpentine		Heritage Council
Masonic Hall (Jarrahdale Lodge)	32 Butcher St Mundijong		Heritage Council
		Municipal Inventory	Shire of Serpentine-Jarrahdale
Touchwood Cottage	354 Soldier's Rd Cardup		Heritage Council
Buckland's Cottage (Mill Brook Historical Cottage)	16 Rhodes Pl Jarrahdale	Heritage List, Classified by the National Trust	Heritage Council
		Municipal Inventory	Shire of Serpentine-Jarrahdale
Mill Manager's Residence	1 Foster Way Jarrahdale		Heritage Council
		Municipal Inventory	Shire of Serpentine-Jarrahdale
Manjedal Brook	between Nettleton & Kargotich Rds Byford	Municipal Inventory	Shire of Serpentine-Jarrahdale
		Heritage List	Heritage Council
Old Mundijong Hotel (Serpentine Hotel)	Cnr Paterson St & Mundijong Rd Mundijong	Municipal Inventory	Shire of Serpentine-Jarrahdale
		Heritage List	Heritage Council
Jarrahdale to Rockingham Railway (Jarrahdale to Rockingham, 1872 Heritage Railway)	POW Camp Balmoral Rd to South Western Hwy Jarrahdale		Heritage Council
Byford War Memorial	South Western Hwy Byford	Statewide War Memorial Survey	Heritage Council
Cheese Factory (Serpentine Falls Cheese & Butter Factory Ltd (fmr), Serpentine Falls Cheese Factory (fmr))	Hall Rd Serpentine	Municipal Inventory	Shire of Serpentine-Jarrahdale
		Heritage List	Heritage Council
Byford Uniting Presbyterian Church	9/39 Clifton St Byford	Municipal Inventory	Shire of Serpentine-Jarrahdale

Heritage Place Name	Location	Listings	Custodian
(Armadale North Murray Parish)		Uniting Church Inventory	Heritage Council
St Paul's Anglican Church	Atkins St Jarrahdale	Municipal Inventory	Shire of Serpentine-Jarrahdale
		Classified by the National Trust, Anglican Church Inventory	Heritage Council
Teacher's Quarters (fmr)	8 Gordon Rd Serpentine		Heritage Council
		Municipal Inventory	Shire of Serpentine-Jarrahdale
Redgum Patch	Cnr Alice & Redcliffe Rds Cardup	Heritage List	Heritage Council
		Municipal Inventory	Shire of Serpentine-Jarrahdale
Jarrahdale War memorial	Jarrahdale Rd Jarrahdale	Statewide War Memorial Survey	Heritage Council
Wungong Farm Cottage (Hall Homestead/Brun's Holding)	Bruns Dr Darling Downs	Municipal Inventory	Shire of Serpentine-Jarrahdale
		Heritage List	Heritage Council
Mundijong Townsite	Paterson, Richardson & Cockram Sts Mundijong		Heritage Council
Nairn's House (Lazenby's Old Farmhouse)	Kiln Rd Byford	Municipal Inventory	Shire of Serpentine-Jarrahdale
		Heritage List	Heritage Council
Keysbrook Farmhouse	South Western Hwy Keysbrook	Heritage List, Register of the National Estate	Heritage Council
		Municipal Inventory	Shire of Serpentine-Jarrahdale
Burnbrae Orphanage (Quo Vadis, Braemar Farm)	Jnc of Nettleton & Admiral Rds Byford	Heritage List	Heritage Council
		Municipal Inventory	Shire of Serpentine-Jarrahdale
Six Mill Houses	Jarrahdale Rd Jarrahdale	Classified by the National Trust	Heritage Council
		Municipal Inventory	Shire of Serpentine-Jarrahdale
Old Bolinda Vale Farmhouse	South Western Hwy Keysbrook	Heritage List	Heritage Council
		Municipal Inventory	Shire of Serpentine-Jarrahdale
Baldwins Cottage (Staging Post and Inn)	2464 South Western Hwy Serpentine	Municipal Inventory	Shire of Serpentine-Jarrahdale
		Heritage List, Classified by the National Trust	Heritage Council
Bishop Hale's Cottage (Lefroy's Cottage, Longbottoms Cottage)	27 Gordon Rd Serpentine	Classified by the National Trust, Heritage List	Heritage Council
		Municipal Inventory	Shire of Serpentine-Jarrahdale
Byford Honour Roll, Byford Hall	South Western Hwy Byford	Statewide War Memorial Survey	Heritage Council
Lowlands & Riverlea Bushland - part	6 km NW of Serpentine	Register of the National Estate	Heritage Council
Ivan Elliot's Shearing Shed	Hopelands Rd Keysbrook	Heritage List	Heritage Council
		Municipal Inventory	Shire of Serpentine-Jarrahdale

Heritage Place Name	Location	Listings	Custodian
Jarrahdale Heritage Park	Jarrahdale		Shire of Serpentine-Jarrahdale
			Heritage Council
Brick Kilns (Metro Brick)	51 Kiln Rd Byford	Municipal Inventory	Shire of Serpentine-Jarrahdale
			Heritage Council
Summerfield Cottage	Gordon Rd Serpentine	Municipal Inventory	Shire of Serpentine-Jarrahdale
			Heritage Council
Serpentine General Store (Middleton's Store, Middleton's Tearooms)	6 Wellard St Serpentine	Municipal Inventory	Shire of Serpentine-Jarrahdale
			Heritage Council
Spencer's Cottage (Carralong Cottage)	Lot 79 Falls Rd Serpentine	Municipal Inventory	Shire of Serpentine-Jarrahdale
		Classified by the National Trust, Register of the National Estate, Heritage List, Register of the National Estate	Heritage Council
Turner Cottage (Bridge Farm)	Cnr Karnup Rd & South Western Hwy Serpentine	Register of the National Estate, Register of the National Estate, Heritage List, Classified by the National Trust	Heritage Council
		Municipal Inventory	Shire of Serpentine-Jarrahdale
Workers' Cottages and Quarters	Millars & Staff Rds Jarrahdale	Municipal Inventory	Shire of Serpentine-Jarrahdale
		Classified by the National Trust	Heritage Council
McKay's House (Eton Farm)	Summerfield Rd Serpentine	Municipal Inventory	Shire of Serpentine-Jarrahdale
			Heritage Council
Brickworks Railway Bridge (fmr), Byford	Millbrace Glen Byford		Heritage Council
		Municipal Inventory	Shire of Serpentine-Jarrahdale
Gooralong Park & Flour Mill Site (Batts or Gooralong Mill)	Chestnut Rd Jarrahdale	Municipal Inventory	Shire of Serpentine-Jarrahdale
		Heritage List	Heritage Council
The Nook (Szczecinski's Cottage)	Lot 1 Roman Rd Mundijong	Municipal Inventory	Shire of Serpentine-Jarrahdale
		Heritage List	Heritage Council
Port Jackson Fig	Gordon St Serpentine	Classified by the National Trust	Heritage Council
Mead's House (Lake View)	Kiln Rd Cardup	Heritage List	Heritage Council
		Municipal Inventory	Shire of Serpentine-Jarrahdale
Road Board Building (fmr) (Library)	10 Paterson St Mundijong	Municipal Inventory	Shire of Serpentine-Jarrahdale
			Heritage Council
The Chestnuts	Chestnut Rd Jarrahdale	Municipal Inventory	Shire of Serpentine-Jarrahdale
		Heritage List	Heritage Council

Heritage Place Name	Location	Listings	Custodian
Mill Site and Timber Store	Millars Rd Jarrahdale	Municipal Inventory	Shire of Serpentine-Jarrahdale
		Classified by the National Trust	Heritage Council
Serpentine (Bridge) School (fmr) (Serpentine School, Old Bridge School)	8 Gordon Rd Serpentine	Classified by the National Trust, Heritage List	Heritage Council
		Municipal Inventory	Shire of Serpentine-Jarrahdale

Source: State Heritage Office inHerit database 2016

Adaptive reuse of heritage buildings is an important aspect of heritage conservation as defined by the *Australia ICOMOS Charter for Places of Cultural Significance, The Burra Charter, 2013* (Burra Charter)[57]. The Burra Charter and the associated series of Practice Notes provide a best practice standard for managing cultural heritage places in Australia. Not permitting adaptive reuse of significant buildings and other places is counter to the objective of retaining these places in perpetuity for the benefit of future generations. If owners of heritage cannot continue to use places for contemporary purposes, there is a risk that those places will become neglected and could be lost. The challenge therefore is to encourage adaptive reuse whilst retaining the significant elements of the place, and this is not possible without an assessment of those values. The Shire's local heritage survey is overdue for review; it should be updated and made available on-line in an accessible format that will help inform and educate the community. Heritage places, including places of natural heritage value, are important contributors not only to the Shire's visual character but also to its cultural identity and the local economy through a multitude of tourism opportunities.

[57] (Australia ICOMOS, 2013)

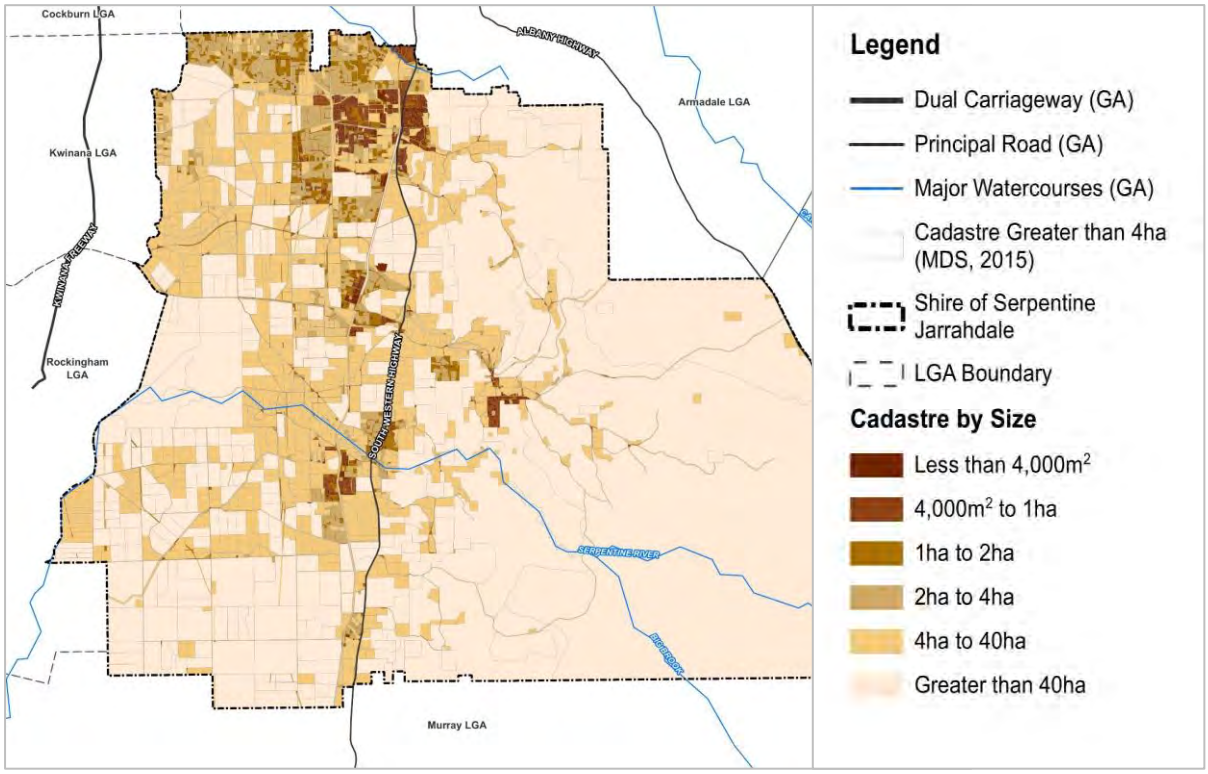
4.9 Rural Areas

Planning decisions for the future of the Shire's rural areas will be particularly influential on both the character of the Shire and the economic opportunities available locally. An acceptable balance must be struck between the use of rural land for rural-economic activities, such as grazing, cropping, horticulture and other primary production (agriculture), and non-productive use of rural land for residential purposes or landscape and environmental values. *SPP 2.5 Rural Planning* will be influential in guiding planning for the future of the Shire's rural areas. Land capability, water supply and environmental protection will be important considerations. Urban, rural residential and rural smallholdings developments are high nutrient exporters compared to non-irrigated beef production. The implication on the nutrient balance of changing from agricultural uses to such uses needs to be considered when planning for these developments.[58]

4.9.1 Lot sizes

There are a range of lot sizes within the rural areas of the Shire, as demonstrated within in Figure 4-12. A study by DAFWA prepared in 2012, *Agricultural Futures – Potential Rural Land Uses on the Palusplain*[59], noted that lot size analysis for 1992 and 2008 showed a large increase in the total area of lots of less than five hectares and a reduction in total area of lots greater than 60 hectares. The change can be attributed to the demand for smaller lot sizes for the purpose of rural living. With regard to rural lots for agricultural purposes, since June 2009, TPS 2 has required a minimum lot size of 40 hectares in the Rural zone. Due to the nature of some rural activities which can generate noise, dust, spray drift and/or odour, larger lot sizes that can contain necessary buffers within lot boundaries are desirable. Conversely, there are some rural activities that can take place efficiently on much smaller land parcels, and the primary concern with these lots is that they do not generate unacceptable external or environmental impacts. SPP 2.5 does not prohibit subdivision of rural land, but aims to ensure that where subdivision is proposed, it is justified in terms of supporting legitimate rural activities without prejudice to the environment.

Figure 4-12: Lot Sizes within the Shire of Serpentine Jarrahdale



[58] (Safstrom, 2012)
[59] (Safstrom, 2012)

4.9.2 Rural Economics

A study undertaken for the *Rural Strategy* by Economics Consulting Services[60] looked at rural land demand and the economics of alternative rural land uses. The study found that purchasers of vacant rural residential lots are willing to pay more per unit area as the lot size falls and that this is clearly the driving message behind property owners' and developers' aspirations to subdivide down to the smallest area allowed by planning controls. The willingness of buyers to pay more per square metre for smaller areas means there will be constant developer and landowner pressure to subdivide areas to smaller sizes. However, servicing and managing small rural lots is an ongoing issue and can lead to degraded land and poor social outcomes if such lots are not well located.

The population pressures and buying preferences mean that there will be strong demand for smaller lot sizes. There are clear precedents for this stretching back to the earliest periods of settlement in the Perth and Peel regions. Huge areas of formerly productive land have been covered with urban development. If land is to be protected for viable agricultural purposes, it must be made clear that urban development will not be contemplated outside of designated areas. Furthermore, remaining rural land must be managed to ensure that lot sizes remain suitable for rural uses. On this matter, SPP 2.5 will be particularly influential.

4.9.3 Types of Rural Zones

Within TPS 2 there is a range of rural zones and associated lot sizes. The *Planning and Development (Local Planning Schemes) Regulations 2015* model provisions streamline the number of rural zones. A role of the Local Planning Strategy is to recommend the transition of existing zones to an appropriate new zone in LPS3. Determining appropriate zones for rural land in LPS3 needs to consider *SPP 2.5*, the *Rural Strategy* and *Perth and Peel @ 3.5 Million* as well as preserving character areas, providing land use choice, environmental protection, land capability and the context of adjoining non-rural land uses. A comparison of TPS 2 zones with the zones specified under the model provisions is shown in Table 4-11.

Table 4-11: Comparison of TPS 2 Zones and the Model Provisions

TPS 2 Zones	Objectives	Closest equivalent zone in Regulations	Objectives (Regulations)
Special Residential	• To provide for a style of spacious living at densities lower than that characteristic of traditional single residential development but higher than that found in special rural zones.	Special Residential	• To provide for lot sizes in the range of 2,000 m² and 1ha. • To ensure development is sited and designed to achieve an integrated and harmonious character. • To set aside areas where the retention of vegetation and landform or other features which distinguish the land, warrant a larger residential lot size than that expected in a standard residential zone.
Rural Living A	• To cater for rural residential development on a range of lots between 4,000 m² to 1 ha in accordance with the objectives and guidelines of the Rural Strategy.	Special Residential	• To provide for lot sizes in the range of 2,000 m² and 1ha. • To ensure development is sited and designed to achieve an integrated and harmonious character. • To set aside areas where the retention of vegetation and landform or other features which distinguish the land, warrant a larger residential lot size than that expected in a standard residential zone.
Rural Living B	• To cater for rural-residential development and ancillary rural	Rural Residential	• To provide for lot sizes in the range of 1 ha to 4 ha.

[60] (Economics Consulting Services, 2012)

TPS 2 Zones	Objectives	Closest equivalent zone in Regulations	Objectives (Regulations)
	related uses on a range of lots between two hectare to four hectares in accordance with the objectives and guidelines of the Rural Strategy.		• To provide opportunities for a range of limited rural and related ancillary pursuits on rural residential lots where those activities will be consistent with the amenity of the locality and the conservation and landscape attributes of the land. • To set aside areas for the retention of vegetation and landform or other features which distinguish the land.
Special Rural	• To depict places within the rural area wherein closer subdivision will be permitted to provide for such uses as hobby farm, horse training and breeding, rural residential retreats and intensive horticulture, and also to make provision for retention of the rural landscape and amenity in a manner consistent with the orderly and proper planning of the selected areas.	Rural Residential	As above
Farmlet	• To cater for a range of lots between four and forty hectares to allow for a variety of lot sizes in accordance with the objectives and guidelines of the Rural Strategy.	Rural Smallholdings	• To provide for lot sizes in the range of 4ha to 40ha. • To provide for a limited range of rural land uses where those activities will be consistent with the amenity of the locality and the conservation and landscape attributes of the land. • To set aside areas for the retention of vegetation and landform or other features which distinguish the land.
Rural	• To allocate land to accommodate the full range of rural pursuits and associated activities conducted in the Scheme Area.	Rural	• To provide for the maintenance or enhancement of specific local rural character. • To protect broad acre agricultural activities such as cropping and grazing and intensive uses such as horticulture as primary uses, with other rural pursuits and rural industries as secondary uses in circumstances where they demonstrate compatibility with the primary use. • To maintain and enhance the environmental qualities of the landscape, vegetation, soils and water bodies, to protect sensitive areas especially the natural valley and watercourse systems from damage. • To provide for the operation and development of existing, future and potential rural land uses by limiting the introduction of sensitive land uses in the Rural zone. • To provide for a range of non-rural land uses where they have demonstrated benefit and are compatible with surrounding rural uses.

TPS 2 Zones	Objectives	Closest equivalent zone in Regulations	Objectives (Regulations)

Agriculture Protection	• To ensure that productive agricultural enterprises remain the primary land use and to maintain the integrity of agricultural infrastructure;
	• To support and protect agricultural and horticultural industries through:
	  • reduced pressure for fragmentation of land to other land uses;
	  • resource security for agricultural enterprise;
	  • maintenance of relative land values and rates levied.
		Rural	As above

Conservation	• To provide an increased level of protection and management for sites identified as significant for conservation.	Environmental Conservation	• To identify land set aside for environmental conservation purposes. • To provide for the preservation, maintenance, restoration or sustainable use of the natural environment.

4.9.4 Agricultural Industries

Increased land prices, both real and anticipated, represent a challenge for commercial agriculture. Therefore it will be important for a strong signal be sent through the planning process that the land is intended to remain rural in the long term for agricultural purposes. Ensuring that rural land is conserved for rural purposes is a core objective of *SPP 2.5* and this is an important planning outcome for the Shire. The *Agricultural Futures* document recognises the importance of the palusplain. The report indicates that the total gross value of land-based agriculture in the Shire was over $84 million (2005-2006). The study drew the following conclusions on a variety of agricultural pursuits within the study area, which focussed on the Shires of Serpentine Jarrahdale and Murray. It should be noted that the study observed that economic data for some land uses was not available at the time it was undertaken.

Beef

Beef grazing on the Palusplain has a competitive advantage being close to markets but local saleyards have closed, reducing this advantage. The relatively high cost of land, small lot sizes and sub-commercial approaches by the majority of landowners suggests that beef farming will not be an economic driver. The advantage of beef grazing over other land uses is that is has a relatively low nutrient export per hectare at the inlet, which could be further ameliorated by soil amendments and improvements in management practices. Retaining lots greater than 100ha with a predominance of soils with fair to good land capability will help maintain flexibility for grazing systems in the long-term. There are few lots of this size in the Shire, however where these circumstances exist, their retention would be encouraged. Expanding beef processing facilities that manage their effluent cycles in closed systems or export their wastes are encouraged because they provide good employment and increase demand for local animal produce. Potential locations of such closed-loop agricultural systems will be influenced by availability of land of a suitable lot size, proximity to sensitive land uses such as urban and rural residential areas, and infrastructure availability. The West Mundijong industrial area could be considered for meat processing, noting however that separation from other meat processing premises would be required.

Sheep

Sheep are similar to the cattle for beef industry in terms of their nutrient inputs and outputs to the system, and also have similar environmental issues. There is potential for increases in lamb production if lamb

prices remain high but this potential is constrained by high land and entry prices. Generally, smaller lots are more costly per hectare and producers may need a number of lots for commercial-scale production. There could be potential for specialised meat breeds. With regard to beef and sheep feedlots, the very high point source pollution from intensive agricultural systems such as feedlots, means that only closed-loop, intensive animal industries are recommended on the Palusplain.

Dairy

Dairy supplying local manufacturers is a secure industry but is a high source of nutrient export. Its capacity to expand is probably dependent on the ability of the local manufacturers to expand their markets. Spatially, the best locations are areas with lot sizes greater than 200ha and with irrigation water available which depends on local circumstances and licence application. This industry could have the economic capacity to invest in soil amendments and best practice pasture, irrigation and nutrient management.

Horticulture including turf and nurseries

Soils-based intensive horticulture has potential to expand on highly capable soils away from streams or wetlands, if alternative water supplies, such as recycled waste water, become available. Use of recycled water for horticulture has potential to support increased production. Best practice soil and water management could be linked to water licensing. Intensive, closed-loop agricultural systems, greenhouse and hydroponic production have potential to expand but are constrained by hot summers and the uncertain quality and quantity of water supplies. Retaining large lot sizes, preferably greater than 100ha to enable good buffers, is preferred to attract horticultural industries.

Poultry

Closed-loop, intensive animal production systems are encouraged on the Palusplain because they make use of good infrastructure and proximity to markets and export minimal nutrients. Retaining large lot sizes, greater than 100 hectares in preferred areas, will enable expansion of the industry, with adequate buffers to sensitive land uses. The Poultry Farm Policy Overlay under TPS 2 and the *Rural Strategy* have been implemented for this purpose. This concept is recommended to be continued in the south-west of the Shire. Poultry farms for meat and egg production are an important economic enterprise in this part of the Perth and Peel region.

Niche agricultural industries

Two examples of existing niche industries are goats and bees. Proximity to markets, potential for on-farm and roadside sales, and boosting of tourism suggest that niche agricultural industries have capacity to expand. Such industries will require suitable landholdings and water near suitable infrastructure. A mix of lot sizes, including areas greater than 40ha, would be preferred. As with all land uses on the Palusplain, niche agricultural uses will need to manage nutrients to minimise export to waterways and wetlands.

Agri-food processing

There is significant potential for the co-location of synergistic industries close to population centres and infrastructure. Examples include closed-loop agriculture production systems close to composting and possible algae production facilities. Such systems are now being designed into new cities and developments in China and elsewhere. Developments could be designed with complementary wetlands that would also serve as buffers. It will be important that such developments are well-managed, closed-loop systems to reduce risk of nutrient export. The Shire has examined the potential for an agri-industrial precinct within the West Mundijong Industrial Area to cater for the co-location of food-related industries such as abattoirs, food (including beverage) processing, cold storage and food transport, and supporting services. Some of these uses require very high levels of capital investment and need separation from sensitive land uses as well as access to industrial standard infrastructure and ready access to freight routes. Attracting this sort of investment to the Shire requires the certainty that adequate buffers can be maintained to prevent

encroachment of sensitive land uses, such as urban and rural residential development, and also incompatible industrial activities such as those that have the potential to generate emissions such as dust or fumes that could contaminate products.

Rural Enterprise

Some agri-food production activities are already established within the Shire within rural areas, particularly in the northern areas around Oakford (eg: composting, aquaculture, dairy processing). As not all activities require large sites, some businesses have been seeking to locate on rural living lots and there is increasing concern about the impact on amenity for rural lifestyle developments. This highlights the need for the planning framework to provide an appropriate zone to accommodate such industries such as the rural enterprise zone. The Rural Enterprise zone provides for intensive agriculture and light industry with ancillary housing on the one lot, with lot sizes in the range of 1ha – 4ha. Rural enterprises are not expected to be incompatible with residential land use and hence this form of development suits business operators who desire a live-work arrangement in a rural setting. Design features can be required that address buffers and amenity. Rather than have such uses throughout the Shire, it is recommended that the Oakford area where these uses have already developed be formalised as a Rural Enterprise zone in LPS 3. Rural Enterprise development can also provide a transition between general industrial estates and surrounding rural areas. It is proposed to investigate the land north of the West Mundijong Industrial Area for this purpose.

Energy industries

There is potential for wind, solar and timber industries for energy production within rural areas. Alternative energy industries could be important in the future. Tree farming for harvesting is compatible with normal agriculture but wind and solar energy farms may require significant buffers and locations that are in close proximity to a suitable electrical grid. Retaining large lot sizes, preferably greater than 100 hectares, will facilitate the future development of such industries.

4.9.5 Rural Living

Rural living lots provide alternative lifestyle and housing types, and may also provide a transition between urban and rural areas. *SPP 2.5* recognises there is a market for rural living development, and that it provides for a range of housing and lifestyle opportunities. However, unplanned rural living development can place additional demand on community and service infrastructure that may be difficult to meet. It is recognised that the rural living style of development is a key characteristic associated with the Shire. Rural living development provides a mechanism to house a growing population while maintaining the rural character and landscape that is significant to the identity of the Shire. TPS 2 includes a number of zones that provide for a variety of rural lifestyle options. There is considerable overlap between requirements for these zones and variations within each zone, with specific requirements for each estate according to local circumstances. The present range of zones and provisions requires some rationalisation.

Under *Perth and Peel @ 3.5 Million* the creation of new rural residential lots/areas beyond those already identified in the document is unlikely to be supported. Existing rural residential areas in the Shire are well located in terms of access to community services and facilities. These are principally in the northern part of the Shire bordering the City of Armadale, in the central corridor generally west of the identified urban areas and surrounding the Serpentine Townsite. Further expansion of rural living development in the Shire will be difficult to support in view of other priorities for rural land. Having regard to these considerations, it is recommended that the existing and already planned rural living estates within the Shire be permitted to consolidate but that no new estates be considered.

Special Residential / Rural Living A

Some of the existing 'Special Residential' zoned land falls within future urban cells and some is in rural areas. In future, any areas within urban cells that have special characteristics justifying or necessitating lots between 2,000m^2 and 1ha should be zoned Special Residential. The Shire has several 'Rural Living A' estates

with lot sizes in the range of 4,000m^2 to 1ha, which are essentially Special Residential estates. These 'Rural Living A' estates have been developed within a rural living context, outside of the designated urban areas, with there being no intention for these lots to be intensified. These areas should remain within a rural living context to ensure that the special character of these areas is preserved.

Rural Residential / Rural Living B / Special Rural

Other rural living estates that have been developed within the Shire are generally comprised of 2ha lots and have been zoned as 'Rural Living B' or 'Special Rural' under TPS 2. Having regard to the prevailing lot sizes under the existing TPS 2 and the State policy framework, Rural Residential is considered to be the appropriate zone for lots within the range of 1ha – 4ha. To reflect the densities that have been permitted under TPS 2 it is recommended that Rural Residential Codes are introduced to specify a minimum of either 1ha or 2ha, to be referred to as Rural Residential 1 (RR1) and Rural Residential 2 (RR2) respectively. Rural Residential zones are consolidated in areas adjoining proposed urban zones, to intensify the population catchment close to urban centres. This can secure rural land from future urban expansion.

Rural Smallholdings / Farmlet

There are some rural living estates that contain larger lots in the range of 4ha – 40ha, which have been developed under the 'Farmlet' zone under TPS 2. These lots can also be considered as Rural Smallholdings under the revised State policy framework. The intention of Rural Smallholdings is to provide high amenity rural lifestyle lots that can accommodate equestrian activity. Such estates exist south of Mundijong Road and adjacent to the railway line in Serpentine. These estates were also designed to potentially result in significant environmental rehabilitation, as larger lot sizes can provide more scope and capability for management. Rural Smallholdings have an important role in the Shire to provide for the equine activities, which is a significant industry within the Shire that is accommodated on rural living land.

Equine Industry

There is a concentration of equine activity within the Shire, which is largely accommodated on rural living lots. This is a defining characteristic of rural land within the Shire with potential for tourism and economic development. As identified in the Shire's socio-economic profile[61], the Shire is already a significant location for the equestrian industry in Western Australia. In consolidating the total number of registered horses/members across the key equine disciplines, the Shire is estimated to be home to 3,876 horses[62]. With more horses than any other local government area in the State, the Shire is the leading Equine Region in Western Australia. It is essential that the equine industry is supported and preserved by the planning framework. The Shire's *Rural Strategy* identified a Residential and Stables Policy Area to designate areas where equine activities are prioritised and protected from urban encroachment and other incompatible land uses. It is recommended that this designation be identified within the Local Planning Strategy to support the established equine industry.

[61] (AEC Group, 2016)
[62] (Shire of Serpentine Jarrahdale, 2018)

4.10 Natural Environment

Natural environment encompasses physical features, atmosphere, geology, climate, and natural resources.

4.10.1 Climate

The climate in the Shire is typical of the south-west of Western Australia with hot dry summers and cool wet winters. The Bureau of Meteorology stations nearest to the Shire with available climate data are located approximately seven kilometres north-east of Byford at Wungong Dam, and 18 kilometres west of Byford at Medina Research Centre. Rainfall and temperature data collected at these stations are considered to reflect the climate of Serpentine Jarrahdale in general.

A large body of climate research has been undertaken for the Australian region in recent years and this, along with international climate change research including conclusions from the International Panel on Climate Change fifth assessment report, has informed Climate Change in Australia (CSIRO, 2007, updated 2015) was developed by the Australian Greenhouse Office together with CSIRO and the Bureau of Meteorology. The CSIRO has provided a number of projections based on the outputs of global climate models that estimate likely changes in regional climate for defined natural resource management clusters around 2030 (near future) and 2090 (late century). Regional clusters correspond to the broad-scale climate and biophysical regions of Australia. The Shire is located in the Western Australian Southern and South-Western Flatlands sub-cluster (the sub-cluster). The following paragraphs address both existing climate and predicted likely changes in climate based on the aforementioned research.

Temperature

Maximum temperatures at Medina Research Centre occur in summer and minimum temperatures occur in winter, with average temperatures peaking in February at approximately 32°C, and dropping to approximately 8°C in July-August. Temperature is predicted to increase by 0.5°C to 1.2˚C by 2030. This has the potential to impact on plants, animals, and people, through increased heat stress and increased risk of bushfires.

Rainfall

The average annual rainfall recorded at Wungong Dam since 1911 is 1,225mm but this has declined in recent years to an average of 1,012mm since 1975, and 998mm since 1995. The minimum recorded annual rainfall occurred in 2010 at just 520mm and the maximum was recorded in 1917 at 1,958mm. The average annual rainfall on the Swan Coastal Plain is generally less than that on the Darling Plateau, ranging from 800mm to 1,000mm. The majority of rainfall occurs in winter between May and September, with the driest months being January and February. Whilst average annual rainfall has generally declined in recent years, it has actually increased in the late winter and early spring months of August and September. This may be indicative of changing rainfall patterns bringing more frequent intense rainfall events later in the year, with longer dry periods in between.

The CSIRO predicts that winter rainfall will decline by up to approximately 15% in the near future (2030), and up to around 30% in the late century (2090) under an intermediate emissions scenario. This projection increases to a 45% decline in rainfall under a high emissions scenario. It has also been reported that climate change is likely to result in lower rainfall in spring and winter, coupled with more intense rainfall events and longer periods of drought linked to reduced soil moisture and increased evaporation rates. This variability has the potential to result in localised flooding from stormwater during extreme events, which may become more frequent in the future. Furthermore, declining stream flows and superficial groundwater levels have been observed over the past ten years, most likely as a result of declining annual rainfall. Continuing reductions are likely to maintain this pattern and may have significant impacts on surface and groundwater availability for both human and environmental needs. As groundwater levels

decrease, climate change may also increase the risk of acidification and heavy metal contamination resulting from the disturbance of acid-sulphate soils.

Wind

Wind is caused by differences in air pressure, affected by factors such as topography and the presence of water bodies. Wind data collected at Medina Research Centre shows that prevailing winds at the station are seasonally variable. Mean wind speeds are higher in late spring (November) in the morning (9am), and in early summer (December) in the afternoon (3pm), with mean monthly speeds ranging from 14 – 21 km/h at these times. Wind direction at Medina Research Centre is typically west-south-westerly in the morning (9am) and north-easterly in the afternoon (3pm). However, given that this weather station is located near to the coast and approximately 19 kilometres west of the Shire, it should be noted that the strength and direction of winds further inland at the Shire may not necessarily be reflected by these patterns.

The impacts of climate change on wind will be related to differences in temperature and other climatic conditions. There does not appear to be much information available that can be directly related to the Shire, however a recently released study involving the Australian National University suggests that southward shifts in westerly winds that circled the Southern Ocean as a result of climate change have been detected, which affect rainfall. Rising temperatures, particularly in summer, will affect wind direction and speed, which in turn can affect the severity of bushfires. As was observed in the summer of 2015-16 with the Yarloop bushfire, large fires can also create their own weather systems. Extreme weather caused by climate change, which can include severe storms causing flooding or destructive winds, temperature extremes and drought – may require improved emergency management responses and plans. Infrastructure may have to be designed to adequately manage extreme weather conditions.

4.10.2 Air Quality

Air quality in the Shire is generally good. In some parts of the Shire dust from construction sites including residential subdivisions is an issue. In some of the townsites, haze from wood heaters and photochemical smog may be an issue, and this will need to be managed as the Shire's population increases. The extraction of basic raw materials can result in air quality impacts such as dust, noise and light. Overspray of chemicals should be considered in areas of intense agriculture. The Shire's *Dust and Building Waste Local Law (2017)* requires that any activity likely to generate dust is proposed (whether or not as part of a development or subdivision application) be carried out in accordance with a Dust Management Plan that must first be submitted and approved by the Shire.

Greenhouse Gas Emissions

The Shire is actively reducing its greenhouse gas emissions through the installation of renewable energy sources for powering Shire buildings. This includes the Shire Administration Centre, Atwell Pavilion in Mundijong, Bruno Gianatti Hall in Jarrahdale, Byford Hall, and the Serpentine Jarrahdale Community Recreation Centre, which also benefits from wind energy. The Shire also works with the Cities of Armadale and Gosnells to deliver the Switch Your Thinking programme, which aims to develop partnerships with business, industry, and residents to encourage energy efficient, water-wise and waste reducing behaviour. Encouraging the reduction of activities producing greenhouse gas emissions will be a matter of consideration for the Shire's Local Planning Strategy.

4.10.3 Land Resources

Landform

The Shire area is unique in its topography and landform with two distinct halves (see

Table 4-12: L3). The western portion of the Shire area comprises low flat topography, typical of the Swan Coastal Plain, whilst the eastern portion is characterised by undulating ridge peaks and troughs of the landform of the Darling Plateau. At the junction of the two landforms, known as the Darling Scarp, the

topography is steep, with an average gradient of five percent. The topographic features of the Darling Plateau and Darling Scarp allow for substantial water bodies to form, such as the Serpentine and Wungong Dams, and are an important catchment for surface water runoff.

Table 4-12: Landform and Soil Classifications

Geomorphic region	Soil landscape zone	Soil landscape system	Approximate area (ha)
Darling Plateau	Western Darling Range	Darling Plateau	35,150
		Murray Valley (includes Darling Scarp)	14,970
Swan Coastal Plain	Pinjarra	Forrestfield	4,640
		Pinjarra	15,740
	Bassendean	Bassendean	19,800

The condition of most of the plateau is good, as vegetation cover has been retained. Most is managed as State Forest, water catchment or conservation reserves. A large area between Jarrahdale and the Wungong Reservoir has been mined for bauxite. Towards the edge of the plateau and along the scarp are gravel pits and rock quarries. The Cardup Landfill site uses one of the old quarries for disposal of regional waste. Along the Scarp, slopes have been cleared for agriculture, leading to erosion and loss of sediments, nutrients, organic matter and water retention capacity.

The Swan Coastal Plain has changed significantly, most importantly by draining of the extensive wetlands that once covered it for much of the year. Many of the drains intersect the groundwater, causing drawdown and reducing soil moisture content. The plain soils have been extensively cleared for agricultural and residential uses. The Pinjarra soils are highly productive and less than 3% of the original vegetation remains. The Bassendean soils retain more vegetation.

Geology and Soils

The soils of the Shire are reflective of the topography. The eastern Darling Scarp typically has a geology of gneiss, granite and shale with colluvium soils of gravel, clay-silt-sand, whilst the Swan Coastal Plain having the Guildford Formation of shallow sands over a basal conglomerate (typically clay). The combination of good agricultural soils (especially on the lower slopes of the Darling Ranges) and palusplain soils (on the Coastal Plain) provides a mix of agricultural opportunities to the Shire. The geology of the area also means that basic raw materials such as hard rock, sand, clay, and gravel are present, along with minerals such as titanium (mineral sands) and bauxite.

Acid Sulphate Soils

Acid sulphate soils are soils and sediments that contain iron sulphides. They are harmless when left in a waterlogged, undisturbed environment. However when exposed to air, through drainage or excavation, the iron sulphides in the soil react with oxygen and water to produce iron compounds and sulphuric acid. This acid can release other substances from the soil, including heavy metals, into the surrounding environment and waterways. Much of Western Australia's acid sulphate soil material lies just below current water tables. Continuing declines in annual rainfall, changes in land uses and increasing ground-water abstraction will lead to lower water tables, resulting in possible widespread acid sulphate soil oxidation. Current information suggests the majority of moderate to low risk of acid sulphate soils occur in the western portion of the Shire, corresponding with the areas of higher water table on the palusplain. Small, isolated pockets of high risk (water table within 3 metres of the ground surface) are associated with wetlands and damplands. Land on the Darling Plateau within the Shire is considered to be low risk. However, site by site assessment is necessary in accordance with the WAPC's *Acid Sulphate Soils Planning Guideline*s. These Guidelines outline a range of matters that need to be addressed at various stages of the planning process to ensure that the subdivision and development of land containing acid sulphate soils is planned and managed to avoid potential adverse effects on the natural and built environment.

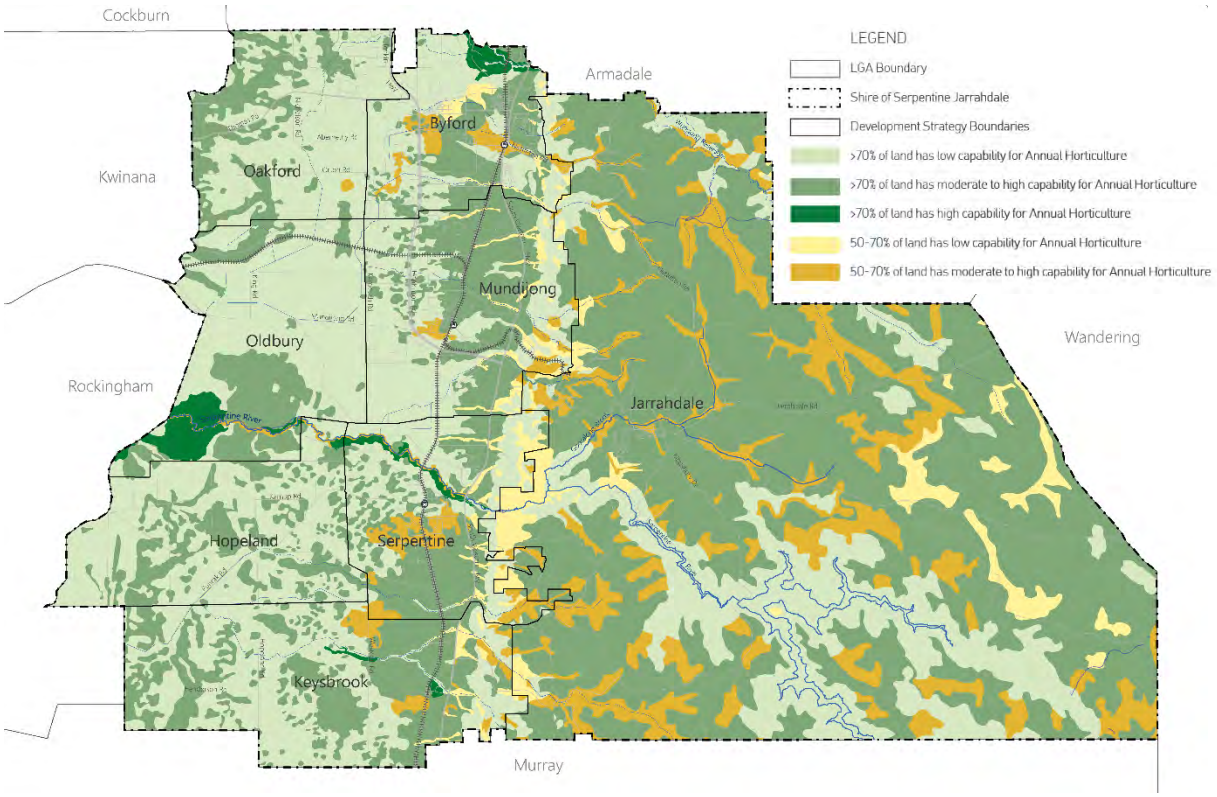
Contaminated Land

Western Australia's contaminated sites legislation aims to protect people's health and save the environment from harm. Under the *Contaminated Sites Act 2003*, contaminated sites must be reported to the Department of Water and Environment Regulation, investigated and, if necessary, cleaned up. Landowners, occupiers, and polluters are required to report all known or suspected contaminated sites. Reported sites are then classified, in consultation with the Department of Health, based on the risks posed to the community and environment. There are four registered contaminated sites in the Shire, most of which are in relation to hydrocarbon contamination. Other sites reported, including sites awaiting classification, are recorded separately and have not been mapped. Therefore, it cannot be assumed that the absence of a mapped site means that there is no contamination.

Land Capability

Land capability is the physical capacity of land to support different types of land uses and management practices in the long term without degradation to soil, land, air, and water resources. It is most often referred to in consideration of agricultural land uses but it is equally relevant to other activities. The Department of Primary Industries and Regional Development (DPIRD) (formerly Department of Agriculture and Food) have assessed the soil degradation hazard of soils in Western Australia. The area of the Shire west of the Darling Scarp is on the Swan Coastal Plain and this is generally recognised as having a high risk of phosphorous export, wind erosion, sub-surface acidification (different from acid sulphate soils) and water logging. Areas of the Darling Plateau associated with the Serpentine River and Dam, and the Darling Scarp, are associated with a high risk of water erosion and phosphorous export.[63] DPIRD has assessed and mapped the capacity of soils to support annual horticulture, perennial horticulture, dryland cropping and grazing. Detailed maps with this information are contained in Figures 4-13 to 4-16.

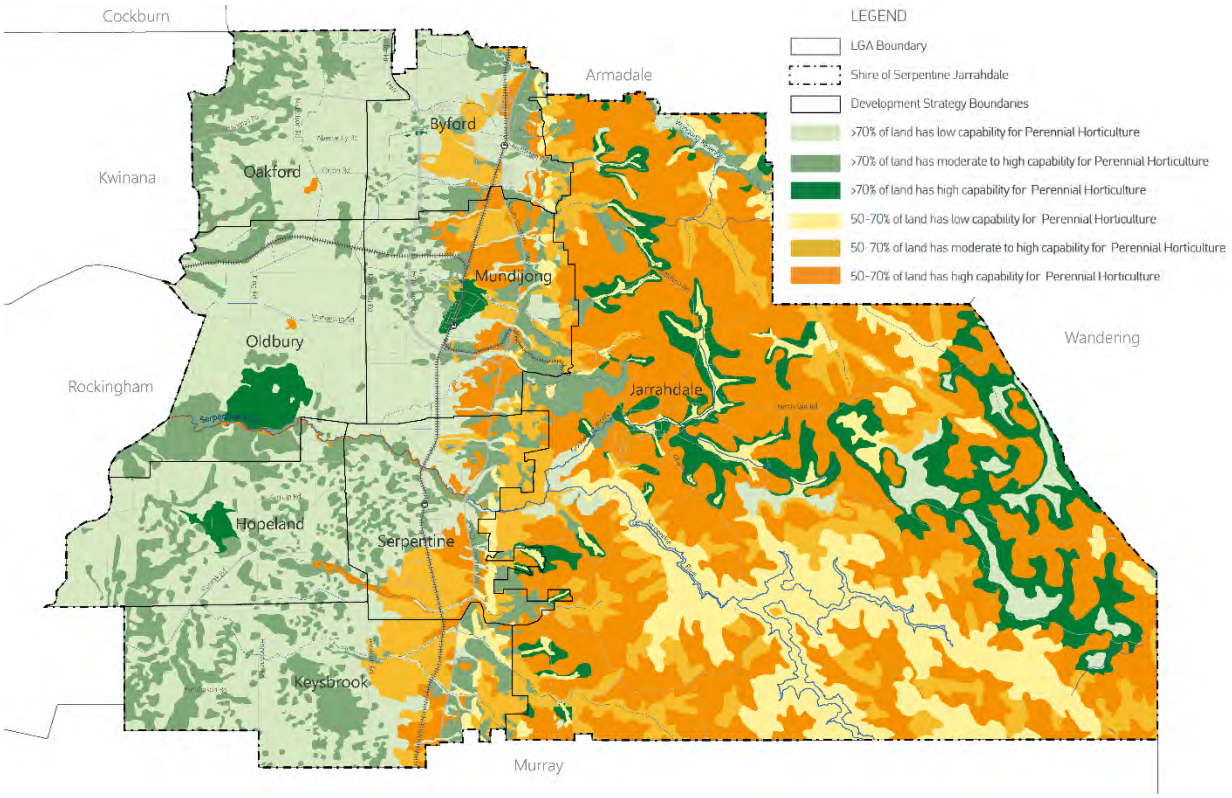
Figure 4-13: Annual Horticulture



Data source: DPIRD NRM INFO mapping portal.

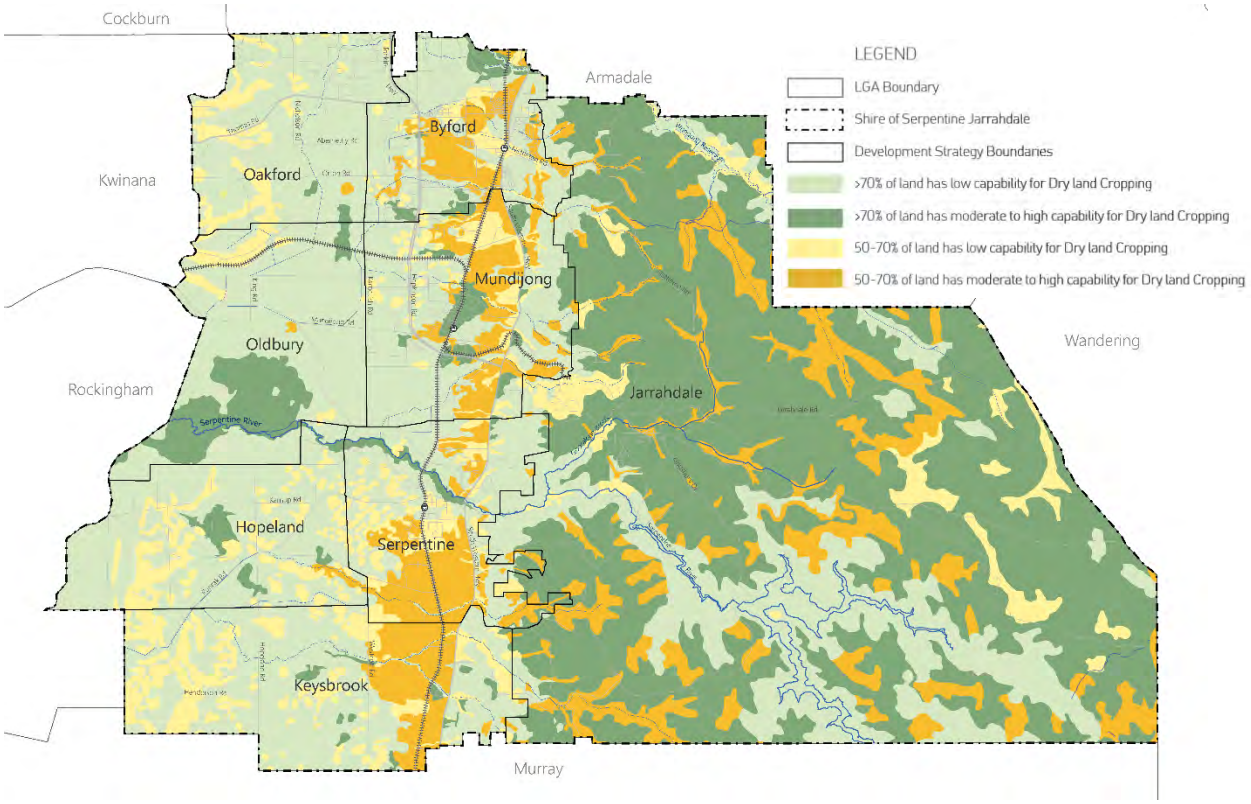
[63] (Essential Environmental, 2016)

Figure 4-14: Perennial Horticulture



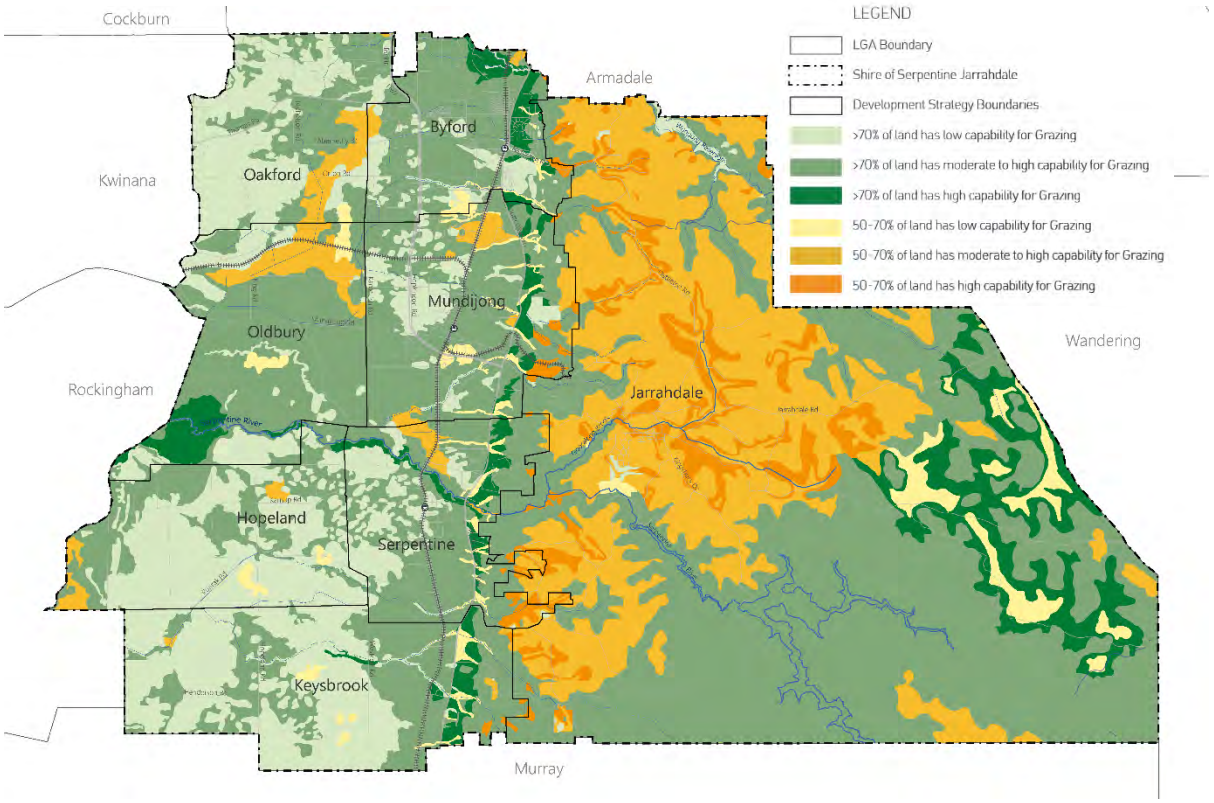
Data source: DPIRD NRM INFO mapping portal.

Figure 4-15: Dryland Cropping



Data source: DPIRD NRM INFO mapping portal.

Figure 4-16: Grazing



Data source: DPIRD NRM INFO mapping portal.

4.10.4 Water Resources

Water resources within the Shire are fundamental to its natural biodiversity and vast agricultural, pastoral, and urbanised land uses. For this reason it is critical that these resources are adequately provided for in land use planning and decision making.

Waterways

The majority of the Shire lies within the Peel-Harvey Estuary – Serpentine River catchment. This catchment drains into the RAMSAR listed Peel-Yalgorup System which is protected as a Matter of National Environmental Significance (MNES) under the *Environment Protection Biodiversity Conservation Act 1999*. The Serpentine catchment provides around 15% of the annual surface inflow to the Peel-Harvey system. In the past, an extensive network of rural drains was developed in the flat low-lying part of the Swan Coastal Plain (the palusplain), east of the Peel-Harvey Estuary and the Serpentine River.

> *The extensive drainage networks, which intercept surface and groundwater, have been effective in draining the system to enable agriculture and other land uses. The drains have also transported nutrients directly and quickly into the Serpentine and Murray Rivers which are now in a very poor state with algal blooms and fish deaths occurring each year and directly stressing the Peel–Harvey Estuarine System.*[64]

The management of both existing and future drainage systems will need to be addressed in areas identified for future development in order to restore the health of the waterways and reduce other risks to ecosystems, infrastructure and property. Modification of existing drainage schemes to incorporate best practice for water-sensitive design and nutrient management may be required and could include the use of detention basins, amended soils and/or nutrient stripping facilities.

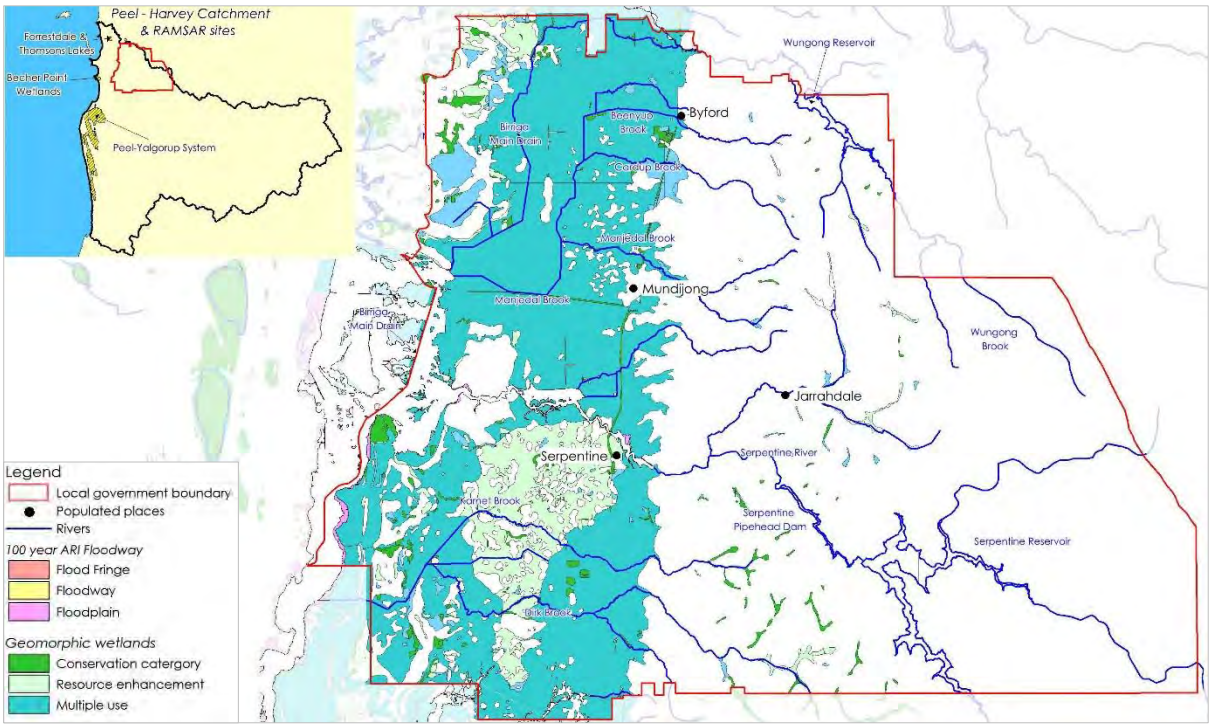
[64] (Safstrom, 2012)

The most notable waterway within the Shire is the Serpentine River, which forms part of the two Serpentine dams (Serpentine Reservoir and Serpentine Pipehead Dam). The Serpentine River traverses the Shire south-east flowing through the western boundary of the Shire. The Serpentine reservoir is one of the biggest dams supplying the Perth metropolitan area. Several brooks pass through the southern Hopeland-Keysbrook area including the Karnet and Dirk Brooks. In the northern part of the Shire the Cardup, Beenyup and Manjadel Brooks and Birriga Main Drain are key features. In addition, a large portion of the Wungong Reservoir is situated in the north-eastern corner of the Shire, with a large amount of the Reservoir's catchment within the Shire's boundaries. Figure 4-17 shows the main surface water resources in the Shire including wetlands and rivers. It also shows the location of the Shire within the Peel-Harvey Catchment.

Wetlands

A number of conservation category wetlands are located within the Shire area. Most of the wetlands are surface expressions of the water table. The western portion of the Shire coinciding with the Swan Coastal Plain is largely categorised as Multiple Use Wetland. This is largely attributed to the geological system of the Guildford Formation, typically sand over clay, which is seasonally waterlogged flat land. In the case of Multiple Use wetlands, the Environmental Protection Authority (EPA) urges that all reasonable measures are taken to retain the wetlands' hydrological functions (including on-site water infiltration and flood detention) and, where possible, other wetland functions. However, the majority of the wetlands on the Swan Coastal Plain have been modified as a result of agricultural practices.

Figure 4-17: Surface Water



Source: Essential Environmental 2016

Groundwater

The most significant groundwater resources underlie the Swan Coastal Plain portion of the Shire. This includes the superficial aquifer, which is unconfined and recharged by rainfall, and the deeper confined aquifers of the Leederville and Yarragadee. Groundwater is generally within three metres of the surface in areas of sand. Groundwater quality is generally good but information on groundwater quality is limited.

The nature of the geology of the Darling Plateau is such that groundwater is located in fractured rock aquifers and so the groundwater resource is not considered to be reliable or readily available for abstraction.

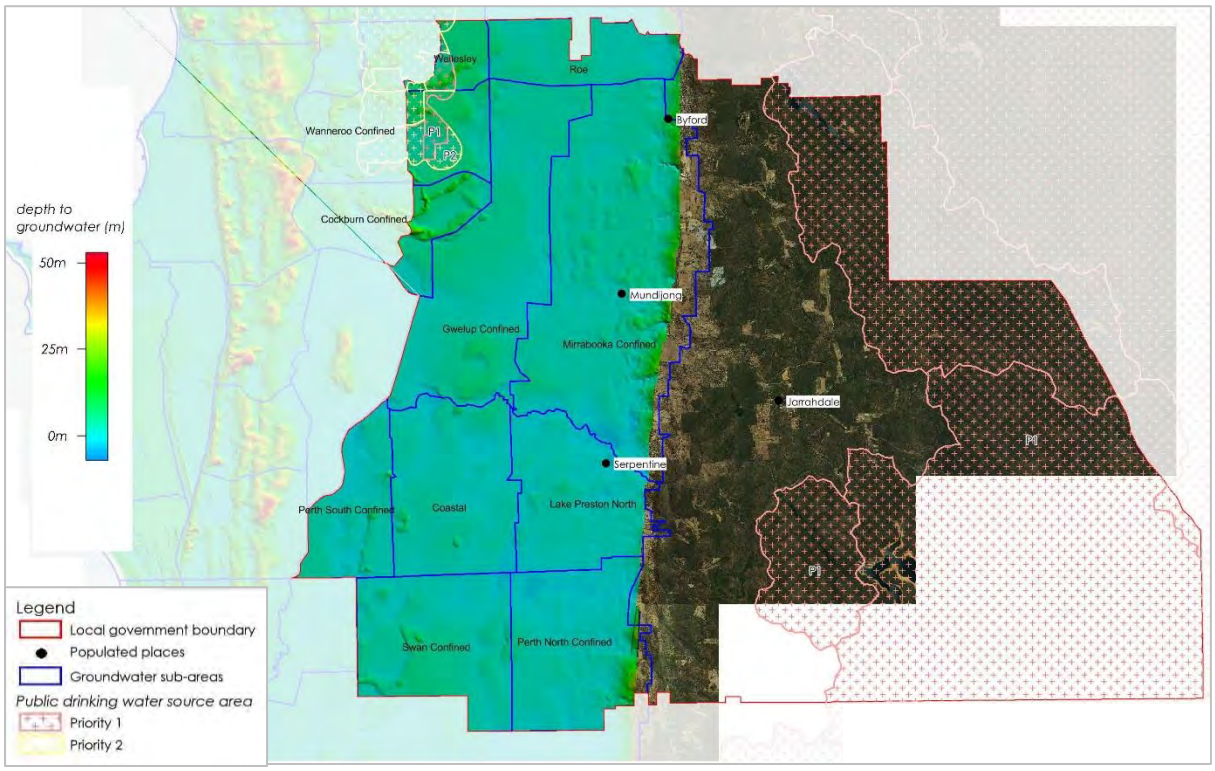
Superficial (surface) and artesian (confined) aquifers underlie most of the coastal plain. The groundwater flows east-west, also discharging to rivers and wetlands, connecting the two systems.

shows key groundwater characteristics within the Shire.

Jandakot Groundwater Mound

The Jandakot Groundwater Mound extends into a small area in the north-west of the Shire and is reserved in both the MRS and TPS 2 as 'Water Catchments'. The mound area is currently reserved for Parks and Recreation under the MRS or zoned for Rural Groundwater Protection under TPS 2. Land located within the Rural Groundwater Protection zoning is required to be used and developed in accordance with the provisions of SPP 2.3. Within the Shire, the Jandakot groundwater mound is divided into sections classified as either Priority 1 (P1) or Priority 2 (P2) underground water pollution control areas (UWPCA). P1 areas correspond with the current MRS Water Catchment and Parks and Recreation reservations, while P2 areas correspond with the current TPS 2 Rural Groundwater Protection zone. Two wellhead protection zones with radii of 300 metres are identified around existing or proposed bores for public water supply abstraction within this area. These are specific buffers defined to protect drinking water sources from contamination in the immediate vicinity of water extraction facilities.

Figure 4-18: Groundwater



Source: Essential Environmental 2016

P1 classification areas are managed by preventing the development of potentially harmful activities, and are principally managed on the basis of risk avoidance. P2 classification areas are managed to ensure that there is no increased risk of water source contamination/ pollution, and are managed on the basis of risk minimisation. The major compatible land uses in P1 areas are national and regional parks and nature reserves, pastoral agriculture, apiaries, forestry and plantations, residential buildings with conditions, community education centres and research facilities, mining and extraction facilities with conditions, and drinking water treatment plants. In addition to the land uses compatible with P1 areas, intensive agriculture, some animal establishments, major transport infrastructure, wineries, and some commercial activity may be undertaken in P2 areas.

Groundwater Availability

Information obtained from the Department of Water in April 2016[65] on the current levels of groundwater allocation of the superficial aquifer suggests that groundwater is likely to be available to provide a source of irrigation for future development including areas of regional and local public open space. It is likely that fit-for-purpose water could also be provided to industrial areas to reduce the use of potable (scheme) water. Groundwater is also likely to be available for irrigated agriculture or horticulture on the Swan Coastal Plain, provided that risks of nutrient export and waterlogging are able to be adequately addressed. Water availability for agriculture on the Darling Scarp is dependent on the site specific characteristics and testing is usually required to demonstrate that an appropriate source is available.

4.10.5 Natural Environment and Biodiversity

Threatened flora

Threatened flora includes Declared Rare Flora (DRF) listed under the *Wildlife Conservation Act 1950* and Priority flora, which are being considered for listing but require further study. Thirty-five species of threatened flora (including seven DRF) are recorded in the Shire, mostly on Shire verges, drains, private land and railway reserves. Under the *Wildlife Conservation Act 1950*, a Threatened Ecological Community (TEC) is an ecological community that has been identified as being subject to processes that threaten to destroy or significantly modify it across much of its range. TECs located within the Shire area, listed in the *Local Government Biodiversity Planning Guidelines*[66], and confirmed by the former Department of Environment and Conservation in 2007 are presented in Table 4-13.

Table 4-13: Threatened Ecological Communities

Threatened ecological community	WA criteria Designation (2007)	EPBC Act category (2016)	Community Identifier
Corymbia calophylla - Kingia australis woodlands on heavy soils of the Swan Coastal Plain	Critically endangered	Endangered	SCP3a
Corymbia calophylla – Xanthorrhoea preissii woodlands and shrublands of the Swan Coastal Plain	Critically endangered	Endangered	SCP3c
Banksia attenuata and/or *Eucalyptus marginata* woodlands of the eastern side of the Swan Coastal Plain	Endangered		SCP20b
Southern wet shrublands of the Swan Coastal Plain	Endangered		SCP02
Shrublands on dry clay flats	Endangered		SCP10a
Corymbia calophylla – Eucalyptus marginata woodlands on sandy clay soils of the southern Swan Coastal Plain	Vulnerable		SCP3b
Herb rich shrublands in clay pans	Vulnerable		SCP08

[65] (Essential Environmental, 2016)
[66] (Del Marco A. T., 2004)

Threatened ecological community	WA criteria Designation (2007)	EPBC Act category (2016)	Community Identifier
Herb rich saline shrublands in clay pans	Vulnerable		SCP07
Dense shrublands on clay flats	Vulnerable		SCP09

Source: Ironbark Environmental 2008

The Salmon White Gum (*Eucalyptus lane-poolei*) and Darling Range Ghost Gum (*Eucalyptus laelei*) have been identified in particular as two species of locally characteristic trees that require protection due to their endemic presence in the Shire. The Salmon White Gum is uncommon in the metropolitan region and is found only in a few places in the Foothills around Keysbrook, Mundijong and Byford. The Darling Range Ghost Gum is confined to the Darling Range between the Helena Valley and Harvey, usually in the Darling Scarp. These trees occur locally in the Serpentine National Park on hillsides above the Serpentine Falls and along Gobby Road in Keysbrook[67].

Fauna

The Swan Coastal Plain was once home to a great abundance and diversity of fauna, but habitat loss and alteration have severely reduced most populations. Around 140 species of birds occur here and the populations of almost half have declined significantly. Thirty-three mammals were once recorded on the Swan Coastal Plain. In 1978 only 18 were located and their status has continued to decline. Recent surveys often record only three mammals (western grey kangaroo, common brushtail possum and southern brown bandicoot). The Carnaby's Black Cockatoo (*Calyptorhynchus latirostris*), a species of Specially Protected Fauna is known to feed, breed and roost throughout the Jarrahdale, Mundijong and Serpentine areas. They are a partially migratory species that breed in the wheatbelt in winter to mid-spring and wander in flocks to coastal areas for foraging in the nonbreeding season. This bird species is listed as Critically Endangered under the Commonwealth *EPBC Act* and is now reliant on parkland areas in the Shire for feeding habitat. The main threats to the long-term survival of the species are loss of nesting hollows and food resources due to land clearing.[68]

Bush Forever

SPP 2.8: Bushland Policy for the Perth Metropolitan Region identifies areas of regionally significant bushland along with TECs and Declared Rare (Threatened) and Priority flora for protection. Bush Forever aims to protect at least 10% of each of the 26 original vegetation complexes within the Swan Coastal Plain section of metropolitan Perth, and to conserve TECs. There are 30 Bush Forever sites in the Shire, listed in Table 4-14. These sites must be taken into consideration for any proposal on or near them. Development is not necessarily prevented, but the values of each site must be assessed to determine if and what nature of development is appropriate.

Table 4-14: Bush Forever Sites in the Shire of Serpentine Jarrahdale

Site no.	Site name
65	Abernethy Road Bushland, Oakford
68	Jackson Road Bushland, Peel Estate
70	Duckpond Bushland, Peel Estate
71	Transit Road Bushland, Jarrahdale
74	Rapids Road Bushland, Peel Estate
76	Kingsbury Drive Bushland, Keysbrook
77	Yangedi Swamp, Keysbrook
78	Page Road Bushland, Keysbrook

[67] (Ironbark Environmental, 2008)
[68] (Ironbark Environmental, 2008)

Site no.	Site name
266	Wungong Brook, Byford
271	Cardup Brook Bushland, Cardup/Peel Estate
321	Brickwood Reserve and Adjacent Bushland, Byford
347	Wandi Nature Reserve and Anketell Road Bushland, Wandi/Oakford
348	Modong Nature Reserve and adjacent Bushland, Oakford
350	Byford to Serpentine Rail/Road Reserves and Adjacent Bushland
351	Cardup Brook Bushland, Cardup/Peel Estate
352	Cardup Nature Reserve and Adjacent Bushland, Cardup
353	Banksia Road Nature Reserve, Peel Estate
354	Norman Road Bushland, Whitby/Cardup
360	Mundijong and Watkins Roads Bushland, Mundijong/Peel Estate
361	Norman Road Bushland, Whitby/Cardup
362	Roman Road Bushland, Whitby
365	Byford to Serpentine Rail/Road Reserves and Adjacent Bushland
368	Lowlands Bushland - Eastern Block, Peel Estate
371	Serpentine River; Peel Estate to Serpentine
372	Lowlands Bushland - Western Block (Hymus Swamp), Peel Estate
375	Byford to Serpentine Rail/Road Reserves and Adjacent Bushland
378	Henderson Road Bushland, Peel Estate
426	Myara Brook Bushland, Keysbrook
449	Oscar Bruns Reserve, Wungong
468	Serpentine National Park and Adjacent Bushland, Serpentine

Biodiversity and Conservation

The Shire is located within the Kwongan ecoregion of the South West Australian Floristic Region, which is one of only twenty-five biodiversity hotspots in the world. The Shire is part of two of Western Australia's bioregions - the Northern Jarrah Forest subregion, which includes the plateau and Darling Scarp in the east of the Shire, and the flat low lying Swan Coastal Plain subregion in the west of the Shire. The Northern Jarrah Forrest Bioregion is characterised by tall, open jarrah-marri forests on laterite gravels over clayey soils with bullich and blackbutt in the valleys, and grades into wandoo woodlands in the east with powder bark on breakaways. There are extensive but localised sand sheets with Banksia low woodlands. Heath (including species such as grevillea, hakeas, rock she-oak and Darling Range Ghost Gum) is found on granite rocks and as a common understorey of forests and woodlands in the north and east.[69] The Swan Coastal Plan Bioregion includes urban developments associated with the city of Perth, and is dominated by woodlands of Banksia and tuart on sandy soils, she-oak on outwash plains and paperbark in swampy areas.

Since 1996, the Shire has had a Conservation zone within its Local Planning Scheme which protects high conservation natural areas from inappropriate development in return for ongoing rate discounts to the landowners. Landowners rezone their land voluntarily. As recommended by the *Biodiversity Strategy*[70], it is proposed that the Conservation zone be retained in the Local Planning Scheme, renamed 'Environmental Conservation' to comply with the *Regulations*. Rezoning to Environmental Conservation would be voluntary, and triggered by either an eligible landowner wishing to protect the conservation values on their land or in some cases for rate relief. Natural areas already in the Conservation zone would be protected and managed in the zone. Rate relief would only be offered to Environmental Conservation zoned property owners based on the preparation and implementation of a management plan. The Shire's *Biodiversity Strategy* includes goals and targets, for which consideration needs to be given in this Local Planning

[69] (Department of Conservation and Land Management, 2002)
[70] (Ironbark Environmental, 2008)

Strategy. The challenge is that the figures in the *Biodiversity Strategy* relating to areas of remaining vegetation type were valid in 2006 but are likely to have changed since then.

Bushfire Risk

In December 2015, the *Planning in Bushfire Prone Areas Bushfire Policy Framework* was introduced to protect lives and property against the threat of bushfires throughout Western Australia. Much of the Shire has been identified as bushfire prone by the Fire and Emergency Services Commissioner. Future planning and development within Bushfire Prone Areas will need to meet the requirements of *SPP 3.7: Planning in Bushfire Prone Areas* and the *Guidelines for Planning in Bushfire Prone Areas.* Deemed provisions relating to bushfire risk management have been inserted into Schedule 2 of the *Planning and Development (Local Planning Schemes) Regulations 2015*.

Flood Risk

Many rivers and brooks pass through the Shire, flowing down from the Darling Scarp across the Swan Coastal Plain. These waterways are a key natural attribute attracting residents to the area. However, there is an associated flood risk to development near any waterway. In accordance with both *SPP 2.9: Water Resources* and *Better Urban Water Management*, flood risk management and mitigation will be required to support any further development within the Shire in proximity to waterways to minimise risk of flooding.

4.10.6 Basic Raw Materials and Minerals

Basic raw materials (BRM) are construction materials such as sand, clay, rock and limestone. Aside from depletion, local BRM supplies are now becoming increasingly constrained by the growth of the city and important environmental considerations. The need to reduce future BRM requirements is an important part of the planning behind future urban and industrial development. BRM resources should be protected where feasible to secure strategic basic raw material resources to meet predicted future needs.

There are fourteen active extractive industries for BRM within the Shire registered by the Department of Mines, Industry Regulation and Safety. There are pockets of regionally significant BRM defined by the WAPC. Regionally significant BRM has to be protected from development that would prevent it from being extracted. There is one exclusion area identified for the Shire area. An exclusion area is where BRM resource extraction will not be approved as it is inconsistent with the *Environmental Protection and Biodiversity Conservation Act 1999* and *Environmental Protection Act 1986*. There is one further investigation area identified for the Shire area. The Whitby Clay and Rock Node is located about 39 kilometres southeast of Perth. Two rock quarries and one clay quarry are operating in the Whitby Node. Future expansion of the rock quarries will require further investigation of the environmental values.

All extractive industries require a buffer distance from sensitive land uses, the development of which cannot be permitted within the buffer area. The presence of a mining activity can therefore prevent development from occurring until such time as the licence expires and/or is surrendered. Clearing of land for resource extraction results in a loss of biodiversity and can lead to erosion. Mining activities also impact on the visual landscape of the Shire and can result in off-site impacts on nearly land uses including dust, noise and light.

Titanium-Zircon Deposits

In addition to BRM, there are nine active mining operations within the Shire registered with the Department of Mines, Industry Regulation and Safety, most notably for bauxite, titanium and zircon. Significant deposits of titanium and zircon exist in southern parts of the Shire west and south of Keysbrook, as well as east of Paterson Street/Soldiers Road in the Mundijong urban area. It is acknowledged that titanium and zircon deposits exist in the Mundijong area that is zoned 'Urban' under the MRS and 'Urban Development' under TPS2. This area is currently in the process of being developed for urban purposes in accordance with this zoning. As such, the Shire does not expect that mining will occur in this area, given

the zoning and development of this land. In addition to this, the land also contains threatened ecological communities and Bush Forever sites, which should be preserved for conservation purposes. Part 1 of this Local Planning Strategy identifies the location of the titanium-zircon deposits, including a 500m separation area to this resource as identified by the State government, for information purposes. It should be noted that Section 120 of the *Mining Act 1978* requires the Minister responsible for granting a mining tenement to take into account the provisions of a local planning scheme, noting that a scheme does not prohibit or affect the ability to grant a tenement.

4.11 Urban Design

The design of both land and building developments is an important influence on local character.

Rural Character

The Shire's 'rural/country town' character is highly valued by existing residents and serves to provide the Shire with a unique sense of place. Balancing a desire to preserve this uniqueness with the potentially conflicting pressures of accommodating the housing, employment and services needs of a growing population is one of the biggest challenges for planning in the Shire. Rural character is highly valued by the community and has been continually expressed in numerous community and stakeholder consultations for a range of projects.

One of the strategies that has preserved rural character within the Shire is the retention of a green/rural wedge between towns and villages to maintain rural character and lifestyle values. This strategy was expressed within the 1994 version of the Shire's Rural Strategy, through the Rural Landscape Buffer Policy Overlay. This concept relates to protecting rural areas against intensive subdivision and loss of rural values. It is proposed that a combination of the Rural Residential, Rural Smallholdings and Rural zones will achieve this purpose.

Defining Character

Given the special and highly valued characteristics of the Shire's environment it is particularly important to define and preserve the Shire's character and ensure that this is articulated at all stages of the planning process. Failure to adequately define the particular characteristics that are valued about specific areas will make it difficult to achieve truly place-responsive design outcomes. Every proposed land development should provide a context and character analysis that, along with environmental features, identifies those elements of the setting and characteristic built form that define the place. Those elements that are to be retained in new development should be identified, and subsequent designs (of subdivisions and buildings) should specifically note how those elements have been incorporated and/or interpreted. For example, place distinctive characteristics might include such things as:

- Traditional building setbacks and spacing;
- Landform;
- Location of car parking relative to buildings and roads;
- Views of defining or distinctive landscape elements/viewsheds/skyline;
- Type and density of vegetation;
- Sense of openness or enclosure;
- Building materials and fencing styles;
- Width of roads and verges;
- Street layout and lot configuration;
- Distinctive biophysical features (rock outcrops, water bodies, vegetated areas, isolated specimen trees, etc); and
- Aural quality (eg: quiet, sound of running water, etc).

This is not an exhaustive list but is indicative of the sorts of elements that can inform good urban design outcomes. It should be noted that this does not necessarily mean the simple replication of existing elements, but rather provides a sound basis for interpretation for place responsive contemporary development. The tendency for urban design objectives to be very generic and not supported by well-defined character analysis has resulted in many places losing their distinctiveness due to generic layouts, landscaping, and architecture. The specific character of the various localities within the Shire differs, which is explored in greater detail in the following sections.

The form and design of major retail, commercial and community nodes in Serpentine Jarrahdale is a critical component of the overall attractiveness, functionality and ultimately the economic performance of the Shire's activity centres.

Byford

The established part of Byford located to the east of South Western Highway, known as the Byford Old Quarter or Blytheswood Park was an estate design that was heavily influenced by the 'Garden City' planning movement. One of the key principles of the Garden City planning movement is towns being contained by agricultural and green belts. As discussed under the Rural Character section above, this has been a significant influence on not just Byford but also the spatial development of the Shire. The Byford Old Quarter is defined circular road layouts with diagonal axial connections and a central parkland/recreation space. Lots sizes in the Byford Old Quarter are also larger ranging from approximately 800m^2 – 5,000m^2.

New residential areas are being developed close to this historic subdivision. The newer residential areas of Byford are characterised by a connected network of multiple use corridors. This pattern of development contributes to Byford's rural setting and sense of place. Lots sizes are much smaller in these new areas than in the Byford Old Quarter precinct, with many lots of approximately 400m^2 in size and some precincts of smaller and narrower lots serviced by laneways in close proximity to activity centres.

Byford built form is characterised by the predominant single storey scale and form of Byford and low rise functional structures in the town centre. Most of Byford is suburban in form, that is housing and other developments are uniformly set back from the property boundary with varying patterns of native and other landscape treatments. The town centre is located north of Abernethy Road between South Western Highway and the railway line. Within this area retail and commercial activities have developed to the property boundary with continuous verandahs, and incorporated off street car parking areas. The South Western Highway has facilitated the initial growth and development of the Byford town centre. However, the scale of future required development needs to be provided within a compact framework focussed on high quality public transport (a new railway station). This original town centre development on South Western Highway is characterised by verandahs and ‘rural style’ building articulation typical of a country town main street development.

Mundijong

As with Byford, the historic town structure is reflective of the predominantly rural activity base of the Shire. In broad terms, Mundijong is a relatively compact residential village, surrounded by farmland and green spaces. The town centre is located well away from the South Western Highway and focussed on the western side of the railway line. Mundijong has been developed with a modified grid street system. The suburban scale and form of development extends to the main street development along Paterson Street and the stores and services are generally isolated developments with little unifying built form or contiguous verandahs. The extensive reserve along the eastern side of Paterson Street, bordering the railway line, is an important landscape element for the town centre. The domestic scale and suburban form of development and the dominant visual effect of mature trees throughout the township are the defining elements of the town's landscape character and built form.

These characteristics are indicative of the Shire’s rural setting and settlement pattern. Notwithstanding its designation as a neighbourhood centre, the changes which are forecast to occur to the settlement pattern could have significant implications for the layout, design and structure of Mundijong’s activity centre unless steps are taken to introduce design guidelines that ensure that the defining characteristics are perpetuated in new development.

Serpentine

Serpentine comprises several residential areas and precincts generally surrounding the Serpentine Townsite, separated by rural land uses, open space and reserves. The cluster of settlements located at the foothills of the Darling Ranges in proximity to the Serpentine River and its network of streams defines the town's physical setting. The Serpentine Townsite is a small grouping of local stores and services focussed on Wellard Street in the historic town area. Large street setbacks, wide road reserves, verandahs and extensive pedestrian areas and landscaping contribute to an attractive and 'natural' town centre environment. Serpentine is identified as a neighbourhood activity centre and the relatively small urban area that surrounds the townsite limits development pressures. However if the historic 'rural town' character is to be retained, design guidance will be required that reflects the defining characteristics.

Jarrahdale

The isolation of the Jarrahdale town, nestled amongst extensive green spaces and forested areas, provides the township with a unique sense of place and enclosure. The township comprises small commercial and residential areas. The small collection of commercial and community facilities in Jarrahdale is generally linear in form along Jarrahdale Road. The main street through the town is generally tree lined and the limited level of activity is not sufficient to generate a specific focal point for the community. The built form is predominantly low scale with large setbacks, which reinforce the distinctive natural setting and the rural and bushland environment. The main street environment is characterised by green spaces and a forest setting. Jarrahdale is an historic town and its 'timber town' heritage is an important part of its character. Jarrahdale is a tourist destination that could be further promoted and enhanced with complementary developments and activities that do not detract from its unique and picturesque character.

Sustainability

Urban design decisions can also substantially impact upon environmental sustainability. In particular, land development and management practices in the past have had a big impact on hydrology. Water Sensitive Urban Design (WSUD) is a multi-disciplinary approach to stormwater management based on addressing the multiple objectives of water flow control, water quality improvement, flood protection, nature conservation, and enhancement of recreational, landscape and educational opportunities. It is important that natural drainage systems and the health of wetlands, including the palusplain and the Peel-Harvey estuary are conserved through responsible and restorative land development and management.

Clearing of native vegetation for new development is the primary reason for loss of native biodiversity within urban areas, and clearing for agriculture has been the primary reason for loss of biodiversity in rural areas. In some areas, road reserves contain the only remaining native vegetation and provide ecological corridors. Protection of this vegetation is very important for the sustainability of native vegetation and habitats for smaller animals as well as for achieving sustainable urban design outcomes.

Development and design responses in new urban areas should generate an integrated townscape. This requires collaborative action between public and private sectors, coordinated development interest and investment resources. Developers may need to modify their development and marketing approaches, to invest in the streetscape design of prominent movement and activity areas such as main roads and public spaces, rather than conventional entry statements to estates. The Shire and other public sector agencies need to coordinate activities and ensure they contribute positively to realising character objectives in each area.

4.12 Traffic and Transport

4.12.1 Travel to work

A comparison of travel methods to work figures from the 2016 Census between the Shire population and the Perth metropolitan average is shown in Table 4-15. These figures relate to the number of employed people over the age of 15 years. The figures show relative parity between the Shire and the overall average, but highlights:

- More (72.2%) Shire residents travel to work by car, either as a driver or passenger, compared with the Perth average (68.7%);
- Significantly fewer Shire residents use the bus as their sole method of travelling to work (1.7% compared with 3.7%), possibly reflecting the low level of service available in the Shire, particularly for travel to Mandurah, Rockingham and Kwinana where many Shire residents are employed;
- Fewer Shire residents use the train as their sole mode of transport to get to work (1.2% compared with 2.8%). This may represent the patronage of the passenger rail service that presently terminates in Armadale, over 3.5 kilometres 'as the crow flies' from the Shire boundary and people using the daily Australind service that stops at Byford, Mundijong and Serpentine.
- More people travel to work by truck (1.9% compared with 0.7%), which may represent the relatively high proportion of construction and manufacturing workers in the Shire;
- A higher proportion of Shire residents worked at home (4.7%) compared with the Perth metropolitan average (3.9%) which is possibly indicative of a lifestyle choice for many in the Shire; and
- Fewer Shire residents cycled to work (0.1% compared with 1.0%), possibly reflective of longer distances and relative lack of infrastructure in the Shire.

These figures highlight that the private car is an even more dominant mode of transport within the Shire than it is across the metropolitan area generally. Public transport and active modes such as walking and cycling are low. Better access to public transport, improved routing and frequency of public transport, and improved infrastructure for walking and cycling will aid in improving transport options within the Shire. Anticipated employment growth in the central metropolitan sub-region is likely to result in more of the growing Shire population having a longer commute to work. The dominant employment locations of Shire residents to the north and west highlight the need for good transport links if residents are going to be able to access jobs. It is also important for workers to have the ability to choose where to live based on lifestyle. This means that east-west links to connect to employment in the coastal areas are essential, and high frequency rapid transit options for travel to the city and inner urban areas are of great importance.

Table 4-15: Travel to Work 2016 Census

Mode	Shire of Serpentine Jarrahdale	Perth Metropolitan
Train	1.2%	2.8%
Bus	1.7%	3.7%
Ferry	0.0%	0.0%
Tram (includes light rail)	0.0%	0.0%
Taxi	0.1%	0.2%
Car, as driver	68.3%	64.1%
Car, as passenger	3.9%	4.6%
Truck	1.9%	0.7%
Motorbike/scooter	0.5%	0.5%
Bicycle	0.1%	1.0%
Other	1.5%	1.2%
Walked only	1.6%	2.1%
Two methods	2.6%	3.8%
Three methods	0.5%	0.6%
Worked at home	4.7%	3.9%

Did not go to work	10.6%	9.9%
Not stated	0.8%	1.0%

Source: ABS Basic Community Profiles 2016

4.12.2 Existing Transport Network

Roads

The central corridor of the Shire accommodates the main urban centres of Byford and Mundijong. The main road transport corridors connecting the Perth region are South Western Highway connecting the main population centres to the north and south, Tonkin Highway and Kwinana Freeway on the western boundary of the Shire. Table 4-16 describes the existing road hierarchy within the Shire as described by the Mains Roads WA functional road hierarchy for Western Australia.

Table 4-16: Shire of Serpentine Jarrahdale Road Hierarchy

Classification	Characteristics	Roads within the Shire
Primary Distributor	**Provide for major regional and inter-regional traffic movement and carry large volumes of generally fast moving traffic. Some are strategic freight routes and all are State Roads. They are managed by Main Roads WA.**	South West Highway Albany Highway Thomas Road (west)
Regional Distributor	Roads that are not Primary Distributors, but which link significant destinations and are designed for efficient movement of people and goods within and beyond regional areas. They are managed by local government.	Rowley Road Anketell Road Hopkinson Road Soldiers Road Nettleton Road Kargotich Road King Road Mundijong Road Watkins Road Jarrahdale Road Wright Road Richardson Road Kingsbury Drive Karnup Road Hopeland Road
Distributor A	**Carry traffic between industrial, commercial and residential areas and generally connect to Primary Distributors. These are likely to be truck routes and provide only limited access to adjoining property.**	Thomas Road (east) Nicholson Road
Distributor B	**Perform a similar function to type A District Distributors, but with reduced capacity due to flow restrictions caused by frequent property accesses and roadside parking in many instances. These are often older roads with a traffic demand in excess of that originally intended.**	Hopkinson Road (north) Rowley Road East **Eleventh Road**
Local Distributor	Local Distributor roads are managed by local government. Their role is similar in both built up areas and rural areas, but traffic volumes and thus traffic management requirements differ significantly: <u>Built Up Area</u> Roads that carry traffic within a cell and link District Distributors or Primary Distributors at the boundary, to access roads. The route of Local Distributors should discourage through traffic so that the cell formed by the grid of higher order distributor roads, only carries traffic	Masters Road Briggs Road Larsen Road Walters Road Beenyup Road Abernethy Road Turner Road Orton Road Casuarina Road Coyle Road

Classification	Characteristics	Roads within the Shire
	belonging to, or serving the area. Local Distributors should accommodate buses, but discourage trucks. <u>Rural</u> Connect to other Rural Distributors and to Rural Access Roads. They are not Regional Distributors, but are designed for the efficient movement of people and goods within regional areas.	Gossage Road Bishop Road Norman Road Taylor Road Adams Street Richardson Street Keirnan Street Paterson Street Kargotich Road (south) Lowlands Road Rapids Road Summerfield Road Punrak Road Hall Road Hardey Road Fisher Road Elliott Road
Access Roads	Provide access to abutting properties with safety aspects having priority over the vehicle movement function. In urban areas, these roads are bicycle and pedestrian friendly, with aesthetics and amenity also important. Access Roads are managed by local government.	All other Streets

Source: Main Roads WA 2018 Road Information Mapping

Freight

The freight network in the Shire consists of a network of major roads plus the existing Kwinana Freight Rail Line. While every effort must be taken to separate freight from activity and residential areas in accordance with *SPP 5.4 Road and Rail Transport Noise and Freight Considerations in Land Use Planning*, some road freight traffic is still required to access businesses within centres and travel through areas where pedestrians and cyclists commute. The metropolitan-wide nature of freight movement restricts the Shire's ability to determine freight network locations. However it does allow the Shire capacity to work with State Government to negotiate the location of industrial areas and mitigate the effects of freight on local areas. Freight rail services connect major industrial locations and presently connect the Shire to Fremantle Port and Kwinana through Mundijong, and to Forrestfield, through Midland and to the north. There is also a freight line linking Jarrahdale to the Perth-Bunbury line.

Public Transport

Bus services within the Shire are presently very limited. Four services are routed along South Western Highway, one of which deviates into north Byford (route 254), one into south Byford (route 251), one terminates in Mundijong (route 252), and one continues to Jarrahdale (route 253). These services are infrequent, and all terminate at Armadale train station. Urbanisation in this corridor will increase demand for bus services, however there are no services to the employment centres to the east in Mandurah, Rockingham or Kwinana. For example, it would take well over two hours to travel by public transport from Mundijong to Rockingham or Mandurah, requiring two train and two bus trips.

The Perth-Bunbury railway runs through the middle of the Shire generally following the alignment of the South Western Highway. Commuter rail services currently terminate at Armadale, with the line south of Armadale used only for freight and the twice-daily Australind passenger service between Perth and Bunbury. There are railway stations for the Australind in both Byford and Mundijong.

Walking

Low walking levels are largely due to the disconnected street systems, lack of footpaths, unsafe routes and long distances to most destinations. There is ample documented evidence (for examples, refer to the Active Healthy by Design website[71]) that the design of the public realm and the movement network is a factor influencing the levels of physical activity and health in a community. Pedestrian infrastructure includes the built and planted features that provide amenities or affect pedestrian mobility, safety and comfort – these include the basic street pattern and road classification, as well as the provision of footpaths, pedestrian crossings, street trees, aesthetics and furniture.

Cycling

Australian road standards identify on-street cycling as acceptable on roads carrying traffic volumes of 3,000 vehicles a day (VPD) or less. Above this volume or near schools, stations or centres, or where long distance commuter or recreational cycling takes place, separate shared (pedestrian and cycle) paths are recommended. Where there are high volumes or high speeds of cyclists, dedicated off road cycle paths are recommended. The Shire is large and includes a range of traffic environments that present hazards for cyclists. To date there has been an ad-hoc approach to the development of cycle infrastructure, with many of the existing pathways not meeting current recommended cycle standards. Major networks are confined to existing established centres. The cycle network consists of Principal Shared Paths (PSPs), Recreational Shared Paths (RSPs), strategic routes and local routes. However, it is recognised that all roads (excluding controlled access highways) will continue to play a critical role in Perth and Peel's cycling network.

Cycling is an activity that benefits public health and should be encouraged through the provision of quality and connected facilities, interesting and relevant destinations (schools, employment centres, shops, recreation destinations) and pleasant and safe routes. There are two broad types of recreational cyclists in Western Australia, leisure cyclists and sports cyclists. To date the vast majority of infrastructure investment for cycling has focused on commuter and recreational cyclists, which has resulted in significant growth in cycling participation for recreation and transport purposes. Cycling is one of the most popular forms of recreation in the state, ranking third for males and fifth for females. The Perth Hills area, which includes part of the Shire, has become a prominent training route for cyclists. There is an opportunity to review this area to understand how it can be developed to cater for an increasing number of cyclists. There are also opportunities for tourism with part of the popular Munda Biddi Long Distance Off-Road Trail passing through the Shire via Serpentine and Keysbrook.

4.12.3 Future Transport Network

The transport network is crucial to support the growth of the Shire planned under the local planning strategy. Given the economic success of the Shire is strongly aligned with access to neighbouring local government areas, efficient transport links with these areas is very important.

Roads

Critical to the future prosperity of the Shire will be the provision of east-west road links that facilitate freight movements between industries and businesses located in the Shire and Tonkin Highway, which is a key link to markets via the ports (Fremantle, future Outer Harbour, Perth Airport, and Bunbury Port) and suppliers. East-west links will also facilitate movement between residential areas and the employment centres at Mandurah, Rockingham and Kwinana. There are a number of specific proposals already being considered to improve road connections, including:

- Southern Link Road;
- Tonkin Highway extension;
- Extension of Rowley Road;

[71] http://www.healthyactivebydesign.com.au/evidence-1

- Fremantle Rockingham Controlled Access Highway (FRCAH); and
- Anketell and Thomas Roads upgrade

Southern Link Road

The Southern Link Road (SLR) will connect the Brookton, Albany and South Western Highways with Tonkin Highway at Mundijong Road. Regional planning suggests the road will be required beyond 2050. The SLR will improve access for agricultural and freight traffic travelling from the Great Southern and Central Wheatbelt regions to metropolitan destinations, including the Western Trade Coast, in particular new container port facilities in the Outer Harbour. An alignment for the SLR has not been resolved and requires further investigation.

Tonkin Highway

The current Primary Regional Roads reservation for the Tonkin Highway extension in the MRS terminates at Mundijong Road. It will include interchanges within the Shire at Thomas Road, Orton Road, Bishop Road (half interchange), Mundijong Road and South Western Highway. The future Tonkin Highway will require a reserve of approximately 100m in width and key interchanges will be grade separated.

The need for a further southern extension, bypassing Pinjarra to the south and linking back to Forrest Highway at Greenlands Road (in the Shire of Murray) has been identified. This southern extension will service planned development in the Peel region, provide additional north-south capacity to reduce demand on the Kwinana Freeway, and provide an alternative to Kwinana Freeway for regional trips between Perth and areas to the south. Detailed planning for the route is yet to be undertaken. Until a future reservation is known, it will be difficult to make definitive plans for any land development in the area south of Mundijong Road, west of the South Western Highway.

Rowley Road Extension

Rowley Road extends from Kwinana Freeway to Tonkin Highway and is currently a local road under Shire control. In the future, Rowley Road will be the principal freight access route to the proposed new container port facilities in Kwinana. The road will be extended 8km to the west from its existing terminus at Kwinana Freeway, to Latitude 32 Industry Zone and then to the coast, connecting with the proposed Outer Harbour container and general cargo port facilities. The road will be constructed within the Rowley Road Transport Corridor, which includes provision for freight rail at the western end. Rowley Road is planned to be a four lane divided road between the Outer Harbour and Kwinana Freeway. Planning for a four lane divided standard between Kwinana Freeway and Tonkin Highway (partly within the Shire) is currently in progress. The road will be classified as a strategic freight route.

Mundijong Road

Mundijong Road / Watkins Road provides a key freight connection between Kwinana Freeway, Tonkin Highway and South Western Highway. At Kwinana Freeway, it connects into the future Fremantle Rockingham Controlled Access Highway (FRCAH) providing a link from the Western Trade Coast to planned industrial areas along Mundijong Road, including West Mundijong and North East Baldivis. At its eastern end, Mundijong Road connects to South Western Highway. Mundijong Road provides connectivity to the Kwinana Freeway for commuter and commercial traffic from Mundijong and surrounding areas. Mundijong Road will be upgraded to serve as a primary road link between the South Western Highway and the Kwinana Freeway.

Proposed Fremantle Rockingham Controlled Access Highway

The proposed FRCAH will provide high standard connectivity between the major industrial and commercial centres located within the south-west metropolitan corridor, serving the Western Trade Coast strategic industrial centre and the Rockingham industry zone. It will extend from Leach Highway to Kwinana Freeway

at Mundijong Road, following the Stock Road and Rockingham Road alignments, and then a new alignment to Kwinana Freeway. The FRCAH is planned to be a six lane freeway standard by 2050.

Anketell Road and Thomas Road

Anketell Road with Thomas Road east of Anketell Road provides a key freight connection between the Western Trade Coast, Kwinana Freeway and Tonkin Highway. The section of Anketell Road between Kwinana Freeway and Thomas Road is a local road under local government control. The road is planned to a four lane divided standard between Rockingham Road and Kwinana Freeway. Planning for a four lane divided standard between Kwinana Freeway and Thomas Road is currently in process. Anketell Road is classified as a strategic freight route. Anketell Road is part of the current High Wide Load network, carrying high, wide loads which are imported and exported through the Australian Marine Complex to Tonkin Highway and into the metropolitan area.

Thomas Road is constructed to a four lane divided standard west of Kwinana Freeway, including a short six lane section between Kwinana Freeway and Johnson Street. Between Kwinana Freeway and Tonkin Highway it is planned to a four lane divided standard. The section west of the Anketell Road intersection is classified as a major freight route, while the section east of the Anketell Road intersection to Tonkin Highway is classified as a strategic freight route and is part of the current High Wide Load network.

South Western Highway

South Western Highway is a high speed, inter-regional route extending from Armadale to Albany via Bunbury. Sections are constructed to a four lane divided standard through Armadale and Byford, and to a two lane rural highway standard further south. It is planned to be constructed to a four lane divided rural highway standard to Pinjarra Road. South Western Highway is an important freight route that services the mining and agricultural industries as well as carrying tourist and commuter traffic, and is classified as a major freight route south of Armadale Road. By 2050 South Western Highway will be upgraded to a four lane divided standard to Mundijong Road. Notwithstanding the extension of the Armadale rail line to Byford, the section of South Western Highway between Armadale Road and Mundijong Road will carry high passenger volumes by 2050. However, the Department of Transport considers that there is adequate road capacity for general traffic and buses without the need for transit priority.

Rail

Planning for new public transport services on new and existing infrastructure, should be closely aligned with land use planning. The extension of the passenger rail to Byford is identified as a METRONET project. The passenger rail station for Byford is identified within the Byford Town Centre under *Perth and Peel @ 3.5 Million*. The extension of the Armadale Line to Byford would allow the growing community of Byford to have a direct public transport connection to employment centres in Armadale, Cannington, and Perth. The location of the station within the Byford Town Centre will enable a transit-oriented development to increase walkability and reduce car dependency. This extension would involve the duplication, upgrading and electrification of approximately 10 kilometres of track in an existing railway reserve. The extension of the passenger rail to Mundijong will also be necessary as development in Mundijong and Whitby increases. A passenger rail station at the Whitby District Centre will be required to facilitate a transit-oriented development.

Freight

The efficient movement of freight in the Shire is required to satisfy the needs of local business and industry and encourage economic growth. Globalisation, increased processing as well as the general growth occurring throughout the Greater Perth Region is placing additional pressure on the freight network. In addition, the impact that freight movement imposes on local communities including noise pollution and severance along freight routes is a source of concern.

Planning for road freight is discussed in the 'Roads' section, above. The freight rail network is established, however the Shire would like to see a deviation of the line that currently bisects the Mundijong Whitby urban area, so that the rail line instead turns south on the western side of and parallel to the Tonkin Highway extension, connecting to the existing railway south of Mundijong Road. This realignment is indicated in *Perth and Peel @ 3.5 million*[72] and is strongly supported by the Shire as it would:

- Remove a constraint to urban development in Mundijong;
- Support the West Mundijong Industrial Area; and
- Provide an opportunity for an intermodal facility in West Mundijong.

The need for planning the realignment of the freight rail, including protecting land through reservation and planning for its implementation in conjunction with the southern extension of Tonkin Highway to avoid duplication of costly bridge infrastructure is critically important, particularly for urban development in Mundijong. An intermodal facility within the West Mundijong Industrial Area would provide a significant catalyst for industrial development as well as facilitate an effective link to the Bunbury Port for producers within the Shire and surrounding areas. The Department of Transport considers[73] that arterial freight routes serving the Western Trade Coast (Rowley Road, Anketell Road and Mundijong Road) carry much lower volumes than the freeway network and will operate at effective levels of service by 2050.

Pedestrian

There will be comprehensive pedestrian networks installed to connect schools, shops, and residential areas in new residential areas. The Shire is committed to reducing the physical, social and institutional barriers that limit the ability of people in the community to access their daily activities by means of walking. This will be achieved by:

- Maximising the pedestrian permeability of the street network and activity centres;
- Ensuring that heavily trafficked pedestrian routes accessing public transport are designed with an emphasis on pedestrian amenity and security;
- Providing quality pedestrian crossing facilities that prioritise safety; and
- Developing a pedestrian way finding and signage strategy within activity centres and residential streets.

Cycling

The Shire aims to implement a Shire-wide bicycle network that complements the *Perth Bicycle Network*[74]. Implementation of this will maximise cyclists' accessibility to recreational and community facilities, activity centres, residential areas, public transport and employment and encourage cycling as a mode of transport. Cycle networks may comprise recreational or commuter routes with elements located on and off road, within a permeable road network. Safety is integral, but different design treatments can be applied to reflect the functions of shared paths.

Current standards for bicycle parking are outlined in *Bicycle Parking Facilities: Updating the Austroads Guide to Traffic Management*[75]. This report provides recommended content for inclusion in the *Austroads Guide to Traffic Management Part 11: Parking*. It guides the design of bicycle parking facilities and helps identify appropriate provisions of bicycle parking and end-of-trip facilities. Providing sufficient bicycle parking can encourage bicycle use and the more efficient use high-value urban space. The Shire should consider requiring the provision of bicycle and end-of-trip parking facilities in accordance with these guidelines. Note that the guidelines suggest that a 10% bicycle mode share is considered to be a

[72] (Department of Planning, Lands and Heritage, 2018)
[73] (Department of Transpot , 2016)
[74] (Department of Transport, 2014)
[75] (Blackett, 2016)

reasonable starting point to accommodate the likely demand generated by land uses in an urban location. The Shire should consider adjusting this if higher rates of bicycle use are anticipated or targeted. The current recommended standards from the guidelines are outlined in Table 4-17 and Table 4-18.

Table 4-17: Austroads Bicycle Provision Rates

Land Use	Description	Peak Population Density	10% Mode Share Rate	
			Short-Stay[1]	Long-Stay[1]
Dwelling	Dwelling	-	0.02 spaces per dwelling[2]	Should be based on average bicycle ownership levels per dwelling type
Office	Office	20 m^2 GFA per employee[3]	0.05 spaces per 100m^2 GFA	0.45 spaces per 100 m^2 GFA
Shop	Shop	20 m^2 NFA per person[4]	0.4 spaces per 100 m^2 NFA	0.1 spaces per 100 m^2 NFA
	Department Store	27 m^2 NFA per person[4]	0.30 spaces per 100 m^2 NFA	0.07 spaces per 100 m^2 NFA
	Supermarket	14 m^2 NFA per person[4]	0.57 spaces per 100 m^2 NFA	0.14 spaces per 100 m^2 NFA
Retail	Bulky Goods Retail	27 m^2 NFA per person[4]	0.30 spaces per 100 m^2 NFA	0.07 spaces per 100 m^2 NFA
Education	Primary	-	-	0.3 spaces per student and staff[5]
	Secondary			0.3 spaces per student and staff[5]
	Tertiary			0.3 spaces per student and staff[5]
Accommodation	Hotel	-	-	0.1 space per staff
	Motel	-	-	0.1 space per staff
	Serviced Apartments	-	-	0.1 space per staff
Places of Assembly	Gallery, Museum, Library	-	0.1 space per visitor	0.1 space per staff
	Sports Facility	-	0.1 space per visitor	0.1 space per staff
	Community Centre	-	0.1 space per visitor	0.1 space per staff
Food and Drink Premises	Restaurant	-	0.1 spaces per seat	0.1 space per staff
	Take-Away Food	-	0.1 spaces per seat	0.1 space per staff
Health Services	Hospital	-	0.1 spaces per patient (max on site at one time)	0.1 spaces per staff
	Health Facility		0.1 spaces per patient (max on site at one time)	0.1 spaces per staff
Industry	Industry	50 m^2 NFA per person[6]	0.02 spaces per 100 m^2 NFA	0.18 spaces per 100 m^2 NFA

1 Short and long-stay splits of 10:90 for office and industry, and 80:20 for shop and retail applied
2 Short-stay rate based on Table 1 to Clause 52.34 of the Victorian Planning Provisions, unless otherwise advised
3 Based on the average employee density rate for offices in the *City of Melbourne (CLUE data, 2015)*
4 Based on comparative differences between the Victorian Planning Provision car parking rates to office
5 A 30% bicycle mode share parking rate has been indicated as it is considered to be a reasonable starting point
6 Based on the maximum rates permitted under the *Building Code of Australia (2010)*

Table 4-18: End-of-Trip Facilities Provision

Number of Showers	Change Rooms[1]
One shower for the first five bicycle spaces or part thereof, plus an additional shower for each 10 bicycle parking spaces thereafter.	One change room or direct access to a communal change room per shower.

1 The change room may be a combined shower/change room.

Note: In instances where more than one shower/change facility is required, there must be provision for separate male and female facilities. This is a requirement of the ACT Bicycle Parking General Code, 2008.

Airport

No airport is being planned within the Shire at present, however in due course a second civil airport for Perth and a second general aviation airport will be required and there may be land within the Shire that could be suitable, given its proximity to major population centres south of the existing Perth and Jandakot airports. Any planning at this time would be very high level and preliminary. An airport is major infrastructure however, so identification of a suitable site will be required far in advance of the need. Airservices Australia and other Commonwealth agencies such as Infrastructure Australia will ultimately be responsible for studies to locate suitable sites for a future second Perth metropolitan airport and a future second general aviation airport.

An airport would be a specialised activity centre and would bring significant economic opportunities, as well as various challenges related to environmental management, particularly aircraft noise. Although the need for another civil airport is beyond the planning timeframe for this local planning strategy, it is noted that limiting the urban footprint within the Shire will reduce the potential spread of population that could be impacted if a site within the Shire were ultimately to be selected for an airport. Proximity to a civil airport would greatly benefit Shire residents and businesses in terms of ease of access.

4.13 Infrastructure Services

Utilities such as water supply, waste water, electricity, gas and telecommunications are important services for all forms of development. Traditionally provision has been centralised, however this is changing as new technologies are challenging how services are delivered to customers. At present, service provision is still largely traditional and this must be allowed for in planning, however planning must also remain flexible enough to respond to alternative modes of delivery.

For example, improved efficiency and lower costs for photovoltaic cells could significantly reduce the amount of externally generated energy for individual developments. Massively more efficient batteries are already making storage of energy viable, meaning that the need to connect to the electricity grid may eventually disappear altogether for all but the very largest power users. Changes in regulation as well as technology are also making it more viable for private providers to enter the market, including for water supply and waste water treatment. Over time, land set aside for utility production and delivery, such as production plants, substations, and transmission corridors may no longer be required, or the amount of land may reduce or be more dispersed. Alternative and/or shared use of land may be desirable. On the other hand, sites for telecommunications infrastructure or other facilities may become more important.

All of these changes and others that are not yet known have the potential to significantly change the way development is designed. To the extent possible, it is important not to lock out future opportunities through commitment to potentially obsolete methods too early. This has been termed the “no regrets approach to infrastructure”, which separates the decisions that need to be made today from those that can be made tomorrow, while being mindful not to disregard options that could become viable in the future.

4.13.1 Waste Water

All subdivision and development is required to be connected to reticulated sewerage. As stated by the Government Sewerage Policy, reticulated sewerage remains the most reliable, efficient and environmentally acceptable means of sewage disposal that provides the flexibility to support the widest variety and changes of land use. Exemptions from this requirement will only be considered in specific areas and circumstances, and where it can be satisfied that public health or the environment will not be endangered.

The South Metropolitan Peel sub-region is currently served by wastewater treatment plants at Woodman Point, Kwinana, Point Peron, Gordon Road (Mandurah) and East Rockingham, as well as by smaller plants at Halls Head, Caddadup and Pinjarra. The first stage of a major wastewater treatment plant in the East Rockingham industrial area was completed in 2015. The new plant occupies about 31 hectares in the industrial area and has an environmental buffer zone to screen the plant and maintain adequate distance to dissipate any possible odours. The plant’s initial capacity is 20 million litres of wastewater a day. However, there is capacity to expand to cope with future demand depending on urban development and population densities.

The urban areas of Byford and Mundijong are either sewered or have access to a reticulated sewerage system. An indicative wastewater main has been identified along the alignment Mundijong Road and Hopkinson Road. No sewerage system is available in the rural and rural living areas of the Shire, which are serviced by on-site effluent disposal systems. The opportunity for alternative wastewater service providers should also be acknowledged and facilitated where appropriate within the Shire. This an important option for investigation in remote urban areas, such as Serpentine, where servicing constraints may prevent further urban development.

4.13.2 Water Supply

In the South Metropolitan Peel sub-region, water is transferred from sources to treatment and storage facilities by trunk mains that traverse the sub-region. Major water storage reservoirs will be necessary in the escarpment to serve long-term urban development in both Byford and Mundijong. A reticulated water supply is available to all urban areas of the Shire and some semi-rural areas. All rural areas are serviced by rain water tanks or groundwater bores or a combination of the two. A reticulated water supply is required for all new residential lots and some rural living lots.

The Water Corporation's existing water supply infrastructure that serves the South Metropolitan Peel sub-region includes several key water sources including surface water, groundwater and desalinated seawater. The Serpentine and Wungong Dams are found in the Shire area. The Shire's most significant groundwater resources underlie the Swan Coastal Plain. This includes the superficial aquifers of the Leederville and Yarragadee. There is an opportunity to investigate managed aquifer recharge, which can provide an option for fit-for-purpose water supply in areas where water sources are limited. There is an existing water reservoir to the east of Byford which supplies water to the Byford urban area via a water main. Water is currently supplied to Mundijong via an off-take from the Serpentine Trunk Main at Wright Road, approximately 5.5 kilometres to the south of the town. Water is conveyed to Mundijong via a distribution main. The Shire is recognised as a Waterwise Council internationally and should continue to encourage and facilitate water use efficiency. The opportunity for alternative water service providers should also be acknowledged and facilitated where appropriate for current and future water assets within the Shire.

4.13.3 Drainage

As the western half of the Shire is situated on the Swan Coastal Plain and is largely palusplain, drainage has been a consideration in this area since the earliest days of settlement. The Shire is part of the Mundijong Drainage District, a rural drainage system, which includes main drains controlled by the Water Corporation. This includes the Birriga and Oaklands Main Drains, which discharge into the Serpentine River and eventually the Peel-Harvey Estuary. Under the *Water Services Act 2012* the Minister for Water can also declare a natural feature (such as a creek) a drainage asset of a licensee. Where the asset is built by a licensee, the drain belongs to that licensee. Developments within this catchment are required to contain the flows from a one in 100 year storm event on site. Discharge to the Water Corporation main drains must be compensated to pre-development levels. Maintaining pre-development discharge rates and volumes from developed catchments is expected to prevent the majority of contaminants from reaching the waterways by ensuring that the majority of flows from high-frequency events are detained or infiltrated on site. However, protecting the water quality of drainage systems from pollutants is a serious concern, especially given that the majority of the Shire is located within the Peel-Harvey Catchment.

Rural drains are not designed to give flood protection at all times and some inundation of land can be expected. The Water Corporation maintains its existing drains to ensure they are capable of clearing water from adjacent rural properties within three days of a storm event, where contours and internal drainage make this physically possible. Flood mitigation measures are focussed on correct planning for appropriate land use in structure plan areas and setting aside the land required for floodplain inundation depths. No local urban drainage connections will be permitted into rural drains. Drainage must be considered at all stages of the planning process and principles and practices of water sensitive urban design and integrated water cycle management must be employed in both urban and rural contexts.

4.13.4 Energy

Western Power's Transmission Network Development Plan (TNDP) and Long-term Network Development Plans (LNDPs) provide the strategic vision, over a 25-year horizon, required to ensure the efficient development of various load areas on the network. Western Power is currently preparing and reviewing its TNDP and LNDPs for transmission infrastructure contained in the Perth and Peel regions and across its entire network. As part of future expansion of the transmission network, new line routes, substations and

terminals will be required. Line routes include the establishment of a corridor to support the transmission lines and associated:

- towers, poles and the associated foundations;
- conductors and insulators;
- access tracks;
- pole and tower site inspection and maintenance areas;
- electrical safety and fire safety clearance standards;
- brake/winch sites approximately every 10km; and
- other ancillary infrastructure such as washdown bays and communication infrastructure sites.

Corridor design is essentially influenced by required span lengths, number of circuits, configuration of circuits, structure height, conducted types and insulator type. Substations and terminals provide multiple functions, including transformation of electricity from high to low voltage or vice versa, or provision of a switching point for a number of transmission lines. Both corridors and site requirements are fundamentally influenced by technical and economic considerations, and also by environmental and community impacts as part of an options analysis process. Higher voltage transmission line infrastructure is typically located within designated easements across a variety of tenure and zonings.

Existing urban areas are serviced by either overhead or underground power. All new subdivisions for either residential or industrial require the provision of underground power. The Shire has a number of high voltage power lines. An existing 330 kilovolt high voltage transmission line traverses the Shire. A further 330Kv line runs through the State forest. A new Western Power substation investigation is proposed in Cardup and at Thomas Road, near the Nicholson Road intersection. A new Western Power terminal is also proposed at the Thomas Road location.

The majority of energy used within the Shire comes from fossil fuels. There has been tremendous growth in alternative and renewable energy technologies and these should be encouraged within the Shire through policy initiatives. A recent report by the Australian Energy Market Operator (AEMO)[76] included forecasts that consumer take-up of improved energy management technology, more energy efficient devices, and distributed generation options such as rooftop solar photovoltaic (PV), is changing the way households and businesses consume energy, impacting traditional consumption patterns and peak demand profiles in the South-West Interconnected System (SWIS). The report shows that forecast growth in rooftop solar PV, energy efficiency, battery storage and in-home energy monitoring devices is expected to result in slow electricity consumption growth from the SWIS over the 10-year outlook.

The effects of these new technologies are already being seen, with rooftop solar PV systems installed by one in five residential customers, and more energy efficient new appliances replacing older models. Consumer uptake of energy management systems including battery storage technology is expected to continue this trend and not only reduce demand from the network, but also shift peak demand to later in the day. However Western Australia trails behind other states in terms of per capita electricity demand, so to the extent possible, Shire planning requirements and policies should promote lower demand and more sustainable energy supply.

4.13.5 Gas

The Shire is currently reticulated with gas by ATCO Australia's gas network which consists of high pressure gas pipe lines. Alinta is the gas retailer. Existing gas mains in the Shire are provided to new urban areas and there are currently no constraints to the provision of gas to these areas. Adequate gas supply is particularly important in industrial areas and failure to ensure this is provided will significantly reduce attraction of

[76] (Australian Energy Market Operator, 2016)

some industries, such as many food processing activities, that rely on high volume, high pressure gas supply.

4.13.6 Telecommunications

There are a number of mobile telephone, television and radio towers which operate within the Shire. All infrastructure is assessed having regard to the requirements of the *Telecommunications Act 1997* and State and local planning provisions and policy requirements. A number of the current facilities include antennae designated 'Low Impact' facilities. The National Broadband Network rollout is progressing within Western Australia including the Shire. The Shire should continue to monitor the project and ensure that heritage and environmentally significant areas are protected from broadband infrastructure. As telecommunications technology advances, fewer households are connecting to fixed telephone lines, or may use them only for monitored security services. Wireless technology is becoming ever more important and the infrastructure to support this must be accommodated, but at the same time it will be important that it does not adversely impact the amenity of the Shire.

4.13.7 New Technologies

It will be important to ensure that development in the Shire is not hampered by inadequate infrastructure to meet the needs of emerging technologies. Telecommunications such as high-speed internet are likely to be especially important to support economic development, but the infrastructure requirements for such things as autonomous vehicle technology and drones should be monitored and the Shire should take a proactive role in promoting and/or facilitating provision of infrastructure that will help the Shire stay ahead. Particularly in newly developing areas it is highly desirable to ensure that the most adaptable and resilient systems are installed.

5 Key Planning Issues

5.1 Housing and Population Growth

It is necessary to prepare for an ultimate population of over 100,000. Whether this population is realised by 2050 does not remove the need to ensure that the population can be accommodated when required, and this means housing, social and community services, and supporting infrastructure including community, utility and transport infrastructure. A particular challenge will be providing infrastructure with adequate capacity in a timely manner without burdening the community and economy in the short term with the cost of providing infrastructure that may not be required for many years. This will require considerable coordination between local and State government and also with developers.

Accommodating population growth and a significant number of new residential dwellings by 2050 will require significant increases in dwelling density if valued rural land and landscapes are not to be consumed by a continuation of the unsustainable low density urban sprawl that has characterised so much suburban development to date. Residential density and dwelling types are not automatically linked. It is possible to have housing forms other than detached single dwellings in R20 coded areas, for example, but it is not happening. Whilst developers may argue that they are responding to market demand, the Shire will need to do more to require diversity of dwelling types as well as diversity of density if the needs of the future are to be met.

One issue discouraging implementation of higher density housing in what is essentially a peri-urban area is the lack of connectivity and public transport. The early introduction of east-west links and public transport options is important to ensure that the much-needed higher densities are viable. The built form being realised is almost exclusively single detached housing even on R30 sites. It will be particularly important to ensure that underdevelopment of land in locations close to public transport and amenities such as shops and retail services is not permitted. Much of the future built form of Byford, for example, is already built, leaving only some areas to achieve the necessary density increases. Even within particular housing typologies there is a need for diversity. For example, apartments need to be designed to meet the needs of families, share households, couples and singles – owner occupiers as well as renters. Detached houses do not all have to have four bedrooms, nor does every household find that one 'master suite' and the rest 'children's rooms' suit their needs. Smaller homes on larger lots to provide the option for large backyards and the range of activities that these lend themselves to are also rare. Increasing numbers of single person households has been a trend in Australia for some time and shows no sign of slowing down. The prevailing housing type being provided within the Shire to date is detached housing, which naturally attracts families and larger households and limits the options for other types of households.

There is a lack of housing diversity in terms of both land parcel size and housing type to meet the future needs of the Shire's population. The vast majority of new dwellings currently being provided are detached single houses aimed at low income, first-home buyers. This risks creating a socially and economically vulnerable population. Achieving both housing diversity and increased net density in suburban development requires careful consideration of the:

- Range of lot sizes provided in any given development area with a view to both immediate housing provision and future infill opportunities;
- Shape of lots to accommodate different housing typologies in the short term and over time (irregular shaped lots being more difficult to develop and redevelop;
- Dwelling size and mix provided within any given development area; and
- Ability of dwellings to be adapted/converted to suit different household types without the need for demolition or extensive and expensive renovation.

Although a significant proportion of new housing in the Shire targets the 'first home owner' and is relatively cheap to buy, the issue of affordable housing is one that must be taken seriously. Increases in interest rates will occur sooner or later, and this will greatly impact the ability of many home buyers at the lower end of the market to continue to meet mortgage obligations. Many older people including retirees are still paying off mortgages. The supply and affordability of suitable housing across the spectrum is a major concern for society and one that can be influenced, although not solved by planning controls. There is a myriad of social problems that would be exacerbated by housing stress, which would have negative impacts on the community.

Related to both housing affordability and diversity is the ability of housing to be adapted to changing needs of occupants as they age or as their requirements change. The design and construction of buildings will affect the ease and cost at which they can be adapted. For example, a large family home could, if suitably designed, be readily converted into two dwellings – allowing 'empty nesters' to stay in their downsized home whilst allowing another household to occupy the created second dwelling. The planning scheme has limited (but some) ability to influence construction techniques, but can facilitate housing conversions by not unnecessarily limiting the type of housing that can be permitted.

5.2 Economy

The Shire is a high growth local government area facing a number of challenges as a result of current and projected growth for the area. These include:

- Encouraging economic and business development within the Shire to increase local employment opportunities and strengthen the local economy;
- Accommodating significant population growth;
- Diversifying and expanding the largely agricultural economic base in response to contextual challenges and opportunities, in areas of competitive, comparative and collaborative advantage within the regional setting;
- Preserving and enhancing the Shire's rural character and role as regional food bowl and food exporter, in the face of population growth and major climate change impacts; and
- Achieving sustainable, water sensitive and energy efficient development and infrastructure outcomes, enhancing biodiversity and developing sustainable social and governance structures to support the Shire's growth.

Employment

The provision of employment for a rapidly growing population will be a key issue. Population growth will not generate all the jobs required for the anticipated future population. Jobs growth needs to be driven by economic expansion and diversification in the Shire and the wider Peel region. There are several nationwide risk elements that are expected to influence future employment opportunities in the Shire. Over the period 2010 to 2015 more jobs were created in Australia (751,100) than were lost (185,400). However, jobs were created in sectors that are likely to continue to grow over the longer term, namely high skilled quaternary and the out-sourcing quinary sectors, for example:

- Professional and technical services;
- Education;
- Hospitality;
- Retail;
- Public administration and safety;
- Arts and recreation; and
- Personal services.

Two sectors that are important to the Shire and its region, both now and for future employment, namely agriculture (in the Shire) and manufacturing (in the region) showed a net decline Australia-wide. This is

evidence of a long-term trend identified with substantial long-term contraction of the proportion of jobs in traditional primary, secondary and tertiary sectors and growth in quaternary and quinary sectors. Planning for the Shire must account for these changes. Given its location and current economic base this is very challenging. It implies that not only must the existing economic base be expanded, it must also be extended to include related services and new product development and new service and knowledge industries. In summary:

- As the population grows, demand for health and community services will continue to increase employment opportunities in this sector;
- Growing wages and demand for skilled employees will provide opportunities for employment over the next five years, as the economy transitions from manufacturing to service and knowledge-based industries;
- Demand for professionals with advanced degrees is expected to rise and more employees are likely to upskill or reskill to satisfy growing employer requirements for knowledgeable staff;
- The economy of the shire must grow and diversify to match population growth.

Economic Development for Employment

Opportunities for economic growth exist in three traditional sectors, namely the agricultural, equestrian and tourism sectors. Opportunities in industrial development are also possible if important infrastructure is provided. Agriculture is a critical contributor to the Peel's economy and based on current global and national trends, the industry has enormous potential for growth. Increased demand for food across the world will create new export opportunities for the Australian food industry. Asian food demand in particular is expected to outpace local food production, leading to higher imports to the region. The combination of good agricultural soils (especially on the lower slopes of the Darling Ranges) and palusplain soils (on the Coastal Plain) provides a mix of agricultural opportunities to the Shire. Preservation of the opportunities for expansion of agriculture and associated pursuits (e.g. the equine industry and rural-oriented tourism) is a key challenge for the next stage of planning. A number of measures are possible to assist this:

- Manage urban growth boundaries to ensure land values remain at a level that will make agricultural and related uses viable; and
- Retain large lots to ensure access to well positioned land for productive use is possible.

Improved transport connections would increase potential for the following industries to locate in the Shire:

- Freight and logistics uses (possibly including an intermodal terminal, but subject to several precedent conditions being in place);
- Food processing uses (taking advantage of access to inputs and to labour); and
- Manufacturing and/or fabrication.

The equine industry is important in the Shire and it is expected to expand. Common economic activities that support the equine industry such as fodder, agistment, veterinarian, stabling, saddlery, etc. will be focussed in the region. Due to the potential incompatibility of equestrian activity, particularly intensive types, with some other rural activities and with residential areas, it will be important to ensure that areas are available for the location of equestrian related activity and employment opportunities.

Being within the Peel region which offers a highly diverse tourism base ranging from beaches, water activities, walking trails, national parks, nature reserves and wineries, all of which are supported by a variety of accommodation options from camping through to deluxe hotels, is an opportunity for the Shire. The tourism industry in the Peel region is largely fuelled by the day visitor and overnight domestic tourism markets, with increasing demand from international markets. There are good tourism product offerings and varied and competitive accommodation options. The peri-urban areas of the shire have a unique relationship with the tourism centres in the Peel region and both influence each other's growth and change.

Planning for the future will need to consider how development is managed in peri-urban areas to ensure natural assets are protected and local communities continue to prosper.

Social Challenge

Regional SEIFA data indicates the Shire is in a region with many suburbs with comparatively low levels of education and occupation and comparatively high levels of disadvantage. Given the location of the Shire on the urban fringe, one scenario is that this pattern will be repeated as Byford and Mundijong are further developed, with housing at relatively low cost attracting a high proportion of people on low incomes, with low levels of educational attainment and in lower skilled jobs. The data indicates that this also is correlated with high levels of disadvantage (high levels of youth unemployment is a regular feature) and consequent high needs for support services.

A critical planning task is therefore to minimise the risk of this scenario and to ensure measures are in place to deal with any of its effects as they arise. Concerted effort by the Shire will be required to maximise the economic potential of industries to provide employment opportunities, which includes education opportunities to provide skilled labour.

Activity Centres

One of the most significant constraints in the development of major activity centres is the difficulty in consolidating land parcels where a long established centre enters a growth phase. Securing and managing land resources and establishing a sustainable program for infrastructure provision required for long-term development is an important foundational principle to ensure that activity centres in the Shire will be able to achieve their long term roles. Similarly the long term planning of the infrastructure system requirements needs to be undertaken prior to the growth phase.

5.3 Environment

The key environmental context and considerations are summarised as follows:

- Increasing population and settlement which requires the planning and development of new communities and associated infrastructure;
- Declining rainfall and increasing temperatures have the potential to impact on the health of the environment and the community, as well as the maintenance of public lands and capacity of infrastructure systems including those managed by the Shire;
- The landforms of the Shire, which comprise the Swan Coastal Plain in the west, the Darling Scarp, and the Darling Plateau in the east, underpin the soil, water and vegetation characteristics and their associated issues. The broad environmental issues associated with each land form are as follows:
- Swan Coastal Plain – is largely seasonally waterlogged, with sands over clays at risk of erosion, waterlogging, nutrient export and acidification. This area has been extensively cleared for agricultural and residential uses;
- Darling Scarp – comprises steep gradients where the risk of erosion increases with clearing of vegetation; and
- Darling Plateau – which is mostly vegetated, with incised valleys containing waterways and dams. Gravel pits and rock quarries are located towards the edge of the plateau and along the scarp.
- Minerals and basic raw material extraction is occurring throughout the Shire. Any further extraction has the potential to impact on the health of the community and the environment through loss of vegetation, erosion, noise, dust and light. Consideration should be given to the potential future use of the site and requirements for rehabilitation on closure;
- The Shire is located in the catchment of the RAMSAR-listed Peel-Yalgorup system which terminates in the Peel-Harvey Estuary. This system has historically been impacted by high levels of nutrients, predominantly from agricultural land uses, which reach the estuary via both surface and groundwater pathways. Consideration should be given to the location of any land use which is likely to result in increased transport of nutrients to surface and/or groundwater, including actions to

manage the risk to the Estuary. This includes residential, rural residential, agricultural and industrial uses;
- A portion of the Jandakot Groundwater Mound is located within the Shire. Land use within the public drinking water source area must be consistent with *SPP 2.3: Jandakot groundwater protection* and address risks to the water quality of the water source;
- Groundwater in the Leederville aquifer throughout the Shire is mostly allocated, although some capacity remains within the superficial aquifer to supply groundwater for non-drinking water needs which may include irrigation of public open space and for agriculture, as well as for industrial use where the quality is fit-for-purpose;
- Areas of the Shire are subject to the risk of flooding. This is largely associated with drains running across the Swan Coastal Plain portion, which are managed to achieve either rural or urban drainage standards. It should be noted that flood mapping has not been completed for all waterways and any new development in proximity to a waterway or drain will need to consider flood risk, consistent with *SPP 2.9: Water Resources*;
- Less than 10% of the vegetation complexes across the Swan Coastal Plain portion of the Shire are currently contained in secure conservation reserves, with only 12% remaining uncleared. The *Local Biodiversity Strategy*[77] provides targets for the conservation of important biodiversity values. Although the strategy is being implemented through an incentives strategy for conservation on private land, limited additional protection has been achieved. Consideration should be given to the prioritisation of protection of Local Natural Areas for incorporation into LPS 3; and
- The majority of the Shire is indicated as being located within a Bush Fire Prone Area of Western Australia as designated by the Fire and Emergency Services (FES) Commissioner. Any future planning and development within a designated Bush Fire Prone area should be consistent with the requirements of *SPP 3.7 Planning in Bushfire Prone Areas*.

Within this local environmental context, consideration should also be given to emerging global, national and regional environmental priorities. These include:

- Climate change leading, in addition to the issues raised above, to global (land and ocean) temperature rise, sea level rise, ocean acidification and increases in extreme weather;
- Reducing greenhouse gas emissions and energy use through improved energy efficiency and increased use of renewable energy;
- Reducing resource consumption and a move towards community acceptance of smaller environmental footprints;
- Innovation leading to the creation of new ways to address sustaining problems including poorly functioning communities, water scarcity and congestion, which result in improved urban form and optimised delivery of services and infrastructure; and
- Enhanced liveability of communities which are adaptive and able to respond to changing environments and community priorities.

The community's desire for a sustainable, connected and thriving community into the future supports many opportunities for environmental innovations. Key areas of focus may include:

- Local-scale service provision which enables disconnection of communities from large centralised systems. This includes locally supplied power, water, wastewater and non-drinking water. Consideration could also be given to decentralised waste-management strategies which optimise reuse and recycling of waste materials;
- Local food supply including native food (bush tucker: quandongs, bush tomatoes, and native citrus) which reduces transport needs, provides local employment and optimises closed-circuit practices including industrial ecology techniques;

[77] (Ironbark Environmental, 2008)

- Improved built form which does not require imported fill for development on clay soils or in areas of high groundwater. The urban form should also respond to local climate conditions including prevailing winds (breezes) and maximise amenity through green infrastructure;
- Provision of "lifestyle lots" in a manner which does not impact on good quality and productive farmland or areas of high biodiversity value. This may include areas immediately surrounding satellite communities which self-supply their water, sewerage and power needs; and
- Eco-tourism opportunities which celebrate the unique natural beauty and biodiversity of the Shire. This may include accommodation, entertainment and artistic opportunities as well as adventure and recreational activities. This could be extended to educational opportunities associated with practical and on-ground environmental learning.

Climate

As the impacts of climate change coupled with natural climate variability continue, temperature increases are likely to result in increased needs for cooling and/or impacts on environmental and public health. Housing and building design needs to respond to incorporate passive cooling techniques (and heating in winter) to reduce the need for energy consuming (and heat generating) mechanical air conditioning. Additionally, the 'urban heat island' effects on public health and energy consumption resulting from heat generating technologies such as air conditioning as well as reduced tree canopy from clearing of vegetation for new development and smaller domestic gardens and infill of large lots need to be given serious weight in requirements for new development. 'Green' technologies should be favoured and if not provided in new developments in the first instance then provision made in the initial design for later introduction at minimal cost to the public and private purses. The design of public spaces must include the provision of shade; heat absorbing surfaces such as hardstand areas including road surfaces must be minimised, and shade tree planting along with other heat absorbing vegetation provided.

Changes in rainfall patterns, particularly as a result of more intensive storm events but overall reductions in rainfall, may result in localised flooding and pressure on stormwater systems, as well as pressure on available water sources. Water sensitive urban and building design including multi-use drainage infrastructure, sewage mining and other techniques will be important to reduce water consumption, minimise waste, and encourage recycling and reuse of waste. Another result of climate change/global warming is expected to be more frequent extreme weather events including storms and bushfire, which may require improved emergency management responses and plans, infrastructure to adequately withstand and manage extreme weather conditions, and generally more resilient built environments.

Air Quality

In terms of air quality, dust, haze/smog and greenhouse gas emissions are the most likely negative impacts that can arise with increased development. Odour and noise are other considerations. Buffers around emitting activities and active management of high-risk activities can protect the community and nearby residents from most negative impacts on air quality, but greenhouse gas emissions cannot be contained by buffers and require smarter and more responsible design, construction and operation of developments – whether residential, agricultural, commercial or industrial.

Vehicle emissions can be reduced by the use of cleaner transport technologies, which is somewhat outside of the Shire's influence, and the encouragement of clean forms of transport such as walking, cycling and mass transit (which results in less emissions per capita). The latter can be influenced by the shire's planning scheme and policies relating to urban design and development, and a strong emphasis on integrated transport planning.

Strong encouragement of soft landscaping (vegetation) and minimal clearing of vegetation will also assist because vegetation helps clean the atmosphere including helping to reduce dust drift and muffle noise. Appropriate siting of sensitive land uses in relation to emitting activities including freight routes will also help protect the community from these negative impacts.

Minerals and basic raw materials

Whilst mining and extractive industries are important economic activities they also result in clearing of vegetation and a loss of biodiversity. Extraction can also lead to erosion where natural drainage patterns are disrupted or simply through the exposure of soils to the elements. Mining activities also impact on the visual landscape and can result in off-site impacts on nearly land uses including dust, noise and light. At the same time, strategic basic raw materials locations should be protected from incompatible development until such time as the resources have been proven and extracted, or deemed unviable. Progressive and environmentally appropriate remediation of mine sites after resources have been extracted is also important to ensure that the land can be used for other suitable purposes in the future.

Soils

The soils of the Shire are typically high in legacy nutrients resulting from historic agricultural land use on the palusplain and the presence of saturated clays with the tendency to absorb nutrients. The movement of groundwater via sub-soil drainage or similar can transport the nutrients to a receiving water body more rapidly than what would occur naturally. This is particularly important in the Peel Harvey catchment, which has been identified at significant risk of eutrophication.

This means that proposed developments need to be designed and located sensitively to ensure that further nutrients are not released into sensitive soils and that drainage systems strip any nutrients in stormwater and ground water before it is able to enter receiving water bodies. For agriculture and other rural land uses, soil capability assessment will be an important consideration to ensure soil is not degraded or polluted by activities taking place upon it. Development in areas of seasonally waterlogged soils must be constructed to withstand these conditions. This has traditionally required the use of fill; however, declining access to said fill is likely to lead to the use of alternative construction techniques and footings and this is to be encouraged to minimise modification to natural drainage patterns.

Erosion is a risk from clearing, whether for agricultural, urban or other uses, particularly along the Darling Scarp. Erosion can lead to loss of sediments to receiving waterbodies. Clearing of vegetation is to be minimised and in the case of mining operations, staged revegetation of mined areas is required. Vegetation retention also assists in the maintenance of soil health. Declining soil and land quality can occur as a result of development where acid sulphate soils are disturbed. This leads to the release of acid and heavy metals which can cause significant harm to the environment and infrastructure. Appropriate management of acid sulphate soils is required, particularly in areas of medium and high risk where changes in groundwater are likely or mining is proposed, consistent with current best practice.

Consideration should be given to the remediation of contaminated sites as part of any future development. Landfill sites are a current and ongoing source of pollution of soil and water. There is a large regional facility at South Cardup, and a decommissioned Shire landfill on Watkins Road, Mundijong. Unsewered residential and industrial areas also have the potential to lead to contamination of land and groundwater and alternative treatment units should be used in areas of high environmental risk.

Biodiversity

Ecological linkages are important to facilitate fauna movement and species adaptation to changing climate and conditions. Unfortunately some of these linkages are associated with infrastructure corridors, and where this is the case liaison with the responsible agency is required to achieve multiple objectives including biodiversity conservation through, for example, modification to the reserve purpose. Consideration should be given to contemporary mechanisms to achieve appropriate tree coverage across the Shire. There are a number of issues that affect the viability of conservation areas, which need to be actively managed by the Shire. These include:

- Uncontrolled access leading to direct loss of biodiversity as well as impacts from rubbish dumping, weeds and bushfires;

- Jarrah Dieback disease (*Phytophthora cinnamomi*) which affects vast areas of the jarrah forest has been identified in several of the Shire's TECs and is known to occur throughout the area. It spreads through water and transport of infected soil, gravel and other materials;.
- The aggressive weeds watsonia and lovegrass affect many Shire reserves with high biodiversity values. Many Shire reserves suffer from high levels of disturbance, and this encourages weed invasion; and
- Feral animals, especially cats, rabbits and foxes, have a major impact on the native flora and fauna.

Water Resources

Altered hydrology is a key water resource consideration. Filling of land has resulted in a loss of wetlands and the installation of drains has significantly altered the natural hydrology of the landscape. This results in a loss of environmental values. Consideration must be given to the natural water cycle as part of any future development in order to re-establish lost values and design systems to cope with soil waterlogging and minimise nutrient and sediment export. Conventional building practices are designed for sandy sites with good separation to groundwater. Alternative building practices including appropriate footings which do not require the use of fill should be encouraged across the Swan Coastal Plain. This will require closer review in structure plans and associated water management plans. Infrastructure should be designed in meet appropriate standards.

The Shire stipulates a high standard of water sensitive urban design in areas of new development, with particular focus on treatment of sub-soil drainage. This practice should be maintained through all new development. Although it is recognised that the Shire is a Waterwise Council, these principles should also be adopted for the design and irrigation of public open spaces. Although unallocated groundwater is still available in most parts of the superficial aquifer, declining rainfall may result in reduced recharge and consequently availability in the future. Therefore, efficient use of water resources is required to avoid wasting this precious resource. Flooding from stormwater is risk in urban and rural areas The Shire will need to ensure adequate stormwater management and that the quality of stormwater is acceptable.

Over 90% of the Shire is in the Peel Harvey catchment, and the estuary's ecosystem is under pressure from eutrophication. Many land uses contribute nutrients to the estuary and impact on the Serpentine River and other waterways, including the artificial drains. As intensive and residential land use grows, there is a risk of increasing nutrient export. Landfill sites are a potential source of pollutants to ground and surface waters, and must be carefully designed, managed and monitored to avoid impacts.

5.4 Rural

Rural land in peri-urban locations like Serpentine Jarrahdale is under constant threat from urban and other intensive forms of development. Encroachment of urban and non-rural development into rural areas reduces the availability of rural land for legitimate rural activities and threatens the viability of rural activities that may be incompatible with the more intensive and sensitive development that comes with urban development.The willingness of buyers to pay more per square metre for smaller rural lots means there will be constant developer and landowner pressure to subdivide rural areas to smaller sizes if possible. Encroachment of rural industrial activities into rural residential areas to take advantage of smaller lot sizes is also creating conflict between these uses and the amenity of rural lifestyle developments.

It is critical that the landscape, environmental and indeed economic values of rural land be recognised and protected. Unless there is a clear message that further encroachment of urban development and further fragmentation of land zoned Rural for non-productive purposes will not be contemplated, there is likely to be speculation and pressure for further rezoning. The highly valued rural character of the Shire will be severely compromised if not destroyed if urban development is permitted to continually sprawl outwards. Residents of the urbanised parts of the Shire will be denied the easy access to the beauty and amenity of that is currently enjoyed. Primary producers will be pushed out of the area by rising land values and

associated costs, and the economic and employment opportunities associated with retaining the rural areas, such as local food production, development of equine-related businesses, and tourism will be lost. The issues include:

- Pressure to rezone rural land for urban development;
- Pressure to further subdivide rural land for rural-residential lots, particularly in locations where provision of supporting utility, service, and community infrastructure cannot be guaranteed or is very expensive;
- Pressure to use rural-residential lots for rural industries, intensive agriculture, and other activities that are incompatible with rural lifestyle lots;
- Pressure for non-rural activities to locate on rural zoned land (eg: private schools) due to unavailability of suitable and/or affordable land in urban locations;
- Loss by subdivision of large rural lots suitable for extensive agriculture and agriculture requiring buffers (such as poultry farms and piggeries);
- Need to accommodate high-value, intensive forms of agriculture and animal husbandry, and rural industries, without risking environmental assets such as surface and groundwater;
- Need to protect the rural landscape from inappropriate forms of development;
- Greater priority being given by the State to agriculture as a generator of economic growth and employment, particularly in light of potential growth of the export markets in Asia and elsewhere for Australian produced and processed food; and
- Importance for rural producers, particularly those with markets beyond Perth, to have excellent access to the freight movement network including ports.

Given that rural land uses are diverse but not universally compatible with one another or with urban development, appropriate zoning of land is required to provide for a range of rural activities whilst minimising adverse impacts on other land uses, the landscape, and the environment. Consolidation of 'like' or compatible rural activities in appropriate locations is recommended. Careful consideration must be given to the range of non-rural uses that can be permitted within each zone to ensure that the intended range of rural activities cannot be jeopardised by approval of land uses that incompatible land uses, or activities that will result in land values that make the desired rural uses unviable.

5.5 Transport

Possibly the greatest transport immediate issue for the Shire is the lack of adequate public transport services to enable residents in the growing urban areas or elsewhere to be able to conveniently access employment and education opportunities. Public transport is infrequent, circuitous, and takes a very long time. Public transport connections to employment centres to the west is very poor, with trips of over two hours' duration from Byford, Mundijong and Serpentine. The nearest commuter train station is in Armadale. This forces a dependence on private vehicles that is unsustainable and inequitable. A passenger rail service to Byford and Mundijong is highly desirable. East-west road and rail connections are critical to provide adequate access to the major employment centres of Kwinana and Rockingham, as well as to provide essential freight links to the ports. A rapid transit route along the Mundijong Road alignment to address public transport deficiencies in that direction should be investigated.

Pedestrian and cycle networks are poor and must be improved and well connected. Structure plans for urban areas will gradually address suburban and town centre networks but implementation of a district-wide network for commuter and recreational cyclists is also required. Consideration should also be given to identification and promotion of key tourist and recreational routes for cars, buses, pedestrians/hikers and cyclists.

Detailed feasibility investigations to realign the freight rail are necessary given the serious implications of the freight rail on the development of the Mundijong Whitby urban cell. The current alignment splits the cell in two, which with 34 freight train movements a day (at present) threatens the ability to create a single

significant town centre. Increased road traffic and informal pedestrian crossings of the railway will create a growing and ultimately significant safety and urban amenity problem. Relocating the freight railway to the west, abutting the Tonkin Highway reserve would prevent these issues and may reduce the need for grade separated crossings. A western re-alignment will also best serve the proposed industrial area in West Mundijong by making it possible to provide a rail/road intermodal terminal. There is now an urgent need to protect land for the new alignment. Definition and protection of the Tonkin Highway extension south of Mundijong Road is also required as soon as possible, to provide certainty for planning and development of land in this area.

New transport technologies such as intelligent transport systems, autonomous vehicles, on-demand public transport, electric cars and bicycles, drone deliveries, very fast trains, hyperloop systems and as yet unknown developments will require the transport network and its management to adapt. Although much of what will be implemented is uncertain, it will be necessary to remain flexible to allow for adaptation. The design of car parks, for example, particularly within buildings accommodating other uses such as commercial and residential, needs to be adaptable so as the need for car parking reduces, the space can accommodate other uses. The location of buildings in relation to open air car parking should also be considered so that the car parking areas can accommodate new buildings in future, without compromising existing buildings on the site. This will be particularly important for shopping centres, where the traditional 'big box in a sea of car parking' typology may make infill development more challenging.

5.6 Utility Services

Provision of services within the Shire is generally adequate to meet current needs, however supply issues for future development need to be resolved in a timely manner. This will require working closely with Western Power, Water Corporation and ATCO Gas to ensure that adequate services are available for future urban and industrial development. The definition of corridors for major new linear infrastructure should be identified as early as possible so that uncertainty does not prevent development opportunities.

Existing service corridors in some cases also provide environmental corridors for flora and fauna, however the agencies controlling these corridors are not necessarily focussed on preserving these values. Whilst multiple purpose corridors potentially serve a number of purposes, accommodating service infrastructure such as transmission lines, drainage, landscape treatment including rehabilitation of remnant vegetation, and passive recreation including bridle and dual use paths, may be difficult to achieve. This will require the development of strong partnerships between the Shire and service authorities, and agreement on the multiple purposes.

Sewerage is relatively easy and cost effective in the lowlands but is constrained in the escarpment due to hard rock being close to the surface and being costly to dig through. Development in the hills areas may have to consider alternative forms of wastewater disposal. There are also servicing constraints to remote urban land, such as the Serpentine Townsite, where urban development is constrained by the lack of adequate services. With a lack of connection to reticulated sewerage infrastructure, the Serpentine Townsite cannot be densified without causing adverse impacts to the environment. In areas such as Serpentine, the investigation of alternative wastewater treatment systems may be possible to facilitate further development.

Deregulation of the energy market may result in new suppliers emerging, which could improve the prospects and potential for decentralised power supply networks, and similarly it can be expected that private water services will become more common, particularly in areas remote from existing reticulated networks. The capacity of existing service infrastructure and potential upgrades required to accommodate proposed development will be addressed by proposals for residential infill and new urban areas through the structure planning process.

A major challenge for planning new areas is building in the flexibility to adopt new forms of infrastructure that emerge during development. Alternative and renewable energy technologies will increasingly become viable and affordable, and the implications for infrastructure provision and current networks and facilities is unclear. Emerging technologies may require additional or different infrastructure provision requirements and even if new technology is not provided in initial stages of development, the capacity to connect it efficiently at a later stage needs to be kept open. An approach to infrastructure provision that separates the decisions that need to be made today from those that can be made tomorrow will assist developers not to lock out future opportunities through commitment to potentially obsolete methods too early. Planning should be careful not to disregard options that could become viable in the future.

5.7 Heritage

While heritage is primarily managed through State and Commonwealth legislation, opportunities exist to protect and promote both Aboriginal and European cultural heritage through joint management arrangements with traditional owners and optimise opportunities for Indigenous training, employment and businesses. Engagement with traditional owners is required to meet legislative requirements of Native Title. Once finalised, the details of South West South West Native Title Settlement and relevant ILUA needs to be examined closely to identify implications and opportunities for land and community within the Shire. Increased benefits may be observed through an elevated level of involvement of the traditional owners within the Shire in terms of land and cultural heritage management.

Whilst the Shire is rich in heritage there is no strategy to guide a cohesive response to heritage to ensure values are protected to the benefit of the current and future community. Heritage should inform the design and development of new urban areas, parks and community facilities by clarifying the themes and characteristics of the Shire's 'back story', providing inspiration for public art, urban design, architecture, signage, festivals and so on. Local heritage places should be reviewed and put into a format that is both accessible and readily updated as places are studied in more detail and as conservation activities progress and/or new uses are found for heritage assets. Along with these measures, good partnerships with the Heritage Council, the National Trust and local heritage interest groups need to be developed and maintained to ensure the Shire's special blend of built and natural heritage continue to define its character.

5.8 Community Facilities

Proportionate distribution of facilities based on population is required between the activity centres of Byford, Mundijong, Serpentine and Jarrahdale. Rationalisation of facilities is advisable to ensure better use and better standards of facilities. Some older community buildings are inadequate by modern standards. It is inefficient and financially unsustainable to provide purpose-built facilities for individual community activities that could share a single space. Multi-purpose community 'hubs' have better potential to provide a community focus and flexible spaces that can be adapted for a variety of community functions. Community buildings require a large capital investment to provide and maintain so it is important that both design and management maximises sustainability – reducing running costs through 'green' design, and making most efficient use of facilities by effective management and maintenance.

There can be confusion between which community facilities and services are a local government responsibility and which are provided by the State, private operators, and not-for-profit groups. The traditional requirement for 4 to 10 hectare sites for schools to accommodate ovals and a largely single-storey campus-style building layout is no longer universal and as land becomes more expensive to acquire private educators in particular are likely to look to alternative models in order to establish new schools. The Department of Education will come under pressure to build "up", especially where additional accommodation is required and the only other alternative may be to build on school ovals, which is increasingly the case in established areas. As public primary schools require development approval, the

Shire should specify expectations and seek to have schools make more efficient use of land, so that this can be taken into account in the design and approval of all schools.

Places of public worship are becoming more regional in focus, requiring larger facilities that may generate impacts on neighbourhoods in terms of traffic and noise that exceed the traditional 'neighbourhood' facility. Yet it is rare for such 'private' facilities to be included in structure plan proposals. As a result rural areas of the Shire come under pressure to accommodate places of public worship and private schools. Land near public transport and activity centres needs to be identified for these sorts of activities.

5.9 Recreation and Open Space

Over half of the Shire's population is currently outside the recommended catchment of any form of public open space. There is limited provision of public open space suitable for sporting purposes and this must be addressed on a district wide and local scale in structure plans for new areas and also when considering the redevelopment of existing park assets. The ability to accommodate a full sized Australian Rules football oval means that a park can also accommodate a wide range of other sports, however at present many parks are unable to provide for this sport, particularly in instances where the oval is shared with or collocated with a school. If the shortage of open space for sports is perpetuated, those parks that do provide sporting grounds may become overused, with a resulting loss of quality as wear and tear on playing surfaces reduces standards. If grassed surfaces are overused they will be harder to maintain.

In a drying climate, parks requiring high water use to maintain will become increasingly unsustainable. The Shire's rural and bushland character, however, lend themselves to more natural forms of landscape. New and redeveloped parks should employ the principles of water sensitive design, with hydrozoning and other techniques to minimise water use. Consideration may be given to 'dry parks' where grassed areas are not essential.

In keeping with the principles of *Liveable Neighbourhoods*, larger scale recreation facilities should be centralised within catchment areas to maximise accessibility and use. Because parks and recreation centres are expensive to provide and maintain, good location and good design are required so that the most efficient and sustainable use can be made of them. The ability to access district sporting and recreation facilities by public transport is important to maximise accessibility and reduce congestion on event-days.

5.10 Urban Design

Whilst retention of 'rural' and 'natural' character is a clear and strong objective, where the specific elements of that character are not well defined, there is little guidance for either proponents or the Shire as to which specific elements define existing or desired character in any given location. This can mean that it is difficult to assess whether proposals are likely to achieve this objective and there is a risk that, despite the good intention, generic development will result. This is a particular risk in new suburban development and in infill around established areas. There has been some urban design analysis as a part of existing planning documents, however further analysis that is more specific about what aspects of existing character and design are to be retained would be useful. Design guidelines should be founded on an understanding of local context, rather than replicating requirements from other areas that may not be appropriate.

Current land development practice relies on significant modification of the natural terrain including import of sand fill, resulting in modifications to natural drainage systems, removal of native vegetation, inadequate tree canopy, and potentially unusable public open space where drainage is also included. Not only are these practices causing environmental issues, they risk perpetuating generic suburban sprawl within the Shire, and further erosion of the character it is desired to retain. Better urban design is required to ensure that new developments are responsive to the landscape, heritage and environment rather than seeking to replace these with elements that do not form part of the place.

Planning for activity centres should allow for adaptation and evolution of the centre over time. This will include considerations such as how car parking is provided. For example, parking in dedicated buildings or sites rather than each development providing its own exclusive car parking is likely to provide better options in the future. Car parking sites can be a good way of 'land banking' for future redevelopment when reliance on private transport and car parks declines. Activity centre planning should also promote walkable, pedestrian environments

Planning for the future also calls for adaptable urban structure, building design and tenure arrangements. Short term expediency to meet current market expectations or capacity can lead to long term inflexibility. Underdevelopment of sites may prevent realisation of medium and long-term goals for both centres and suburb.

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