WELLARD VILLAGE STRUCTURE PLAN

A JOINT VENTURE BETWEEN PEET & COMPANY AND LANDSTART

SEPTEMBER 2006

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Prepared by: **Taylor Burrell Barnett Town Planning and Design**
187 Roberts Road
SUBIACO WA 6008
Ph: 9382 2911 Fax: 9382 4586
planning@taylorburrell.com.au

In association with:
TABEC Consulting Engineers
ATA Environmental
EPCAD Landscape Architects
Creating Communities
ADLink JLS Marketing Consultants
ERM Traffic Consultants
Patrick Partners Retail Consultants
Fugro Surveys
Jim Davies and Associates Hydrogeological Consultants

SCHEDULE OF MODIFICATIONS

1. Northern Structure Plan Modifications	
(i) SP/P.45	Modified existing Structure Plan and updated paragraph on page 45 to incorporate further information on Wellard downgrading as per attached.
(ii) SP	Modified existing Structure Plan to reflect the plan of subdivision (Stages 1, 2, 3) approved by the WAPC on 20 January 2005 (WAPC Ref:.....).
(iii) SP	Modified existing Structure Plan to reflect latest subdivision plan lodged with the WAPC for approval. The latest plan has been given support in principle by the Commission and reflects amendments to the original approved plan.
(iv) SP	Modified existing Structure Plan to reflect road modifications and amendments to the lot layout to incorporate the buffer setback requirements as specified by the Department of Environment and Conservation.
(v) SP & report	Modifications to the Structure Plan and accompanying report to reflect the annotation of 'Neighbourhood Centre' rather than 'Village Centre'.
(vi) SP & report	All items as specified above, are now reflected on the Structure Plan and accompanying report.
2. Southern Structure Plan Modifications	
(i) SP	Residential densities have been increased around the Neighbourhood Centre (and associated Rail Station). Other areas of commercial and mixed uses are located within an 800-metre catchment of the rail station.
(ii) SP, P. 26, 37, 38, 39	All areas of Public Open Space in the Southern Structure Plan have been reviewed and reflected in the Structure Plan and report. New POS Schedule and Table have been prepared and included in the report.
(iii) SP & report	The larger residential lots abutting 'Homestead Ridge' to be classified as 'Large Lots' rather than given a density code. The lots are now classified as 'Large Lots – R10' to include the need for a specified density code.
(iv) Fig 12	The 'Large Lots' as shown on the Structure Plan are now rezoned and reflected on the zoning plan as being 'Residential' rather than the previous zoning of 'Special Residential'.
(v) Fig 37	The provision of integrated cycle and pedestrian network.
(vi) Attached	Please refer to attached.
(vii) SP	Structure Plan reflecting use of a constructed road to act as a firebreak and access to the Leda Reserve.
(viii) Attached	Detailed location and design treatment of a pedestrian underpass across the railway as well as a new fauna underpass provided as part of the extension of Leda Boulevard.
(ix) Attached	Detailed information regarding the community purpose site as per attached information.
(x) Attached	Detailed information regarding the treatment of the Acid Sulphate Soils as per attached information.

SCHEDULE OF MODIFICATIONS

As outlined in the Western Australian Planning Commission's correspondence dated 18 March 2005, they agreed to endorse in principle the Local Structure Plan for Wellard Village (Northern Precinct) dated January 2003 as a guide to subdivision, land use and development for the landholdings north of the railway reservation subject to a number of modifications to the plan and accompanying report.

Northern Wellard Structure Plan

We have addressed the Commissions requests for modifications, and have outlined these requirements below.

(i) The LSP and accompanying report being modified to reflect the current MRS status of Wellard Road as an Other Regional Road, however, acknowledging the status and management of the road is under review.

Wellard Road is currently identified as 'Other Regional Road Reserve' on the MRS.

In accordance with Council's report, 'Kwinana Transport Structure Plan', this Structure Plan acknowledges the downgrading of Wellard Road. The removal of the ORR status currently forms part of MRS Amendment 1099/33.

The proposed downgrading was originally supported by the Transport Committee and hence the proposal was included as part of Amendment No. 1099/33. The amendment was initiated by the Western Australian Planning Commission and the downgrading is supported by both the Commission and the Town of Kwinana.

The amendment is due to commence advertising mid to late April 2005.

(ii) The LSP and accompanying report being modified to reflect the accompanying subdivisional road layout and land uses proposed in accompanying broad acre subdivision plan dated 20 January 2004 (WAPC 122614).

The revised LSP is reflective of the subdivisional layout of Stages 1, 2, & 3. However, we can advise that several revised plans have been lodged and approved by the Commission since the approval of the plan dated 20 January 2004. The revised LSP reflects the latest and most up-to-date approved subdivision design for these stages as well as the latest lodged subdivision plan for Stages 4, 5 and 6.

(iii) The LSP and accompanying report being modified to reflect the proposals for the Wellard Station Precinct proposed in the accompanying subdivision (WAPC 124206) and Commission development approval for Wellard Station (85% design stage)

The revised LSP reflects the latest design proposed for the Wellard Station Precinct.

We must advise that recent liaison between the Public Transport Authority, the Commission and Taylor Burrell Barnett has resulted in need for further modifications to the subdivisional layout of the station precinct.

As the variations of the design were deemed substantial by the Commission, a new subdivision plan and application was lodged on 1 February 2005 and is currently being assessed by the Commission (WAPC Ref: 127545).

The revised subdivision design has received 'Support in Principle' from the Commission. This plan has been reflected in the modified LSP.

(iv) The subdivisional road layout for the proposed residential R40 pocket located adjacent to the Conservation Category Wetland (CCW) being reviewed to provide a sufficient buffer setback to the CCW (to the satisfaction of DoE) and provide a satisfactory frontage treatment.

The subdivision design of Stages 4, 5 & 6 of Wellard (those stages adjacent to the Conservation Category Wetland) has been reviewed to include a buffer setback of between 37 metres and 140 metres, which averages to be 72.2 metres, which is approximately 22 metres more than that required by the Department of Environment.

The final design was lodged as a subdivision application with the Commission on 8 November 2005 and is currently being assessed. It is this latest subdivision plan that has been reflected within the modified LSP.

(v) The annotation of land uses on the LSP should be consistent with the land uses referred to Amendment No. 85 to the local scheme and all land uses clearly shown on the LSP legend.

All land uses denoted on the LSP are consistent with those referred to on Amendment No. 85 and the Town's Local Planning Scheme.

Modifications to the Structure Plan and report include:

- The term 'Village Centre' being replaced with the term 'Neighbourhood Centre'

(vi) That items (i) to (v) above, be addressed in the final Wellard Village LSP documentation submitted to the Commission for final approval.

As outlined above.

Southern Wellard Structure Plan

The Commission also specified the need to address a number of issues relating to the preparation of the Local Structure Plan for the Southern Precinct. These have been addressed as follows:

(i) Maximise residential densities and transit orientated land uses within the 800 metre walkable (southern) catchment of the Wellard Station;

Residential allotments located south of the proposed Wellard Rail Station and within a 400-500 metre walkable catchment of the station, have been allocated higher densities to reflect the principals of Transit Oriented Design.

Directly south of the station, Residential R40 rear loaded lots are provided, with the remainder of the catchment area being prescribed the Residential R30 code.

Portion of the town centre is also located directly south of the rail station.

(ii) Review the size and function of Public Open Space areas and update the POS Schedule for the LSP including the accreditation for drainage and wetland areas, accordingly;

After having liaised and met with the Town on several occasions on site, the significant vegetation and trees were identified and classified as either having the potential for retention or removal. All significant vegetation was identified and mapped using GPS.

As a result of the identification of the significant trees located on site, the overall design of the Southern Structure Plan was reviewed and modified to include 'green belts' and areas of open space to enable the retention of significant trees.

Several new pockets of open space were included in the design, and previous areas reduced or removed.

A modified POS Schedule for the Structure Plan area has been prepared and is reflective of the modifications made to the Southern Structure Plan.

A total of 12.93% of public open space has been proposed for the Wellard Village development.

(iii) The annotation of land uses on the LSP should be consistent with the land uses referred to in Amendment No. 85 to the local scheme and all land uses clearly shown on the LSP legend;

All land uses denoted on the LSP are consistent with those referred to on Amendment No. 85 and the Town's Local Planning Scheme.

Modifications to the Structure Plan and report include;

- The large lots abutting the existing 'Homestead Ridge' development being specified as 'Large Lots – R10' rather than just being coded 'Residential R10'.

(iv) The lot configuration and interface treatment of the south eastern portion of land (adjacent to the Homestead Ridge estate and the existing linear open space area) proposed to be zoned from 'Special Residential' to 'Residential' by Amendment No. 85 to the local scheme;

The lots are now shown on Figure 12 – Existing zoning as being coded 'Residential' rather than the previously zoning of 'Special Residential' as per Amendment No. 85.

(v) The provision of an integrated cycle and pedestrian network;

An updated cycle and pedestrian network plan has been provided within this document and is reflective of the requirements of the Town of Kwinana and Commission as specified within previous planning approvals.

(vi) Justification for the size and function of neighbourhood/local centre adjacent to the High School site – Public Purpose reservation.

The Structure Plan's original designation as 'Local Centre' has been modified to 'Neighbourhood Node', with the following description included under section 6.3.2.1 of the Structure Plan text.

"The Neighbourhood Node's primary objective is to establish a focal destination for the localised community (within 400 m). It should offer a small commercial (convenience store between 100-200 m² GLA) and community based use, and thus offer both convenience and service type facilities from this. It should exist on a single street block of approximately 1,500 m² in area.

The built form of Neighbourhood Node should include the following attributes:

i. Street based, with a reduced setback to the primary street boundary;
ii. Incorporate on street car parking where practical, as well as off street parking;
iii. Verge areas between kerb lines and building fronts treated as a hard paved side walk, including street furniture;
iv. Sidewalk areas afforded weather protection by awnings;
v. Buildings at nodes architecturally contributing to the street, and providing an active edge.

A Detailed Area Plan must be submitted and approved by Council for development of the Neighbourhood Node."

(vii) Design interface treatment with the existing Leda Reserve/Bush Forever Site (No. 349) to provide for adequate access and fire management.

A road is proposed to abut the Leda Reserve/Bush Forever Site No. 349 and will provide access to the reserve and act as a firebreak between the proposed residential development and reserve. .

(viii) Location and design treatment of a pedestrian/fauna pass across Railways reservation (southwest extension)

The Department of Environment and Conservation determined that a fauna underpass was not required to be provided directly south of the most southern wetland. A dedicated pedestrian underpass has been provided in this location.

The Town of Kwinana in reviewing the Southern Structure Plan identified the need for a new fauna underpass to be provided as part of the extension of Leda Boulevard. Accordingly, the Structure Plan has been updated to identify the general location for the underpass and also includes notation relating to the requirement for a fauna underpass to be provided as detailed following.

"Denotes location for dedicated fauna underpass to be provided as part of the extension of Leda Boulevard. The underpass is to facilitate fauna connectivity either side of Leda Boulevard within the adjacent Bush Forever Site. The underpass is to be located, designed and constructed to the satisfaction of the Department of Environment and Conservation and Town of Kwinana."

(ix) Identification of a community purpose site of 5000m² and the status of the Community Needs Study required by the Town;

In June 2004 Creating Communities completed a Community Facilities Needs Assessment for The Village at Wellard to determine the best mix of community facilities for the estate. The needs assessment methodology included:

- A literature review
- A demographic and standards analysis
- A review of existing provision, and
- Consultation with key stakeholders and community representatives.

The needs assessment report adopted a broad view and considered existing and future needs for community facilities across the Town of Kwinana to inform a facility provision strategy for The Village at Wellard.

The report identifies primary and secondary community facility requirements:

Primary Requirements:

- Facilities, equipment, training and support for community groups
- Office equipment, meeting facilities, training & support for home based businesses and business enterprise
- Meeting rooms
- Multipurpose function/activity facilities
- Volunteer recruitment, training and support services
- Workshop/seminar and training facilities
- Dance studio
- Community information point
- Youth facilities
- Active district open space (2 ovals) for formal outdoor sports with multipurpose pavilion
- Quality open space landscaped with passive amenity

Secondary Requirements:

- Art and design activities and gallery space/ visual arts display
- Youth hang out/ sit and chat spaces
- Outreach community health/ child health/ family support services

- Integrated social support services
- Low cost programs and services
- Support services for multicultural groups/ Adult literacy
- Playgroup facilities
- 'Computer skills training courses
- Social facilities for seniors
- Community bus
- Multipurpose outdoor sports courts
- On-line computers/ internet access/ word processing facilities
- Children's activities
- Homework support/ tutoring/ exam supervision
- Counselling facilities

A key recommendation of the needs assessment is for the provision of a multi-purpose community centre on the main street of the village precinct to provide a focal point for community interaction, local information, social activity and community education/training.

The recommendations of the needs assessment report have since been endorsed by the Community Facility Planning Reference Group, and a feasibility study for the main street community centre is now proceeding.

Following various discussions and meetings with the Town in relation to the proposed size of the multi-purpose community centre, the Structure Plan has been updated to include notation relating to the community purposes site and explains that the site may be reduced in land area subject to a number of requirements. The wording notated on the Structure Plan is detailed below.

"Denotes a community purposes site of 5,000 m² to be vested free of cost in the Crown in accordance with section 152(1)(f) of the Planning and Development Act 2005 or to the Town of Kwinana in freehold land. This site may be reduced in land area subject to the following requirements being met:

i. The Council of the Town of Kwinana agrees to the reduction;
ii. The reduction is not more than 3,800 m² (ie minimum site area 1200 m²);
iii. The land owner makes a reasonable financial contribution to the Town of Kwinana as agreed to by Council, with this based upon an equitable funding arrangement for a community centre to be developed on the site;
iv. The community centre under iii is that chosen by the Council of the Town of Kwinana;
v. The land owner enters into a suitable agreement with the Town of Kwinana guaranteeing requirements i to iv are met."

Other local community facilities that are being planned as a result of the needs assessment include a multi-purpose community pavilion, two shared 'school/ community' ovals, passive parks incorporating a variety of play equipment and public amenity, and an interpretive walk trail about the wetland/ conservation area.

(x) Treatment of Acid Sulphate Soils in accordance with Commission Bulletin No. 64.

The Western Australian Planning Commission Bulletin No. 64 identified the wetland soils (located on the western boundary of the subject land) as being moderate to high risk of acid sulphate soils.

An investigation into the acid-generating potential of soils within the western portion of the Structure Plan area is currently being undertaken by ATA Environmental. The investigations comprise both soil and groundwater investigations. Field tests were conducted on all samples to determine which samples required further laboratory analyses. These groundwater samples have been analysed and it was determined that ASS are present on the site. An Acid Sulphate Soils Management Plan is currently being prepared and will outline measures for managing the problem.

This proposed management strategy has been utilised by ATA Environmental previously and has demonstrated ability to handle and treat acid sulphate soils and dewatering effluent.

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1.0 INTRODUCTION

1.1 Background

The Wellard Village Project is a joint venture initiative between Peet and Company Limited and Landstart. This report has been prepared to support structure plan approval for the subject land to facilitate subdivision approval. It also serves as a reference document for community comment and to assist foster partnerships with local community groups, government agencies and local businesses in delivering the project's objectives.

The project area comprises approximately 320.5888 hectares and includes portions of Lots 254, 271, 272, 242 and 277 in the localities of Wellard and Leda. The land is bound by Wellard Road to the north, the existing Homestead Ridge Estate to the east, Leda Reserve to the south and Gilmore Avenue to the west (**Figure 1**).

A Structure Plan has been prepared for the site drawing on the skills and expertise of a multidisciplinary consultancy team that includes:

- Taylor Burrell (Planning and Urban Design)
- TABEC Consulting Engineers
- ATA Environmental (Environment)
- EPCAD (Landscape)
- Creating Communities (Community, Economic Development)
- ADLink JLS (Marketing)
- ERM Traffic Consultants (Traffic)
- Patrick Partners (Retail Consultants)
- Fugro Surveys (Survey)
- Jim Davies & Associates (Hydrogeological Consultants)

Together with the Peet and Co and Landstart the project team has developed a unique approach to the project that serves to link social, economic and environmental objectives. The plan has been prepared in accordance with the Western Australian Planning Commission's Liveable Neighbourhoods.

1.2 Joint Venture

In March 2002, Peet and Company Limited submitted a joint venture proposal to Landstart for the Leda Project. This proposal included a Structure Plan for Leda, which identified Peet and Company's vision for the development.

Peet and Company Limited was subsequently announced as the preferred tenderer, and as a result, a design review process followed, involving the client, consultant team and relevant local and state government agencies including the Town of Kwinana and the Perth Urban Rail Development (PURD).

The Joint Venture partnership has now been formalised between Peet & Company and Landstart and for the purposes of this report will be referred to as the 'Joint Venture'.

The Joint Venture also wish to foster similar partnerships with the community and key stakeholders throughout the life of the project.

1.3 The Wellard Village Structure Plan

The Wellard Village Structure Plan and Report elaborates on the previous planning for the area and has been prepared on behalf of the Joint Venture to provide the rationale and framework to support future subdivision and development within the Structure Plan.

The Structure Plan has been prepared in accordance with the requirements of Liveable Neighbourhoods.

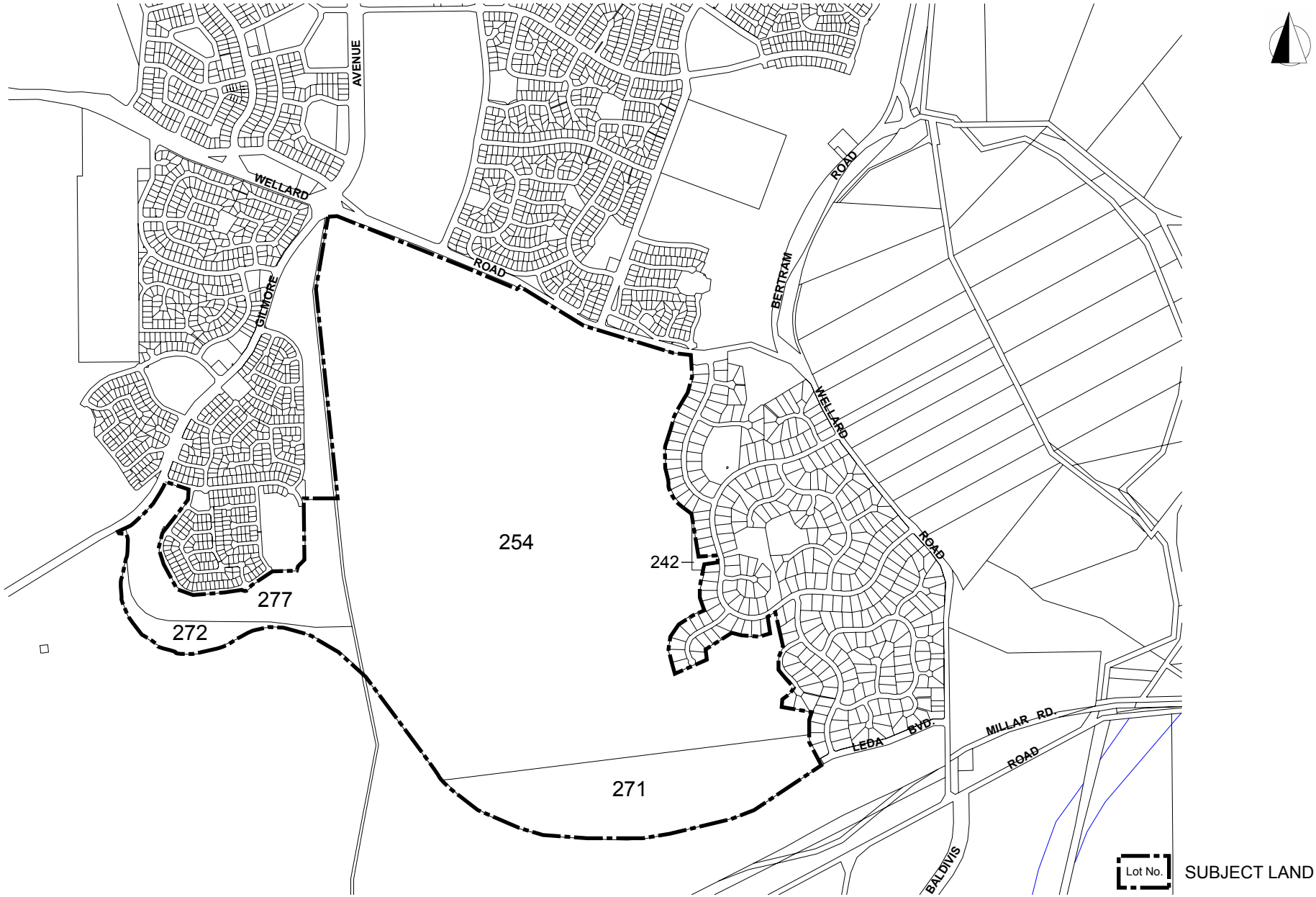
Support and approval to the Structure Plan is sought from the Town of Kwinana and Department for Planning and Infrastructure.

1.4 Land Description

The subject land comprises approximately 320 hectares of land as outlined below in **Table 1.1**. **Figure 2** indicates the location of the various land parcels:

Locality Plan

Figure
1



Land Descriptions

Figure
2

Table 1.1: Land Description

Lot Number	Volume/folio	Area (ha)
Lot 254	2136/94	255.7210
Pt 277	2144/1000	22.2438
Part 271	2136/95	34.8123
Part 272	2136/95	7.2087
Part Lot 242	2144/1000	0.6030
Total Structure Plan Area		**320.5888**

1.5 Project Philosophy and Objectives

The Wellard Village Project has been formulated to reflect the principles of sustainability. The core objective is to maximise community formation by creating an integrated land use pattern in a manner that generates social, economic and environmental opportunities. This Structure Plan presents a unique opportunity given Wellard Village has all of the aspects of control required to develop the station precinct as a model for transport and landuse integration, including:

- Single landownership around the station precinct;
- Control of planning and statutory requirements covering the station;
- Control of the district movement network;
- The ability to facilitate access and services infrastructure that are critical to development;
- The ability to facilitate establishment of a subdivision development front, integral with the establishment of the rail station and public transport feeder services;
- A synergy of purpose and the willing cooperation of the stakeholders, including Department for Planning and Infrastructure, Landstart and the Town of Kwinana, which is critical.

Within this context a number of subsidiary objectives have been developed that have been categorised into three inter-related elements.

1.5.1 Planning and Infrastructure

- To deliver a diverse range of functioning planning precincts;
- To create a mixed use town centre;
- To create a transit oriented village;
- To deliver a pedestrian oriented built form;
- To deliver a functioning road layout and movement network for pedestrians, cyclists and vehicles;
- To create a diversity of functional public open spaces;
- To ensure that land use zonings and densities create a functioning and robust community structure;
- To ensure that all infrastructure is of a high standard;
- To ensure that the urban design reflects the principles of the WAPC's Liveable Neighbourhoods; and
- To ensure that lot layout and housing orientation maximises passive surveillance.

1.5.2 Community and Economy

- To create a vibrant and robust local community;
- To ensure that Wellard Village creates local employment opportunities;
- To ensure that a wide range of recreational and leisure opportunities are provided;
- To ensure that the urban design outcome creates spaces and places for social interaction;
- To ensure that the project fosters partnership opportunities;
- To ensure that the development has the feel of the safety and security;
- To ensure that the provision of community facilities is effective and does not unnecessarily duplicate facilities in surrounding areas;

- To ensure that the community has access to a high standard of education services;
- To create a community that is integrated into the existing Kwinana population;
- To ensure that the development has the support of the local community; and
- To ensure that there is a strong sense of community through the preparation of a community development plan.

1.5.3 Environmental Sustainability

- To ensure that the development is energy efficient;
- To ensure that existing wetland areas are protected and rehabilitated;
- To ensure that the existing landform is protected where possible;
- To ensure that that there is adequate preservation of remnant vegetation;
- To ensure that detailed management plans are prepared for ecologically sensitive areas;
- To ensure that water sensitive urban design principles are adopted;
- To ensure people are encouraged to walk, cycle or take public transport; and
- To ensure that lot layout maximises solar efficiency.

These objectives form the planning framework of the project, but they also serve to guide the ongoing development of the site and the way it relates to the surrounding community.

1.6 Community Consultation

The development of Wellard Village represents a substantial investment in the area that will ultimately produce a broad spectrum of community benefits. The Joint Venture and the project team have undertaken a comprehensive synthesis of the opportunities and constraints to formulate a plan that is cognisant of the community values and expectations for the regions. A number of opportunities now exist to implement the ingredients to ensure the creation of a successful community environment.

It is envisaged that Wellard Structure Plan process and the ongoing development of the site will be the subject of an extensive community consultation process above any statutory obligations.

The purpose of the initial consultation will allow the project team to further refine the overall design philosophy and make adjustments as required to better reflect community sentiment. In addition to its statutory requirements, a rolling display will also be set up and stationed by members of the project team to ensure that the community has the opportunity to comment on the plan.

A series of workshops will also be held over the next six months with key local stakeholders. The purpose of these sessions will be to develop an overall community development vision for the project to complement the built form in developing a sense of place and stimulating a vibrant and robust local community. This will comprise an economic, environment and social component.

Strategies will also be put in place during construction stages to ensure that the community is kept informed of progress and has the opportunity to comment on and become involved in the project.

2.0 EXISTING ENVIRONMENT

2.1 Physical Environment

2.1.1 Topography

The Structure plan area is characterised by two north-south parallel ridges. The eastern ridge is the highest of these and rises to a maximum elevation of 38m AHD near Homestead Drive. The western ridge generally rises to 26m AHD with a high point of 28m AHD towards the northern end.

Two linear swale areas are located adjacent to the ridges. The western swale has the lowest elevation with an elevation of approximately 3m AHD and contains two wetland areas. The eastern swale is broad and has a higher elevation with a low point of 8m AHD.

2.1.2 Geology and Soils

The structure plan area comprises soils from the Karrakatta and Cottesloe units, both of which are representative of the Spearwood Dune System. The Cottesloe soil unit is characterised by shallow, yellow-brown sands overlying Tamala limestone and occurs in the western portion of the structure plan area. The Karrakatta soil unit is similar to the Cottesloe but is deeper and more deeply leached and occurs in the eastern portion of the structure plan area.

The soils of the Structure plan area are highly permeable and promote rapid infiltration of rainfall to the water table with little surface runoff.

2.2 Biological Environment

2.2.1 Wetlands

Two wetland areas are located within the structure plan area. A Conservation Category Sumpland is located in the north-western portion of the Structure Plan area near the junction of Wellard Road and Gilmore Avenue. A Resource Enhancement Category sumpland is located to the south of the Conservation Category Sumpland adjacent to Dalrymple Road, Leda.

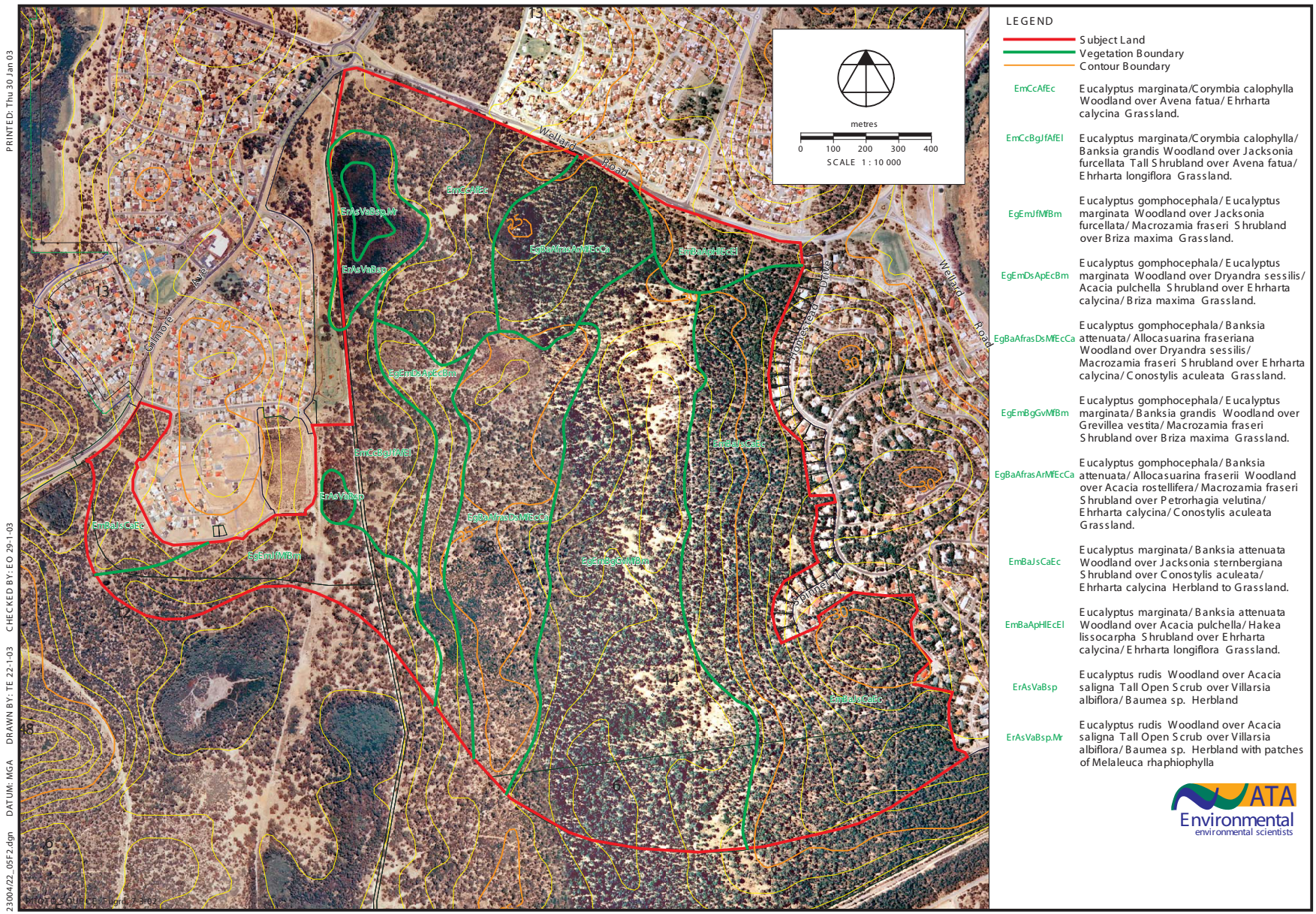
The boundaries of the wetland areas have been delineated on site by ATA Environmental. The wetland areas were defined based on the presence of wetland plant species, soils, aerial photography and topographic contours. The boundaries are similar to those previously determined by Hill *et al.* (1996) and are shown in **Figure 3.** The northern wetland area encompasses approximately 9.3 ha and the southern wetland area encompasses approximately 1.2 ha.

The northern sumpland has fringing vegetation dominated by *Eucalytpus rudis* with an understorey dominated by *Acacia saligna*. The central portion of the sumpland contains *Melaleuca rhaphiophylla* with an understorey of *Baumea* sp, *Lepidosperma longitudinale* and *Villarsia albiflora*. The condition of vegetation within the northern sumpland is generally Very Good.

The southern sumpland is dominated by *Eucalyptus rudis* with an understorey of *Acacia saligna, Baumea* sp., *Lepidosperma longitudinale, Villarsia albiflora* and *Pennisetum clandestinum*.

A site inspection indicates that both wetland areas are expected to contain above ground water during part of the year although no open water is present. Both wetlands are generally below 3m AHD.

The management categories and objectives for wetlands as described by Hill *et al.* (1996) are outlined in **Table 2.1**.



Vegetation Associations

Figure 3

Table 2.1: Wetland Management Categories & Objectives

Management Category	General Description of Wetlands	Management Objectives
Conservation Wetlands	Wetlands which support high levels of attributes and functions.	To preserve wetland attributes and functions through reservation in national parks, crown reserves, state owned land and protection under environmental protection policies.
Resource Enhancement wetlands	Wetlands that have been partly modified but still support substantial functions and attributes.	To restore wetlands through maintenance and enhancement of wetland functions and attributes by protection in crown reserves, state or local government owned land and by environmental protection policies, or in private property by sustainable management.
Sustainable use – Multiple Use Wetlands.	Wetlands with few attributes, which still provide important wetland functions.	Use, development and management should be considered in the context of water (catchment/strategic drainage planning), town (land use) and environmental planning through landcare.

From Wetlands of the Swan Coastal Plan Volume 2b (Hill et al., 1996)

2.2.2 Vegetation

2.2.2.1 Description

ATA Environmental conducted a survey of the Structure Plan area on 13 January 2002. The survey was conducted by traversing the area by vehicle and foot. The major landforms and vegetation communities were surveyed, as identified using a colour aerial photograph. The vegetation was described and mapped according to the structure and species composition of the dominant stratum.

Eleven vegetation associations were identified during the site visit. These were:

- Eucalyptus marginata/Corymbia calophylla Woodland over Avena fatua/ Ehrharta calycina Grassland.
- Eucalyptus marginata/Corymbia calophylla/ Banksia grandis Woodland over Jacksonia furcellata Tall Shrubland over Avena fatua/ Ehrharta longiflora Grassland.
- Eucalyptus gomphocephala/Eucalyptus marginata Woodland over Jacksonia furcellata/ Macrozamia fraseri Shrubland over Briza maxima Grassland.
- Eucalyptus gomphocephala/Eucalyptus marginata Woodland over Dryandra sessilis/ Acacia pulchella Shrubland over Ehrharta calycina/ Briza maxima Grassland.
- Eucalyptus gomphocephala/ Banksia attenuata/Allocasuarina fraseriana Woodland over Dryandra sessilis/ Macrozamia fraseri Shrubland over Ehrharta calycina/ Conostylis aculeata Grassland.
- Eucalyptus gomphocephala/Eucalyptus marginata/Banksia grandis Woodland over Grevillea vestita/Macrozamia fraseri Shrubland over Briza maxima Grassland.
- Eucalyptus gomphocephala/Banksia attenuata/Allocasuarina fraseriana Woodland over Acacia rostellifera/Macrozamia fraseri Shrubland over Ehrharta calycina/ Conostylis aculeata Grassland.
- Eucalyptus marginata/Banksia attenuata Woodland over Jacksonia sternbergiana Shrubland over Conostylis aculeata/ Ehrharta calycina Herbland to Grassland.
- Eucalyptus marginata/ Banksia attenuata Woodland over Acacia pulchella/ Hakea lissocarpha Shrubland over Ehrharta calycina/ Ehrharta longiflora Grassland.
- Eucalyptus rudis Woodland over Acacia saligna Tall Open Scrub over Villarsia albiflora/ Baumea sp. Herbland.
- Eucalyptus rudis Woodland over Acacia saligna Tall Open Scrub over Villarsia albiflora/ Baumea sp. Herbland with patches of Melaleuca rhaphiophylla.

The boundaries of these vegetation communities were not particularly discrete, with one community often grading into another forming a mosaic of varied vegetation types.

The eleven vegetation communities identified and mapped during this assessment are described below:

- *Eucalyptus marginata/Corymbia calophylla* Woodland over *Avena fatua/ Ehrharta calycina* Grassland – This vegetation association occurs over a large proportion of the broad eastern swale and in disturbed areas along the western boundary of the study area. The association is dominated by *Eucalyptus marginata* and *Corymbia calophylla* to 12 – 15m over a Grassland dominated by the introduced grasses *Avena fatua* and *Ehrharta calycina.* Other common species include *Macrozamia fraseri, Jacksonia furcellata, Euphorbia terracina* and *Lupinus cosentinii*. *Banksia grandis* is present in places.

- *Eucalyptus marginata/Corymbia calophylla/ Banksia grandis* Woodland over Jacksonia furcellata Tall Shrubland over *Lepidosperma longitudinale/ Avena fatua/ Ehrharta longiflora* Grassland – This vegetation association occurs towards the western boundary of the study area and grades into *Eucalyptus marginata/Corymbia calophylla* Woodland over *Avena fatua/ Ehrharta calycina* Grassland and *Eucalyptus gomphocephala/ Eucalyptus marginata* Woodland over *Jacksonia furcellata/ Macrozamia fraseri* Shrubland over *Briza maxima* Grassland. The association is dominated by *Eucalyptus marginata* and *Corymbia calophylla* to 10 – 15m and *Banksia grandis* to 8m. The understorey vegetation is dominated by *Jacksonia furcellata* to 3m over *Avena fatua* and *Ehrharta longiflora.* Other common species include *Hardenbergia comptoniana* and *Gomphocarpus fruticosus*.

- *Eucalyptus gomphocephala/ Eucalyptus marginata* Woodland over *Jacksonia furcellata/ Macrozamia fraseri* Shrubland over *Briza maxima* Grassland – This association occurs to the south of the northern wetland and on the easterly sloping area adjacent to Dalrymple Road. Vegetation is dominated by *Eucalyptus gomphocephala* and *Eucalyptus marginata* to 10 – 15m. Understorey vegetation is dominated by *Jacksonia furcellata* and *Macrozamia fraseri* to 3m over *Briza maxima* dominated Grassland. Other common species include *Banksia grandis, Euphorbia terracina* and *Lupinus cosentinii.*

- *Eucalyptus gomphocephala/ Eucalyptus marginata* Woodland over *Dryandra sessilis/ Acacia pulchella* Shrubland over *Ehrharta calycina/ Briza maxima* Grassland – This association occurs along the westerly facing slope of the western north-south linear ridge. Vegetation is dominated by *Eucalyptus gomphocephala* and *Eucalyptus marginata* to 10 – 15m. Understorey vegetation is dominated by *Dryandra sessilis* to 3.5m and *Acacia pulchella* over *Ehrharta calycina* and *Briza maxima.* Other common species include *Hypochaeris radicata* and *Conostylis aculeata*. The association grades into the *Eucalyptus gomphocephala/ Banksia attenuata/ Allocasuarina fraseriana* Woodland over *Dryandra sessilis/ Macrozamia fraseri* Shrubland over *Petrorhagia velutina/ Ehrharta calycina/ Conostylis aculeata* Grassland association towards the top of the ridge.

- Eucalyptus gomphocephala/ Banksia attenuata/ Allocasuarina fraseriana Woodland over Dryandra sessilis/ Macrozamia fraseri Shrubland over Ehrharta calycina/ Conostylis aculeata Grassland - this association occurs on the westerly ridgeline on a limestone substrate. The association is dominated by Eucalyptus gomphocephala, Banksia attenuata, and Allocasuarina fraseriana to 12m. Understorey vegetation is dominated by Dryandra sessilis and Macrozamia fraseri to 2.5m over introduced grasses and Conostylis aculeata. Other common species include Briza maxima, Hakea prostrata, Burchardia umbellata, Petrorhagia velutina and Dianella divaricata.

- *Eucalyptus gomphocephala/ Eucalyptus marginata/ Banksia grandis* Woodland over *Grevillea vestita/ Macrozamia fraseri* Shrubland over *Briza maxima* Grassland – This association occurs in the broad north-south linear swale area towards the eastern portion of the Structure Plan area. The association is similar to the *Eucalyptus gomphocephala/ Eucalyptus marginata* Woodland over *Jacksonia furcellata/ Macrozamia fraseri* Shrubland over *Briza maxima* Grassland described previously with more *Banksia grandis* in the overstorey and the absence of *Jacksonia furcellata* in the shrub layer. The association is dominated by *Eucalyptus gomphocephala, Eucalyptus marginata* and *Banksia grandis* to 10 – 15m over *Grevillea vestita* and *Macrozamia fraseri* to 3m. The understorey is dominated by *Briza maxima*. Other common species include *Euphorbia terracina* and *Lupinus cosentinii.*

- Eucalyptus gomphocephala/ Banksia attenuata/ Allocasuarina fraseriana Woodland over Acacia rostellifera/ Macrozamia fraseri Shrubland over Ehrharta calycina/ Conostylis aculeata Grassland - This association occurs towards the centre of the northern portion of the Structure Plan area near the site of the proposed railway station. The association grades into the Eucalyptus gomphocephala/ Eucalyptus marginata/ Banksia grandis Woodland over Grevillea vestita/ Macrozamia fraseri Shrubland over Briza maxima Grassland broad swale vegetation to the south and is similar to the vegetation occurring on the limestone ridge although Grevillea vestita is absent within the shrub layer. The association is dominated by Eucalyptus gomphocephala to 15m and Banksia attenuata and Allocasuarina fraseriana to 8m. Understorey vegetation comprises Acacia rostellifera and Macrozamia fraseri to 2m over Ehrharta calycina and Conostylis aculeata. Other common species include Trachyandra divaricata and Petrorhagia velutina

- *Eucalyptus marginata/ Banksia attenuata* Woodland over *Jacksonia sternbergiana* Shrubland over *Conostylis aculeata/ Ehrharta calycina* Herbland to Grassland – This association occurs towards the eastern boundary of the Structure Plan area as the topography rises towards Homestead Drive and also in the west of the Structure plan area adjacent to Dalrymple Road. The association is dominated by *Eucalyptus marginata* and *Banksia attenuata* to 8 – 10m over *Jacksonia sternbergiana* to 2m. The understorey vegetation is dominated by *Ehrharta calycina* and *Conostylis aculeata*. Other common species include *Petrorhagia velutina, Persoonia saccata* and *Petrophile linearis.*

- *Eucalyptus marginata/ Banksia attenuata* Woodland over *Acacia pulchella/ Hakea lissocarpha* Shrubland over *Ehrharta calycina/ Ehrharta longiflora* Grassland – This association occurs towards the northern boundary of the Structure Plan area. The association is dominated by *Eucalyptus marginata* to 12m and *Banksia grandis* to 8m. Understorey vegetation comprises *Acacia pulchella* and *Hakea lissocarpha* to 2m over *Ehrharta calycina* and *Ehrharta longiflora.* Other common species include *Olearia axillaris* and *Kunzea ericifolia. Dryandra sessilis, Acacia pulchella*, *Ehrharta calycina* and *Avena fatua* are present in the understorey adjacent to Wellard Road.

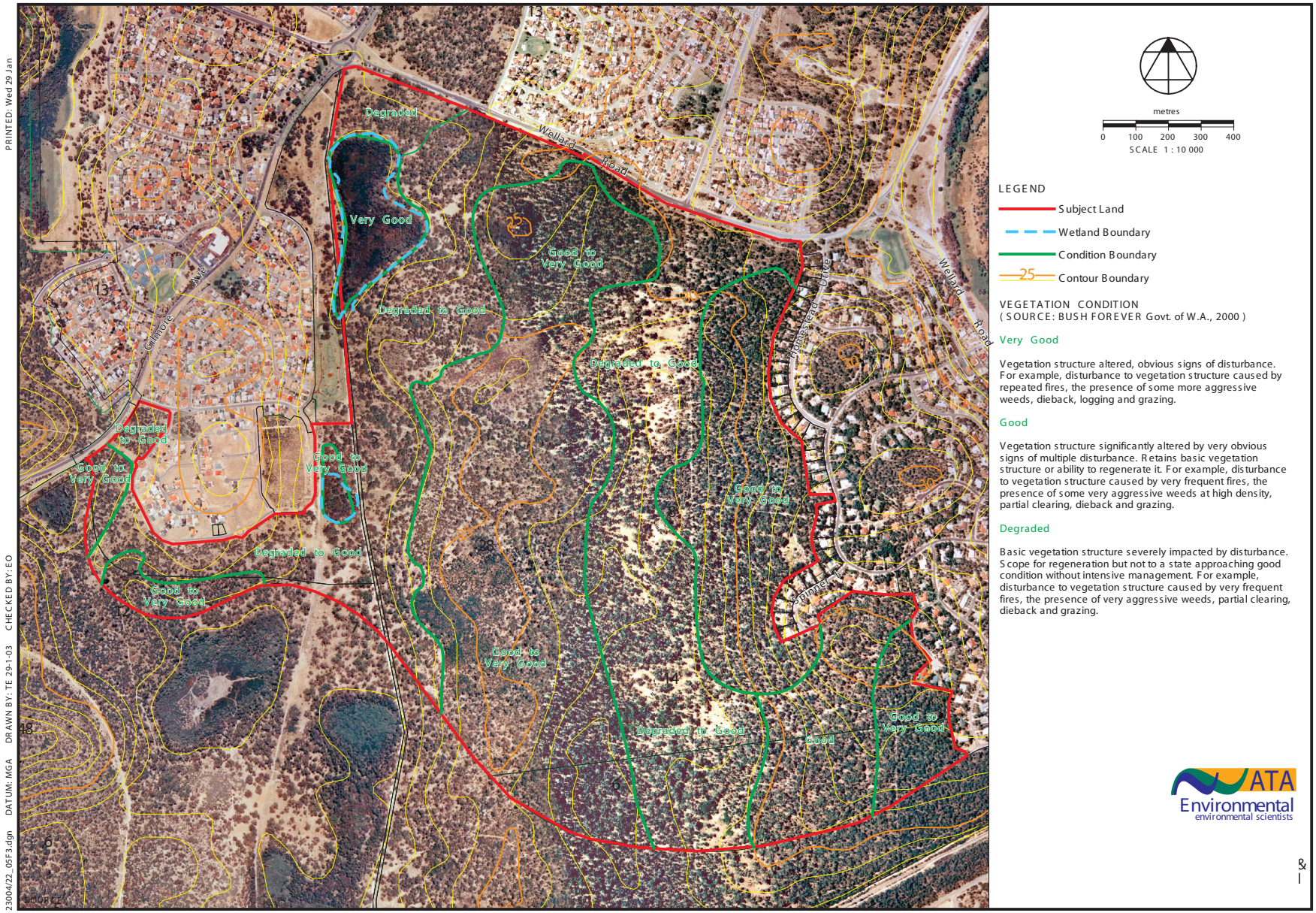
- *Eucalyptus rudis* Woodland over *Acacia saligna* Tall Open Scrub over *Villarsia albiflora/ Baumea* sp. Herbland – This vegetation association occurs in the two sumpland areas in the western portion of the Structure Plan area. The association occurs on the outer fridges of the larger northerly sumpland area and in the southern smaller sumpland area. The association is dominated by *Eucalyptus rudis* to 10 – 12m over *Acacia saligna* to 2 – 4m. Understorey vegetation is dominated by a herbland of *Villarsia albiflora* and *Baumea* sp. Dense patches of *Lepidosperma longitudinale* occur in some areas. The introduced grass *Pennisetum clandestinum* is also common in the southern sumpland. Other common species include *Pelargonium capitatum, Conyza albida* and *Isolepis nodosa*.

- *Eucalyptus rudis* Woodland over *Acacia saligna* Tall Open Scrub over *Villarsia albiflora/ Baumea* sp. Herbland with patches of *Melaleuca rhaphiophylla* – This association occurs in the centre of the larger northerly sumpland area and is dominated by *Eucalyptus rudis* to 10 – 12m over *Acacia saligna* to 2 – 4m. Understorey vegetation is dominated by a herbland of *Villarsia albiflora* and *Baumea* sp. Dense patches of *Lepidosperma longitudinale* occur in some areas. Towards the centre of the sumpland patches of *Melaleuca rhaphiophylla* occurs.

2.2.2.2 Vegetation Condition

The condition of vegetation surveyed during the site visit was assessed according to the criteria in Bush Forever (2000). Vegetation condition is mapped in **Figure 4**. A description of the vegetation condition scales for those conditions identified during the site visit are outlined below.

Very Good (3) Vegetation structure altered, obvious signs of disturbance. For example, disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing.



Vegetation Condition & Wetland Location

Figure 4

Good (4) Vegetation structure significantly altered by very obvious signs of multiple disturbance. Retains basic vegetation structure or ability to regenerate to it. For example, disturbance to vegetation structure caused by very frequent fires, the presence of some very aggressive weeds at high density, partial clearing, dieback and grazing.

Degraded (5) Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. For example, disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing.

The condition of vegetation varies across the Structure Plan area. Vegetation in Good to Very Good condition is found along the westerly ridge and towards the eastern boundary of the site as the topography slopes up towards Homestead Ridge. The remainder of vegetation in the Structure Plan area is generally in Degraded to Good Condition with a large proportion of the area being subject to clearing and other disturbance in the past. The condition of vegetation in the Structure Plan area is indicated in **Figure 4.**

A survey conducted by Ecoscape and Galvan Dieback Services in 2000 (cited in Bowman Bishaw Gorham, 2002) indicated no infestation by the plant pathogen *Phytophthora cinnamomi* was present within the proposed railway alignment. Based on this, it is highly unlikely that *Phtyophthora cinnamomi* would occur in any other parts of the Structure Plan area.

2.2.2.3 Vegetation Significance

The vegetation of the study area is representative of vegetation of the Spearwood Dunes and comprises two different vegetation complexes. The eastern portion of the Structure Plan is mapped as Karrakatta Complex – Central – South and the western portion of the Structure plan area mapped as Cottesloe Complex – Central – South in Bush Forever (Government of Western Australia, 2000). The Karrakatta Complex – Central – South currently has 8% remaining in conservation estate which is below the target of 10% minimum protection as recommended in Bush Forever (2000).

A portion of the Karrakatta Complex – Central – South vegetation in the south-eastern part of the site was recommended for protection in Bush Forever to assist in the protection status of this vegetation complex. The remaining bushland was not identified as regionally significant.

The vegetation does have some local significance however, with the high aesthetic value of the trees within the Structure plan area as well as connections through to the wetland chain in Leda reserve to the south.

The sumpland vegetation in the Structure Plan area is representative of Floristic Community Type 17 - Melaleuca rhaphiophylla – Gahnia trifida seasonal wetlands. The remainder of the vegetation in the Structure plan area is representative of Floristic Community Type 28 - Spearwood Banksia attenuata or B. attenuata – Eucalyptus woodlands. These Floristic Community Types are not listed as Threatened Ecological Communities (English and Blythe 1997). Vegetation of these Floristic Community Types are conserved within the adjacent Bush Forever Site 349 and Bush Forever Sites 67 and 356.

Tuart (*Eucalyptus gomphocephala*) has a natural range restricted to near coastal habitats between Ludlow and Moore River. Tuart dominated communities have been significantly impacted by partial clearing, grazing, frequent fire, forestry and horticulture and weed invasion and are considered to be poorly represented within the conservation reserve system (Keighery, B. J and Longman, V. M., 2002).

The Tuart vegetation in the study area has been significantly disturbed and is not considered a good example of remnant intact Tuart communities. Stands of Tuart dominated vegetation are conserved in the adjacent Bush Forever Site 349 Leda and Adjacent Bushland Leda, and in Bush Forever Site 356 Lake Cooloongup, Lake Walyungup and Adjacent Bushland, Hillman to Port Kennedy to the south. Stands of Tuart dominated vegetation are also conserved in Bush Forever Site 67 Parmelia Avenue bushland, Parmelia to the north.

2.2.3 Flora

A total of 106 species were recorded from the site during the ATA Environmental January 2003 survey. The total includes one Gymnosperm (*Macrozamia fraseri*), 32 Monocotyledons and 73 Dicotyledons. The flora assessment was undertaken in January, a time of the year when some ephemeral species such as orchids and lilies are not present. The total number of species occurring on the site therefore is expected to be considerably larger than the 106 species identified.

Of the 106 plant species recorded, 77 (73%) were native and 29 (27%) were introduced. Families with the greatest representation of taxa were the Proteaceae (*Banksia*) family (15 taxa), the Poaceae (Grass) family (10 taxa) and Papilionaceae (Pea) family (9 taxa). The species list is contained in **Appendix A**.

No Priority species, Declared Rare Flora or Commonwealth Listed species were recorded from the study area.

A search of CALM's Declared Rare and Priority Flora database was undertaken prior to the survey of the Structure plan area. The database search found that one taxon had been previously recorded from the vicinity of the study area.

- Rhodanthe pyrethrum (Priority 3)

This species typically occurs in clayey wetlands of the type that do not occur in the Structure Plan area. This species is highly unlikely to occur on the site.

2.2.4 Fauna

The Southern Brown Bandicoot (*Isoodon obesulus fusciventer*) is known to occur within the Structure Plan area. Ecologia Environmental Consultants conducted a survey of the wetland POS area in 1996 to determine population numbers.

Assessment of the bandicoot population size was conducted using wires cage traps and Elliott traps to facilitate mark-recapture trapping. In addition to population number, information regarding sex, weight, reproductive organ size and status and condition of the animal was recorded.

A total of 21 animals were captured during the course of the five-day survey resulting in an estimate of a total population size of 29 individuals. Five of the 11 females captured were reproductively active with young at various stages of development. Teats were also detected indicative of young having recently left the pouch. The Leda Bandicoot population exhibited standard demographic patterns for a healthy population, with a range of age classes represented and evidence of recruitment in the form of pouch young.

The Bandicoot population within the Wellard Village Structure Plan area is not directly connected to any other Bandicoot populations and the vegetated links that currently exist have been subject to clearing and disturbance in the past.

Although the Bandicoot is considered to be of State conservation significance the population in the Wellard Village Structure Plan area is not considered to be significant at a state level in terms of species distribution and overall abundance. On a regional scale the small local population of Bandicoots does make a significant contribution to the species preservation in the surrounding Kwinana region. However the small size and isolation of the population (due to lack of suitably vegetated corridors) limits the potential for a larger more viable population on a regional scale (Ecologia, 1997).

Locally it is considered that while the population may continue to exist in the short term the area and the population may be too small and isolated to be self sustaining in the longer term (15 – 20 years) (Ecologia, 1997).

2.3 Other Environmental Issues

2.3.1 Noise and Vibration

The state government has identified the need for a passenger railway linking the existing Perth rail network to the cities of Rockingham and Mandurah. The proposed railway traverses the Structure Plan area from the north-eastern corner in a south-westerly direction. A station is proposed to be sited in the centre of the Structure Plan area and will form the central focus for a planned commercial precinct.

As part of the Public Environmental Review (PER) for the proposed southwest metropolitan railway a Noise and Vibration Management Plan (NVMP) was prepared by Lloyd Acoustics Pty. Ltd in 2002. The aim of the NVMP was to quantify the noise and vibration levels along the proposed rail route and to compare the levels against a range of criteria currently being evaluated for Western Australia by the Infrastructure Co-ordinating Committee of the WA Planning Commission Working Group.

2.3.1.1 Noise

For the initial assessment of noise impacts the two suggested criteria currently being evaluated are detailed below:

Criteria 1 Noise level above which noise mitigation will be provided

- $L_{Aeq\ (daytime)}$ 60dB(A); and
- $L_{Aeq(night\text{-}time)}$ 55dB(A).

Criteria 2 Noise Level above which noise mitigation will be considered

- $L_{Aeq\ (daytime)}$ 55dB(A); and
- $L_{Aeq(night\text{-}time)}$ 50dB(A).

The majority of the noise produced by passenger trains results from the interaction between the train wheels and the track, however other potential sources of noise include noise from the pantograph connected to the power lines and signals (Lloyd Acoustics, 2002). Future potential noise emissions from the rail alignment were calculated using the sound pressure levels and travelling speed for trains to be used on the railway. Specific receiver locations were chosen along the railway alignment allowing variables such as topography, existing fencing and barriers to be taken into consideration. Other variables included train length and the height of the noise source.

Seven of the noise receiver locations chosen in the noise study were in close proximity with the Structure Plan area Six were located close to the north-eastern corning of the Structure plan area with one located in close proximity to Dalrymple Road. The following table indicates the noise levels predicted for those receivers in close proximity to the Structure Plan area.

Table 2.2: Predicted Noise Levels

Receiver ID	Location	Distance from Track	Daytime Noise Level Predictions $L_{Aeq\ (daytime)}$dB(A)	Night-time Noise Level Predictions $L_{aeq\ (nightime)}$dB(A)
D229	Timbertop Cres	84	55	46
D230	Timbertop Cres	112	54	45
D231	Timbertop Cres	74	57	48
D232	Wellard Road	69	53	44
D233	Wellard Road	46	57	48
D234	Wellard Road	103	51	42
D235	Dalrymple Dr	164	56	47

Source: Lloyd Acoustics, 2002
Note: No predicted noise levels exceed Criteria 1. Shaded cells indicate where Criteria 2 is exceeded.

As illustrated in the table above three predicted noise levels exceed Criteria 2 daytime noise levels.

2.3.1.2 Vibration

Ground borne vibration resulting from train pass-bys can depending on the energy levels result in annoyance or structural damage to structures. Lloyd (2002) states that there have been few complaints in Western Australia received regarding vibration from railways. No criteria exist to address vibration levels from transportation corridors. Studies conducted for the South West Metropolitan Railway Noise and Vibration Management Plan used criteria developed to address vibration issues in Switzerland. These criteria were adopted in the NVMP with certain actions required based on predicted vibration levels. The criteria used in the NVMP are as follows.

- Criterion 1 – Vibration Limit – Curve 2 (109dB); and
- Criterion 2 – Vibration Planning and Design Level – Curve 1.4 (106dB).

Above Criterion 1 (Vibration Limit), vibration isolation measures would be required and incorporated into the design of the railway. In terms of planning, noise sensitive rezoning/development would only be permitted where the new building was vibration isolated. Criterion 2 (Planning and Design Level) is a level to which the project should be designed, and above which the planning system should avoid placing new residential areas where practicable.

In the Structure Plan area and surrounding area one receiver station exceeded Criterion 2 –Vibration Planning and Design level.

2.3.2 Aboriginal Heritage

A search of sites registered with the Aboriginal Affairs Department indicates no sites have been recorded within the Structure plan area. The site search is contained in **Appendix B.**

3.0 REGIONAL CONTEXT

3.1 Location

3.1.1 Sub-Regional Context

The subject land is located 1 kilometre south of the Kwinana Town Centre and 9 kilometres north-east of the Rockingham Town Centre, refer **Figure 5**. The Kwinana Freeway is located 2.5 kilometres east of the subject land on the extension of Wellard Road – Mortimer Road with access directly available via the Mortimer Road Freeway Ramps.

Thomas Road, Wellard Road and Gilmore Avenue are important regional movement systems and perform important linkages to Kwinana, Rockingham, Mandurah and Perth.

3.1.2 Local Context

The subject land is located west of the steep sloping escarpment adjacent Parmelia and Orelia, between the localities of Wellard and the Spectacles, with Casuarina and the balance of Wellard to the east of the Freeway. Leda is located west of the subject land, with the Leda Reserve forming the southern boundary to the development.

3.2 Regional Structure

3.2.1 Demographics

The Town of Kwinana's has a current population of 20,809 (2001, ABS Census), which is an 8.7% increase since 1996. Driven by a number of major infrastructure projects, by 2016 the population is conservatively expected to expand to 35,000 (Town of Kwinana, 2000) (See **Figure 6**)

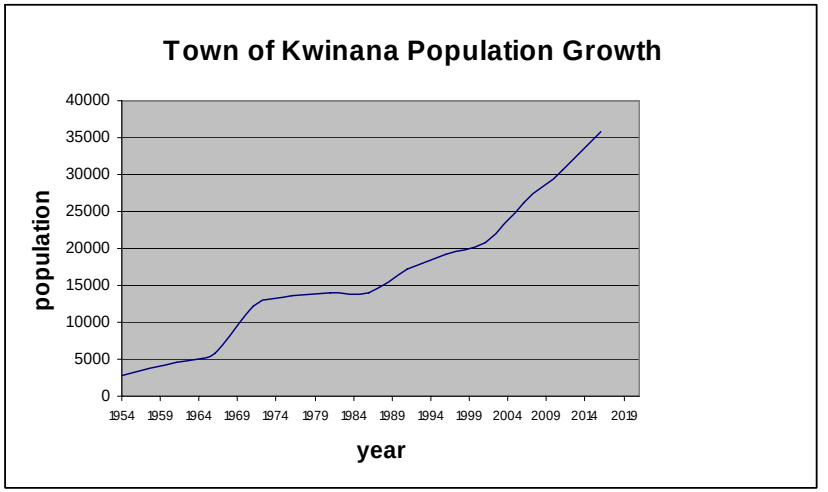


Figure 6 - Town of Kwinana Population Growth

The structure of the Town's demographics in the past years remained relatively stable, with only a few noticeable shifts (**Figure 7**). The most prominent in this regard was the decline in the number of 20-29 year olds, which totalled 3204 in 1996 and 2924 in 2001. The median age changed from 29 in 1996 to 32 in 2001. Nonetheless, the Town of Kwinana's population still remains relatively young with over 63% still under the age of forty. Forecasts predict that in time the area will be increasingly aged.

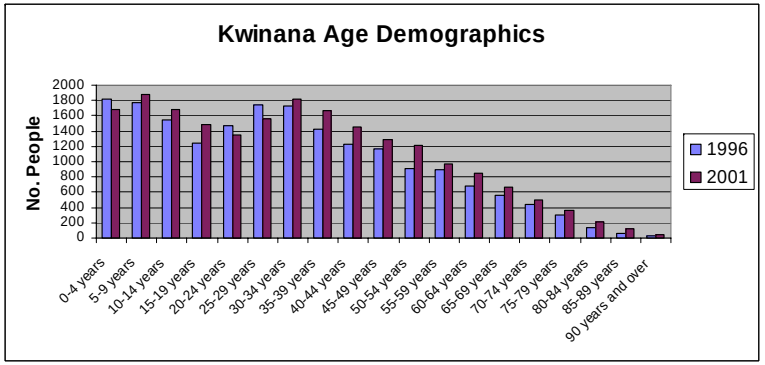
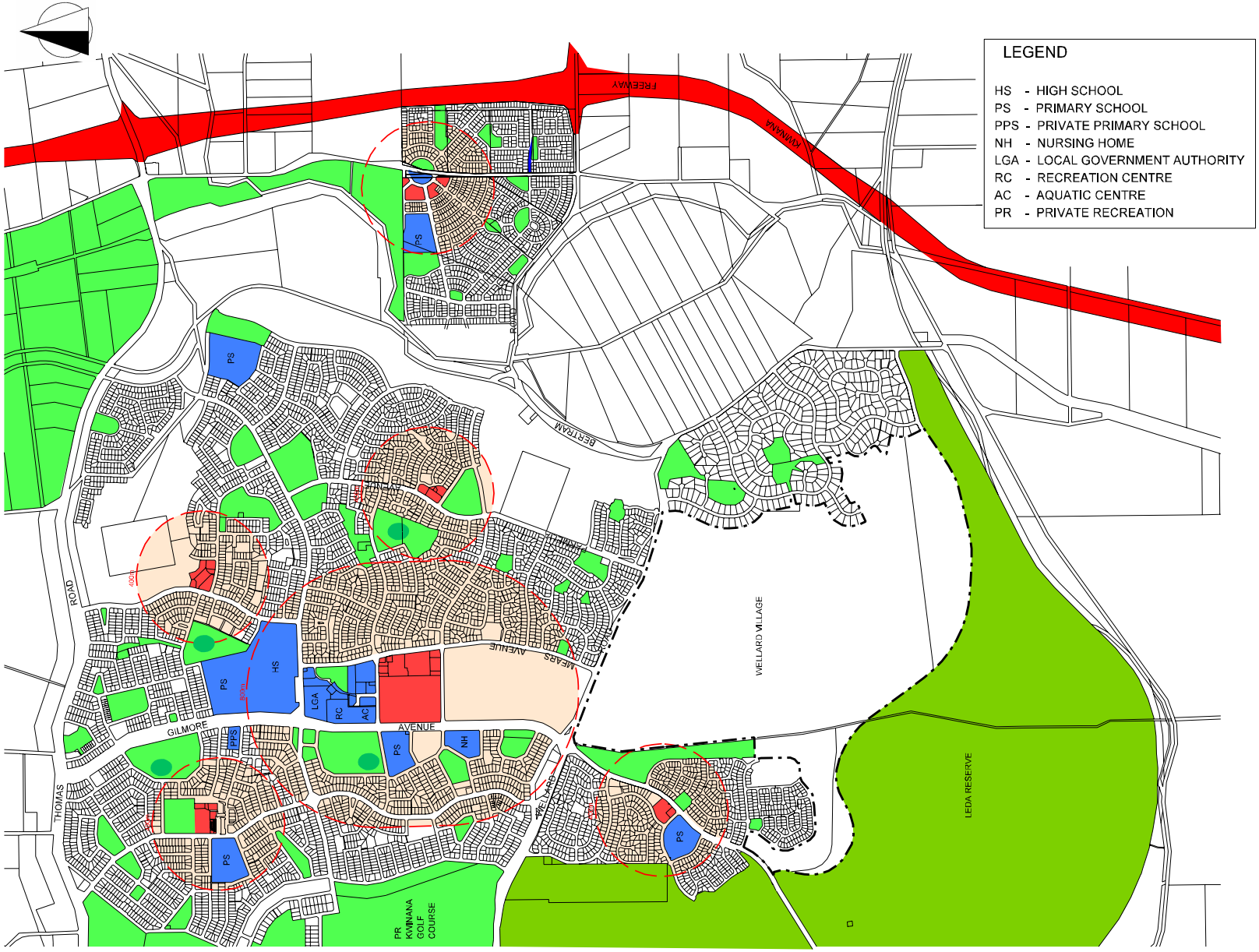


Figure 7 - Kwinana Age Demographics



Regional Context

Figure 5

The median individual weekly income during 1996 and 2001 period rose from $200-299 to $300-399. The most prominent income trend is the decline in the number of low income earners (see Figure 8).

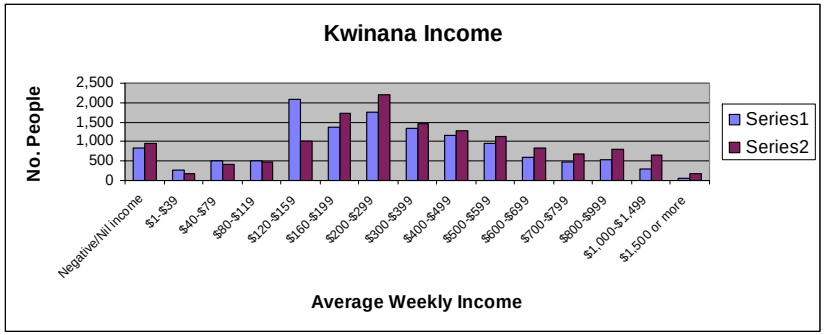


Figure 8 - Kwinana Income

Between 1996 and 2001 the average household size slightly declined from 2.8 to 2.7 persons per household.

These trends and issues will be drawn out more fully in the ongoing community development initiatives proposed for the project. For now they serve as useful contextual information for the structure plan which has considered these issues in the design process.

3.2.2 Local Institutions

The Town of Kwinana is in the fortunate position of being well serviced with local institutions and community organisations, which is a testimony to the a strong sense of community. **Table 3.1** provides a snapshot of these organisations, which total some 145. The Wellard Village Structure Plan will require the development of additional institutions to support the local population. The population influx should also add to the social and economic viability of existing organisations. Partnerships with these groups will be encouraged throughout the course of the project and opportunities for additional facilities will be explored.

Table 3.1: Kwinana Organisations

Type Organisations	No.
Aboriginal Organisations	2
Children services	13
Church Services	9
Community & service Clubs	8
Community Action Groups	3
Cultural Services	6
Disability Services	1
Education Services	2
Schools	9
Emergency Services	3
Family Support Services	16
Government Services	2
Health Services	7
Hobby and Interest Groups	4
P & C Organisations	6
Policing	2
Progress Associations	6
Recreation and Leisure	4
Senior Services	10
Social Clubs	2
Sporting Clubs	27
Youth Clubs	3
Total	145

3.3 Economics

3.3.1 Employment

Wellard Village is located 1 km south of the Kwinana Town Centre, which has been revitalised in recent years. Wellard Village will complement these efforts and provide additional population to support the Town of Kwinana's economic development initiatives.

One main issues facing the Town of Kwinana is the levels of youth unemployment. Overall unemployment rests at about 13%. There is also a trend towards an increase in the percentage of the workforce engaged in casual and part-time work (see **Figure 9**).

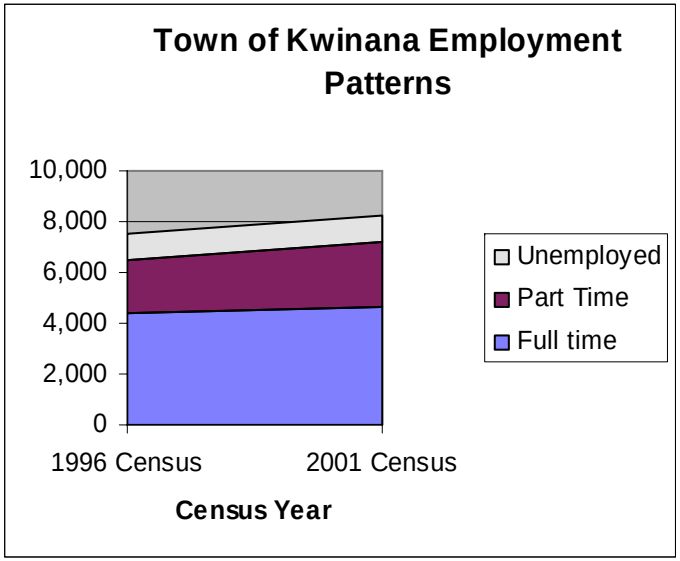


Figure 9 - Town of Kwinana Employment Pattern

Manufacturing and the retail sector remained the municipalities largest employers, account for 19% and 17% of all employment (see **Figure 10**). Most people were employed as tradespeople, clerical/service workers, transport workers or labourers.

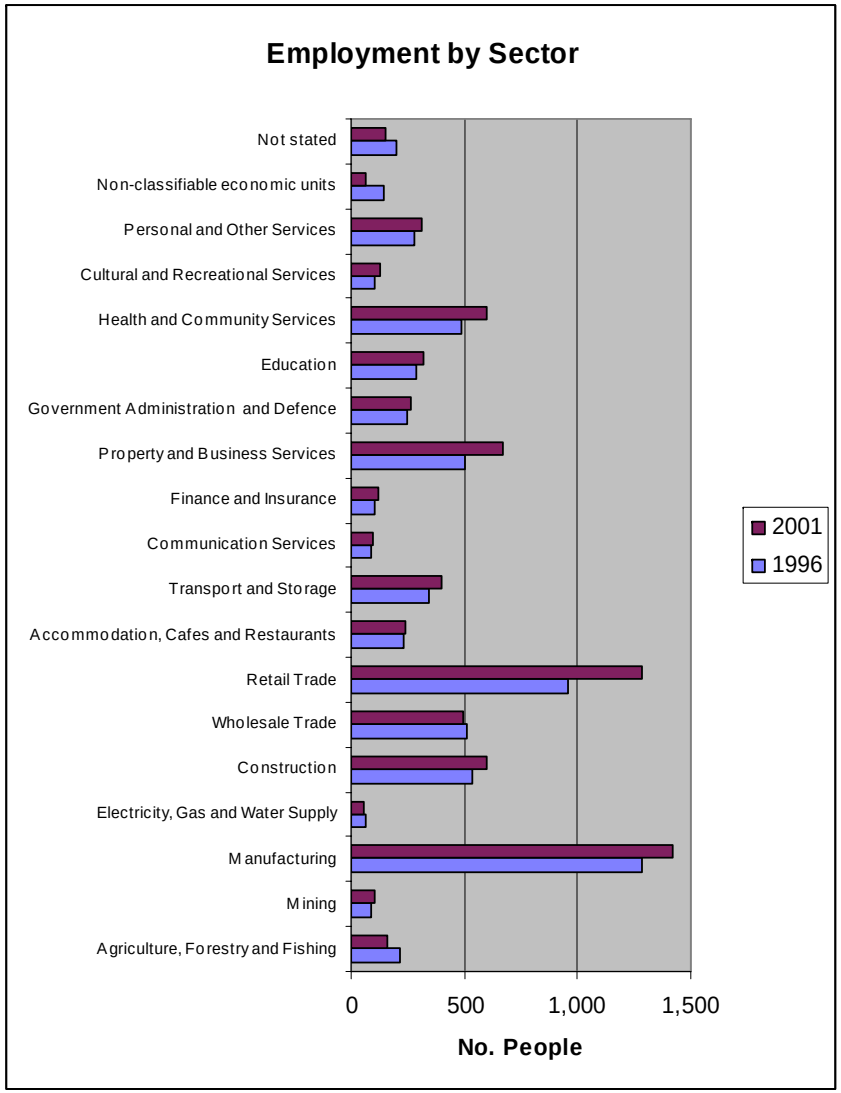


Figure 10 - Employment by Sector

The Kwinana industrial estate, located within 10 km of Wellard Village is a significant local employer. The opportunity exists to explore linkages within Wellard Village with respect to employment and traineeships.

Overall the Town of Kwinana, is well positioned for sustained economic growth. Wellard Village will assist in the process by providing additional population and employment/business opportunities. Together with the partnership approach developed by the project team, the development will add and build upon the municipalities regional, national and global competitive edge.

3.3.2 Education

The Kwinana District comprises a range of educational establishments as outlined below in Table 3.2 (refer **Figure 5**):

Table 3.2: Education Establishments

Primary Schools	North Parmelia Primary School Orelia Primary School Medina Primary School Calista Primary School Leda Primary School Saint Vincent's Primary School (private) Bertram Primary School (proposed)
High School	Kwinana Senior High School

The Education Department has advised that current primary school facilities within the district are at capacity and a strong demand exists for new facilities in the Wellard area which can also be supported by new growth rapidly occurring in Bertram and a lack of facilities in Parmelia.

4.0 PLANNING BACKGROUND

4.1 Metropolitan Regional Scheme

The subject land is predominantly zoned 'Urban' under the Metropolitan Region Scheme except for:

- The Perth to Mandurah Railway Line, which traverses the subject land from north-east to south-west, is included within the Railways Reservation
- A proposed High School site has been reserved for Public Purposes (High School) consistent with a previously approved Structure Plan for the site
- Other Regional Roads Reservations for Wellard Road, along the northern boundary and Gilmore Avenue along the western boundary
- Parks and Recreation Reservations for Leda Reserve along the southern boundary of the site.

The extent of zonings and reservations within the Metropolitan Region Scheme is shown in **Figure 11**.

4.2 Town of Kwinana Planning Scheme No. 2

The majority of the subject land is included within the Residential Zone with an R Coding of R20 under the Town of Kwinana Town Planning Scheme No. 2 (Refer **Figure 12**). A recent Amendment No. 75 proposes to rezone the southern portion of the site from Rural to Special Residential, Parks and Recreation Reservation and Residential R20.

Under the provisions of Council's Town Planning Scheme No. 2, the land is identified as part of Area 19 – Leda, where there is a requirement for the preparation of a Structure Plan to be approved by Council and the Western Australian Planning Commission.

The purpose of this Structure Plan is to satisfy this requirement and facilitate development.

4.3 Leda Structure Plan (February 1997)

The Leda Structure Plan (refer **Figure 13**) was prepared by the Roberts Day Group on behalf of LandCorp in 1997, following a review of the approved Leda Structure Plan of 1992.

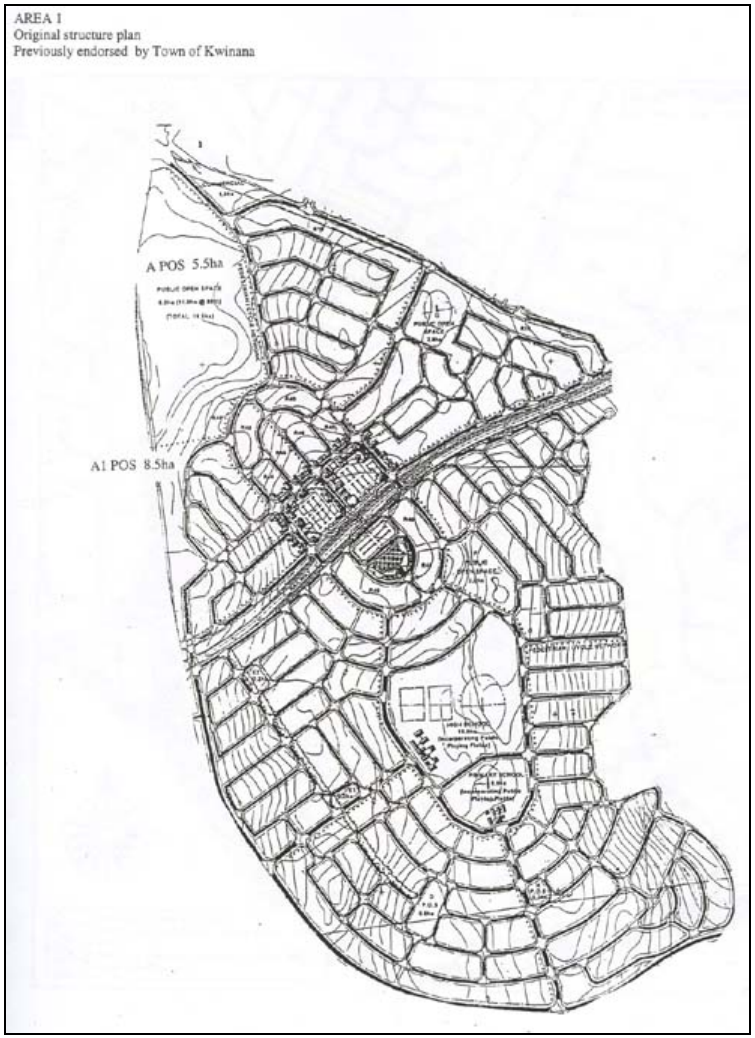
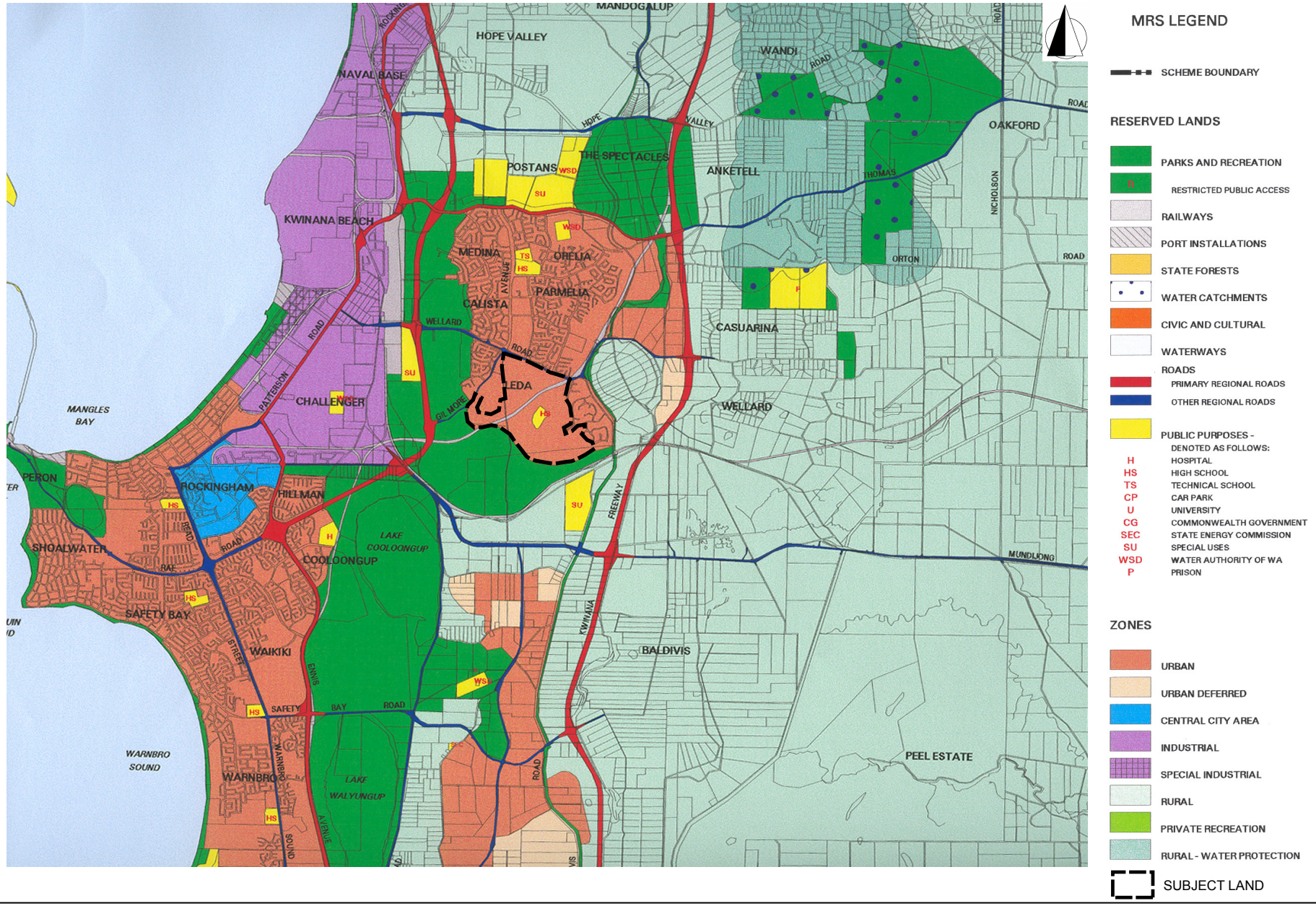
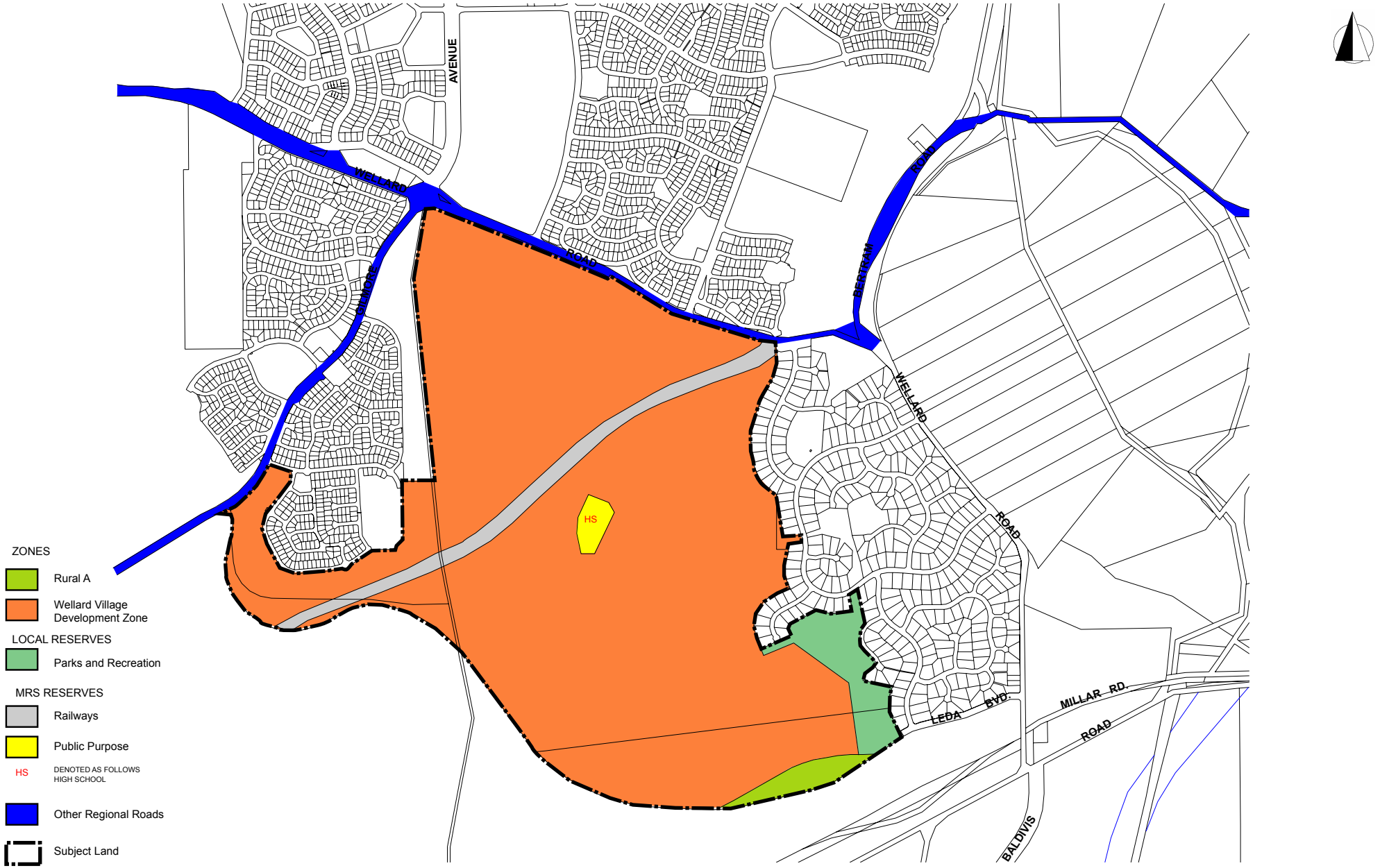


Figure 13 - Leda Structure Plan (February 1997)



Existing Metropolitan Region Scheme Zoning

Figure 11



Existing Zoning

Figure
12

Due to the reservation of land for a future rapid rail transit system between Perth and Mandurah which traverses the site, Landstart initiated a review of the Structure Plan to address and reflect this planning initiative as part of an overall assessment of its requirement for the land.

As a result Landstart commenced a series of investigations to assess the appropriate long term use for the landholding within an acceptable review process.

The first phase involved liaison with a number of consultant groups during which time a number of alternatives were considered. The schemes produced during this phase highlighted the need to involve representation from both the local community and the technical service agencies as well as the Kwinana Town Council. Many of the components in the resulting Structure plan reflect the findings and outcomes that were derived from the workshops particularly in regard to matters such as the location and content of open space; the provision of tree lined boulevards; the retention of vegetation, the number and location of education facilities, a variety of lots sizes and the central location of community and commercial facilities.

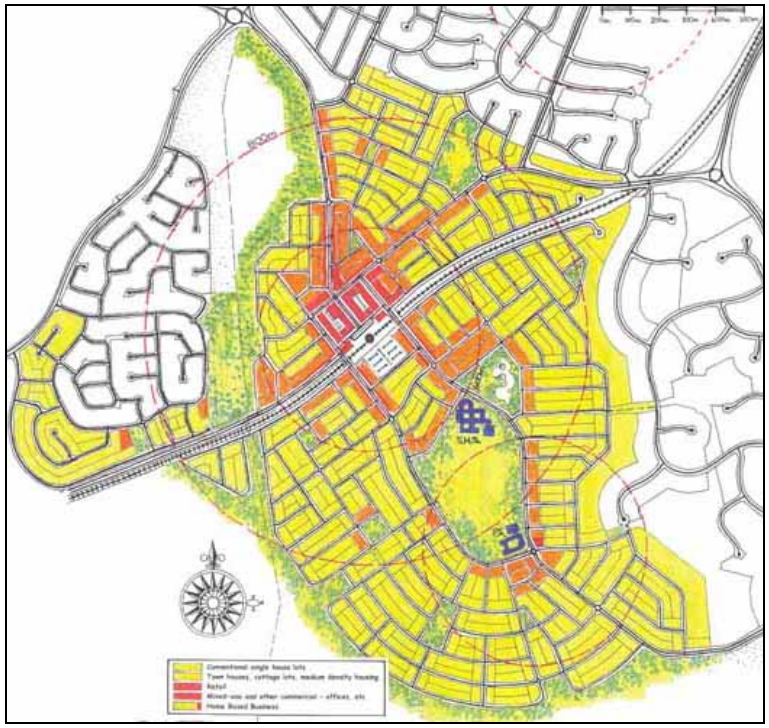
Key elements of the plan, relevant to this application include:

- Town Centre Village comprising 'Main Street' commercial development focussed on the Railway Station and including park and ride and bus transfer station and community infrastructure
- High School located south of the railway line
- Retention of wetlands within the public open space system along the western boundary of the site

4.4 Enquiry by Design Workshop

In 2001 the DPI conducted two design workshops attended by representatives of Council, Department of Transport and Landstart to consider appropriate modifications to the 2001 structure Plan to accommodate a new transit location and to address various infrastructure requirements requested by approval agencies.

As a result of the two workshops, two new structure plans were produced by DPI, see below. The preferred option, below, embraces Liveable Neighbourhoods planning which promotes strong linkages to public open space, recreation, community and regional facilities as well as being pedestrian oriented.



Overall DPI Preferred Option

4.5 Relevant Policies

Although various policies prepared, adopted and administered by the WAPC have broader relevance to the study area, the most relevant and significant include:

- Liveable Neighbourhoods
- Policy DC1.6 Planning to Enhance Public Transport Use
- Transit Oriented Development

4.5.1 Liveable Neighbourhoods

Liveable Neighbourhoods was prepared to implement the objectives of the State Planning Strategy that aim to guide the sustainable development in Western Australia to 2029. It operates as a development control policy to facilitate the development of sustainable communities. The key elements of Liveable Neighbourhoods critical to the development of the subject land include:

- Maximising residential density and mixed use development focussed on the station precinct and the main approach roads.
- Providing for choice and accessibility (walking, cycling, bus,, rail, and car within the station precinct).
- Providing a permeable street network that optimises walkability to the station as well as creating main road links to the Kwinana Town Centre and the Rockingham District Centre.
- Creating employment opportunities through local neighbourhood commercial integrated with the station precinct.
- Creating a strong identity for the station precinct with landmarks where possible, and establishing strong view corridors from the station precinct to focal points within the neighbourhoods.
- Staging – it will be important that the first stage of the development be integrated and co-ordinated as closely as possible with construction and commissioning of the rail station to develop an appropriate identity, provide opportunities for local commercial ventures to maximise returns early, establish public transport as a viable alternative to private car usage, encourage patronage, and maximise transport infrastructure investment.
- Permeable street design should be based on creating an attractive environment, with shared paths for cycling and walking on both sides of the street, street side parking and strategically located bus stops. Station parking should be design so as to not dominate the urban form and may be considered in the ling term future as potential land banking for development as provided by demand and increased land values.
- Creating an environment in and around the station, park and ride and around the areas for mixed use development that has a high degree of passive surveillance.
- In and around the station, pedestrians will have priority of access, and be mixed at grade with buses and kiss and ride cars through appropriately detailed calming techniques based on encouraging safety awareness and co-existence rather than conflict.
- Public open space is to be provided in appropriate locations, safe with good surveillance, useable integrated, linked, sufficient size for purpose and with possible links to school sites and community sites.

4.5.2 Policy DC 1.6 Planning to Enhance Public Transport Use

Policy DC1.6 – "Planning to enhance Public Transport Use" applies to all land within the Metropolitan Region situated within 800 metres of a railway station. It contains six main policy measures:

- To promote public transport as an alternative to car travel and enhance mobility in the community, particularly for those who do not have access to a car.

- To ensure the optimum use of land close to railway stations, bus terminals, transport interchanges and routes containing frequent public transport services for residential, commercial and other intensive uses.

- To maximise accessibility to electric rail and other public transport services, in particular high frequency bus routes and System 21 bus corridors.

- To maximise accessibility by rail and other public transport to a range of work, shopping and other urban activities.

- To facilitate safe pedestrian and cycle access to and from public transport services and a range of activities focussed around them.

- To promote the development of a more sustainable urban form.

- To promote designs for public transport that minimise any adverse impact on local amenity arising from public transport operations.

- To ensure adequate consideration is given to public transport access by planning authorities, consultants and developers.

With respect to land use in areas accessible to major public transport infrastructure, the Policy supports higher residential densities, commercial and mixed use developments should be encouraged as outlined below:

- Medium to high density residential development and accommodation for groups dependent upon public transport such as the aged, socio economically disadvantaged and those with disabilities.

- Commercial development such as retail office uses (where appropriate and consistent with other relevant policy statements), focussed on the core area of public transport precincts.

- Intensive recreation, education and leisure activities.

- Other uses likely to attract significant employment.

Unless as part of a staged program looking to implement preliminary uses, there should be a presumption against the use of land within public transport precincts for:

- low intensity commercial uses such as showrooms and showroom-warehouse development, except as part of an established or proposed commercial centre identified under a relevant policy;
- warehouses;
- general industry with extensive land needs;
- low density residential development;
- public utilities and drainage reserves; and
- large areas of undeveloped public open space.

4.5.3 Recent Design Trends

Since the 1980's, a major international urban design trend variously referred to as 'New Urbanism' , 'Neo Traditional Planning' or 'Liveable Neighbourhoods' has emerged. This trend has focussed upon the redefinition of urban spaces in general, and 'town centres' in particular.

Key proponents of the trend have included Duany/Plater-Zyberk, Calthorpe, Krier, Murrain, Morris/Kaufman, Katz, et al. Apart from initially being academically driven, the trend is increasingly being embraced by the development and commercial/retail industry. Recent surveys by KPMG for example have documented a decline in consumer preference for mall-based shopping, whilst street based commercial development has retained (or increased) consumer share.

Moreover, most design aspects of these trends are now embodied in the Liveable Neighbourhoods adopted by the WAPC in June 2000.

Key physical attributes of 'Neo Traditional' planning include the following:

i) "Streets are laid out on a grid or network, so that there are alternate routes to every destination. This permits most streets to be smaller, with slower traffic. They are equitable for both vehicles and pedestrians."

ii) "Streets are spatially defined by buildings which enfront the sidewalk in a disciplined manner uninterrupted by parking lots."

iii) "Buildings are various in function, but compatible in size and in disposition on their lots. There is a mixture of houses, large and small, outbuildings, small apartment buildings, shops, restaurants, offices and warehouses."

iv) "Civic buildings (schools, meeting halls, theatres, churches, clubs, museums, etc) are often placed on squares or at the termination of street vistas. By receiving important locations, these buildings serve as landmarks."

v) "Open Space is provided in the form of specialised squares, playgrounds and parks." (excerpt from a presentation by Andres Duany to the American Institute of Certified Planners, via http://www.erdman.com/mhills/livable.htm - 9/6/99).

Further attributes also include:

i) re-introducing parking on-street (to maintain convenience and commercial viability),

ii) accommodating additional off-street parking internally within street blocks,

iii) encouraging finer grained (detailed) and more responsive architecture facing the street (eg, punctuating important thresholds and nodes)

Of particular relevance to Wellard Village is a further 'New Urbanist' scheme developed by Peter Calthorpe and others, and typically referred to as 'Transit Orientated Development' (TOD) which integrates landuse and transportation strategies.

Key elements of TOD design relevant to the study area include:

i) focussing roads and activity on the primary transit stop (via, railway station/bus transfer station) to allow optimal accessibility;

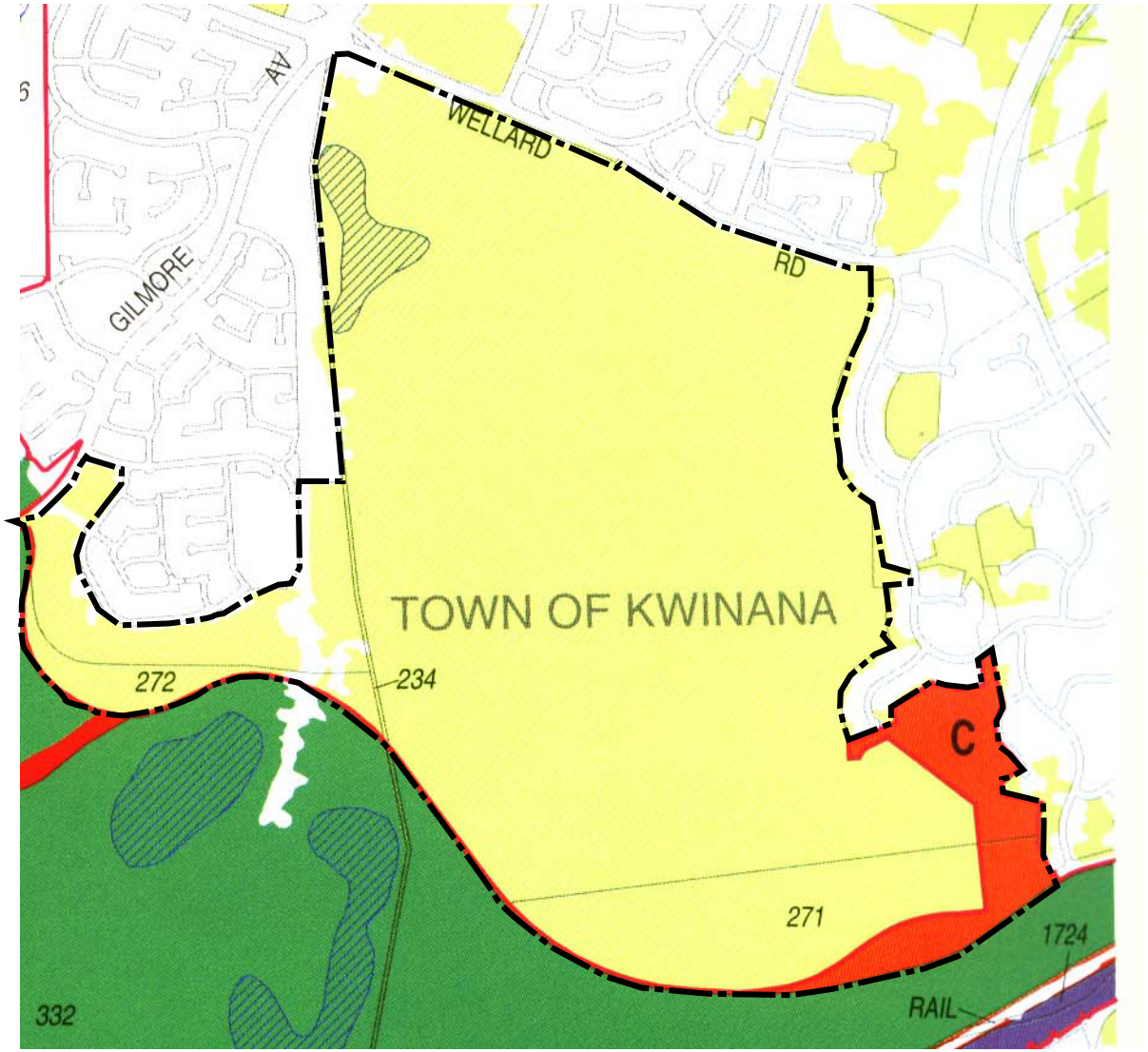
ii) encouraging a mix of commercial and residential uses within a ten minute walk (800 metres) of the transit stop, with the most intense/highest density being closest to the station; and

iii) incorporating some civic elements (eg, halls, parks, etc) within the precinct to strengthen the community focus of the TOD.

Calthorpe's TOD principles are generally theoretic, and are ideally applied to greenfield sites.

4.5.4 Bush Forever

The Wellard Structure Plan area is adjacent to Bush Forever Site 349 Leda and Adjacent Bushland Leda, refer **Figure 14**. Bush Forever Site 349 comprises approximately 960 ha of vegetation and contains a number of wetland and dryland vegetation types. The boundaries of Bush Forever Site 349 have been the subject of Negotiated Planning Solution with an area at the southern portion of the Wellard Structure Plan area exchanged for an area in the south-eastern portion of the Structure Plan area adjacent to Homestead Ridge.



BUSH FOREVER SITE

SUBJECT LAND

Bush Forever Site
Agreed Outcome

Figure
14

5.0 OPPORTUNITIES AND CONSTRAINTS

5.1 Wetlands

The Department of Environmental Protection (DEP) require a buffer to be retained around wetland areas. The buffer width typically recommended is a minimum of 50m or 1m AHD higher than the outer edge of wetland dependent vegetation, which ever is the larger. A 50m buffer around the wetland area is shown on **Figure 4**. Subdivision would not be permitted within the buffer area, although earthworks for the purposes of drainage management and the development of POS is sometimes acceptable depending on the condition of the buffer. In this case, the buffer around the wetlands is significantly degraded and could be enhanced though rehabilitation and use as POS or used for appropriately designed drainage swales or infiltration basins.

5.2 Remnant Vegetation

Much of the Structure Plan area comprises Eucalyptus Woodland with understorey vegetation in varying condition. A portion of the Structure Plan area has been identified as regionally significant in Bush Forever and will be required to be protected for conservation purposes. The remaining vegetation within the Structure Plan area is not considered regionally significant in Bush Forever and does not contain any Threatened Ecological Communities. In addition, the vegetation types are well represented within conservation reserves in the surrounding area. Therefore, the vegetation itself does not present a constraint to development.

The Study Area does however contain some areas of good quality vegetation. Remnant vegetation should therefore be retained where possible to retain some of the environmental values of the site. The retention of remnant vegetation will lend an instant maturity to future residential development and will provide opportunistic habitat and feeding opportunities for native fauna species.

The retention of remnant vegetation will be achieved in a number of areas within the Structure Plan. Remnant vegetation will be retained in the wetland POS area and within the southern wetland area. In addition, vegetation will be retained in parkland areas and Eucalypts will be retained within road verges and around formal recreational areas where possible. Management of remnant vegetation is outlined in Section 11.4.2.

Further to the above, there is an important vegetation area identified on the Structure Plan, south of the railway. The existing linear public open space and adjacent road reserves will incorporate and protect vegetation where practical. The ability to protect the vegetation will be determined through a detailed tree survey at the subdivision design stage, with the final subdivision design being articulated to ensure the practical protection of vegetation.

5.3 Fauna

The Bandicoot population in the Wellard Structure Plan area is considered to be restricted to the northerly sumpland area as this area contains the densest understorey vegetation in the area.

The sumpland area is proposed to be retained within an area of Public Open Space and managed to maintain vegetation condition and structure. With adequate protection and management of the sumpland area the Bandicoot population should remain viable in the longer term (15 – 20 years) (Ecologia, 1997). Management of fauna within the structure plan is outlined in Section 11.4.3.

A dedicated fauna underpass will be provided as part of the extension of Leda Boulevard. The underpass is to facilitate fauna connectivity either side of Leda Boulevard within the adjacent Bush Forever Site. The underpass is to be located, designed and constructed to the satisfaction of the Department of Environment and Conservation and Town of Kwinana.

5.4 Bush Forever

In addition to providing refuge for flora and fauna the presence of Bush Forever Site 349 Leda and Adjacent Bushland Leda adjacent to the Structure Plan area will lend a natural environment atmosphere to any proposed future residential development. Potential impacts on the reserve arising from the future development of the Structure Plan area may result from inappropriate usage and unrestricted access into the reserve. Potential impacts resulting from housing development adjacent to bushland reserves include:

- Killing of native fauna by domestic pets.
- Weed introduction through dumping of garden waste, pets and people.
- Cutting of native vegetation.
- Increased risk of fire.

The interface between Bush Forever Site 349 and the Structure plan area will require adequate design and management to avoid any potential impacts. Management guidelines are outlined in Section 11.4.2.

5.5 Noise and Vibration

One receiver near the corner of Wellard Road and Homestead Drive recorded noise levels 2Db above daytime Criterion 2 levels and vibration levels 3Db above Criterion 2 levels.

The NVMP prepared by Lloyd acoustics (2002) indicates that if noise levels exceed Criterion 2 mitigation measures may be considered. Management of noise from the railway line is discussed in section 11.3.4.

The predicted vibration calculations are based on measured vibrations of trains travelling along a track on ballast in the Metropolitan area. However ground borne vibrations are complicated by the soil/rock structure of the ground and will vary from site to site (Lloyd, 2002). The NVMP recommends that specific vibration analysis including assessment of the ground geology should be undertaken by the Perth Urban Rail Development Office prior to construction of the line to determine if vibration control is necessary.

The new generation trains to be used on the proposed railway line are expected to reduce vibration levels by 3Db (Lloyd, 2002). Given that the current prediction for vibration near Homestead Ridge is to exceed Criterion 2 by 3Db the use of new generation trains is expected to lower the vibration levels to below Criterion 2 levels. Management of vibration from the railway line is discussed in section 11.3.4.

5.6 Interface with Leda Reserve

As indicated in **Figure 15** the majority of the Structure Plan area has a road interface with Bush Forever Site 349 Leda and Adjacent Bushland Leda. A road interface with the reserve will act as a firebreak and discourage disposal of garden waste in the reserve as well as providing a bushland outlook for nearby houses.

Two exceptions to the road interface exist; consisting of two areas of Public Open Space. These POS areas will contain grassed areas as well as native vegetation retained where possible.

The following management principals should guide the treatment of the Reserve/Subdivision interface:

- Areas of POS abutting the reserve will need a controlled edge to delineate the reserve boundary. This may include fencing as described above and the use of limestone blocks, vegetation screening or similar landscaping features.
- The reserve boundary must be clearly marked and fenced prior to commencement of construction to prevent unnecessary disturbance within the reserve.

5.6.1 Wetland

The Conservation Category wetland is proposed to be maintained within an area of POS in the northeast of the Structure Plan area. The wetland area itself will be retained in its natural state with a boardwalk or similar structure providing controlled access for viewing. The remainder of the POS will largely comprise the 50m wetland buffer. Some areas of the POS will be landscaped to provide passive recreational opportunities such as grassed areas, seating and a dual use path. The POS area will also be used for stormwater drainage with a retention basin or similar structure within the wetland buffer area.

1. MAJOR CONNECTION TO KWINANA TOWN CENTRE
2. ANGLICAN PRIVATE SCHOOL K-12
3. CONSERVATION WETLAND AND RECREATION
4. MEDIUM DENSITY RESIDENTIAL / MIXED USE IN CLOSE PROXIMITY TO NEIGHBOURHOOD CENTRE
5. PUBLIC OPEN SPACE LINK BETWEEN WETLANDS AND REGIONAL OPEN SPACE
6. DISTRICT RECREATION FACILITY COMPRISING OVAL
7. PUBLIC PRIMARY SCHOOL
8. RUNNYMEDE GATE - TREE LINED ENTRY - MEDIAN PROVIDED
9. NEIGHBOURHOOD CENTRE INCORPORATING EDUCATION, RETAIL, OFFICE RESIDENTIAL AND COMMUNITY FACILITIES
10. WELLARD TRAIN STATION
11. LARGE LOTS (1500m^2) TO PROVIDE TRANSITION BETWEEN EXISTING SPECIAL RESIDENTIAL DEVELOPMENT AND FUTURE RESIDENTIAL
12. POS LINK TO EXISTING SPECIAL RESIDENTIAL DEVELOPMENT
13. HIGH SCHOOL INCORPORATING PUBLIC PLAYING FIELDS
14. PRIMARY SCHOOL
15. BUSH FOREVER SITE
16. EXTENSION OF LEDA BOULEVARD
17. WELLARD ROAD IS IDENTIFIED AS 'OTHER REGIONAL ROAD RESERVE' UNDER THE MRS. MRS AMENDMENT 1099/33 PROPOSES THE DOWNGRADING OF WELLARD ROAD BY REMOVING THE OTHER REGIONAL ROADS CLASSIFICATION

- RESIDENTIAL R10 (LARGE LOTS)
- RESIDENTIAL R20
- RESIDENTIAL R30
- RESIDENTIAL R40
- RAILWAY RESERVATION
- NEIGHBOURHOOD CENTRE (R80)
- NEIGHBOURHOOD NODE
- PUBLIC OPEN SPACE / CONSERVATION
- COMMUNITY PURPOSES

18 Denotes a community purposes site of 5000m^2 to be vested free of cost in the Crown in accordance with section 152 (1) (f) of the Planning and Development Act 2005, or granted freehold to the Town of Kwinana. This site may be reduced in land area subject to the following requirements being met:

i. The Council of the Town of Kwinana agrees to the reduction;
ii. The reduction is not more than 3800m^2 (i.e. a minimum site area 1200m^2);
iii. The land owner makes a reasonable financial contribution to the Town of Kwinana as agreed to by Council, with this based upon an equitable funding arrangement for a community facility to be developed on the site;
iv. The community facility under iii is that chosen by the Council of the Town of Kwinana;
v. The land owner enters into a suitable agreement with the Town of Kwinana guaranteeing requirements i to iv are met.

IMPORTANT VEGETATION AREA

Existing linear public open space and adjacent road reserves will incorporate and protect vegetation where practical. The ability to protect vegetation will be determined through a detailed tree survey at the subdivision design stage, with the final subdivision design being articulated to ensure the practical protection of vegetation.

DEDICATED FAUNA UNDERPASS

Denotes location for dedicated fauna underpass to be provided as part of extension of Leda Boulevard. The underpass is to facilitate fauna connectivity either side of Leda Boulevard within the Bush Forever Site. The underpass is to be located, designed and constructed to the satisfaction of the Department of Environment and Conservation and Town of Kwinana.

Wellard Village Structure Plan

Figure 15

6.0 WELLARD VILLAGE STRUCTURE PLAN

6.1 Design Philosophy

The principle philosophy of the Structure Plan is to maximise community formation by creating an integrated land use and transport village in a manner that generates social, economic and environmental opportunities.

Specifically, the Wellard Village Structure Plan design is based on the following fundamental principles, as illustrated in **Figure 15,** Wellard Village Structure Plan:

- Wellard Village will be a town designed around Traditional Neighbourhood Principles and a return to the traditional neighbourhood.
- A central access spine focussing on the Neighbourhood Centre and transit precinct, with north-south movement systems focused into the Neighbourhood Centre.
- A village core within the heart of the centre to encourage a strong sense of community.
- Mixed land use activity in the Neighbourhood Centre to encourage social interaction, supported by a permeable road and pedestrian access system between neighbourhoods.
- A pedestrian friendly street environment with good accessibility to the public transport system to assist in reducing car dependency and encouraging social interaction and alternative forms of transportation i.e. cycling.
- A pedestrian movement system which provides linkages between key land use activities including the Neighbourhood Centre, station precinct, educational facilities, and open space.
- A robust Neighbourhood Centre precinct to allow for change in land use activity over time.
- A path network which provides linkages with regional recreation opportunities and adjacent facilities external to the site including, Leda Nature Reserve, Bollard Bulrush Swamp and Kwinana Town Centre.
- Street networks and public open space designed to maximise passive surveillance.

6.2 Community Benefit

Wellard Village provides significant investment in the locality and community benefit for both existing and future residents, as outlined below:

- Enable development of a quality 'Main Street' and town centre precinct focussed around the station.
- Provide a broader choice of residential locations and lifestyle opportunities.
- Opportunities to expand the employment opportunities within the area by development of the Neighbourhood Centre.
- Retention of existing vegetation where possible within streets and public open spaces.
- Extension of Leda reserve through public open space and bush forever site allocation.

6.3 Community Facilities and Amenity

6.3.1 Community Development Initiatives

Design creates social, economic and environmental opportunities.

It is widely acknowledged that the world we live in has changed at the local, regional, national and global level. These shifts are reflected in employment patterns, social attitudes, product development, market needs, built form, regulatory regimes and the state of the environment.

At the community level these changes have major repercussions, the most profound of which is that now more than ever before efforts need to be made to create communities. Mass production and consumption has led to a situation whereby the world has become more and more the same. Standard built form and planning practices over the last 20 years has led to a situation whereby the distinctiveness of many localities is lost in a sea of sub-urbanism.

What these trends and influences indicate is that traditional community structures are less likely to evolve naturally. What is often required, particularly in new localities, is a series of enablers to stimulate people to interact, build relationships, establish networks and create a local sense of community identity.

As part of the Wellard Village project, a community development plan is to be developed that will provide the framework in which these enablers are collated and documented. The intent and process of developing the CDP will serve to draw together key stakeholders and explore areas of mutual self-interest between the various partners.

These objectives will complement the broader land use and design initiatives undertaken as part of preparing the Wellard Village Structure Plan. They will also assist in its on going refinement over time.

6.3.2 Community Facilities

Community facilities provide focal points for social interaction and assist in building a strong and cohesive local community. Within the structure plan a number of areas have been set aside for these facilities.

Whilst the final design and layout of this proposed infrastructure will need to be determined by discussions with the wider community and the Town of Kwinana, the current framework provides a number of opportunities for existing and future populations, refer **Figure 16**. This includes:

- A 9.0 ha private school site;
- A 3.5 ha and 4.0 ha primary school site, one north and one south of the railway line;
- A 7.5 ha mid school site;
- A TAFE/Tertiary education site;
- 11 parcels of public open space with active, passive and conservation uses;
- Dual use paths throughout the subdivision; and
- An integrated rail station connecting south to Mandurah and north to the Perth Central Business District.
- Neighbourhood Centre, comprising a range of retail, commercial and entertainment uses.

Initially it is proposed that a sales office will be established that will also double as a community house. A more permanent integrated facility could be developed to service local organisations within the town centre.

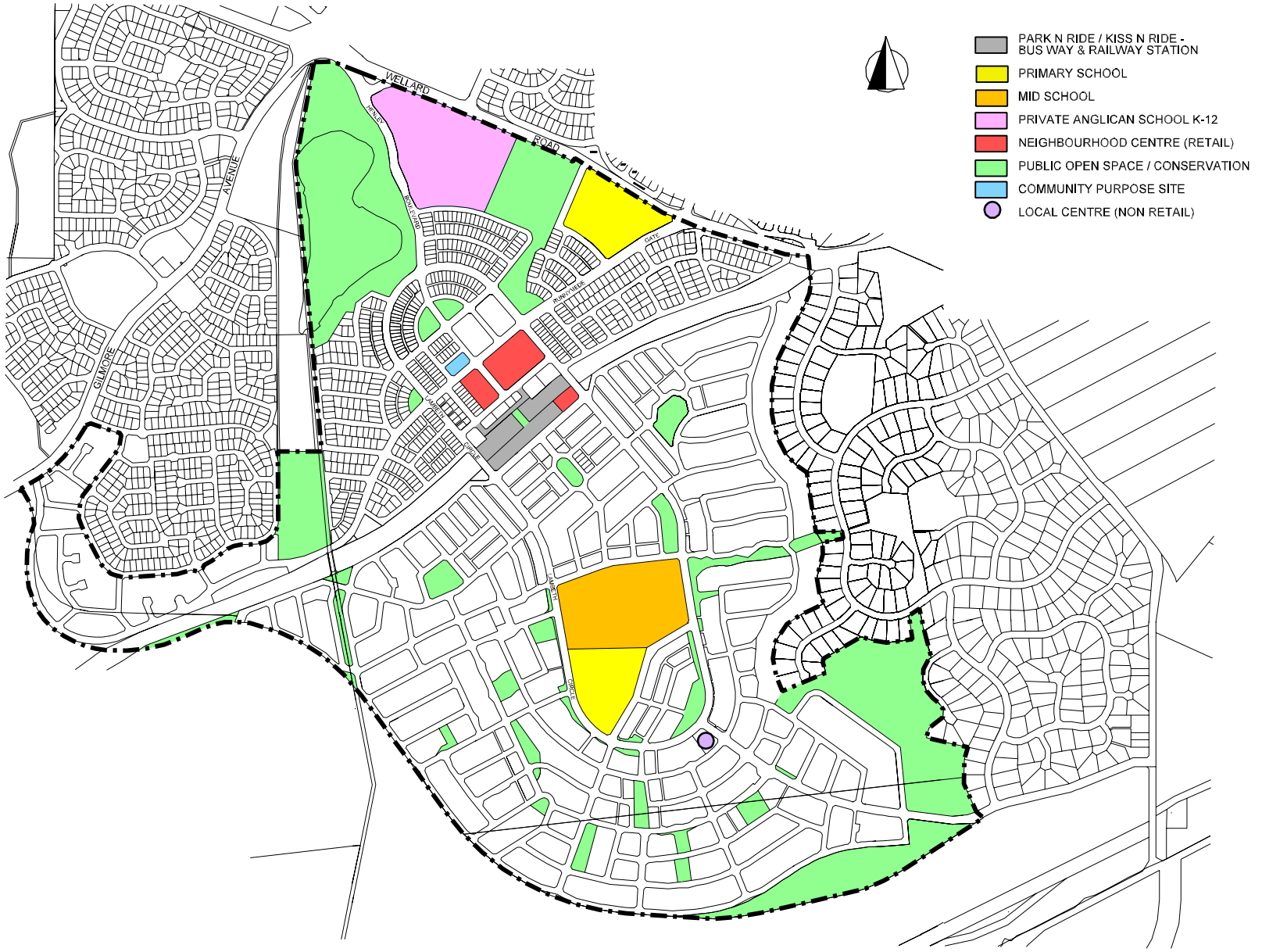
It is also envisaged that school in shops or houses will be established to service stage one and two populations. Over time these will be replaced by the establishment of a permanent primary school site and, at a later date, a middle school.

The opportunity also exists to create a small scale tertiary education site. Preliminary discussions have been held with Murdoch University who are interested in establishing a social research facility in the region. Challenge TAFE may also relocate local training programmes on site.

If these opportunities became a reality, Wellard Village will present the prospect of developing a unique education orientated precinct. This will allow a number of training initiatives to be created that centre on ensuring that the local youth and unemployed have improved employment prospects.

A diverse set of leisure based facilities will also be provided within the development. Co-located active sports ovals are proposed for the private and public school sites along Wellard Road, and ovals will also be provided as part of the middle school, south of the railway station.

A community purposes site of 5000m^2 will be located within the Neighbourhood Centre and will be vested free of cost in the Crown in accordance with section 152(1)(f) of the Planning and Development Act 2005 or to the Town of Kwinana in freehold land.



Proposed Community Infrastructure

Figure
16

The size of the community purposes site may be reduced in land area subject to the following requirements being met:

i. The Council of the Town of Kwinana agrees to the reduction;
ii. The reduction is not more than 3,800 m^2 (i.e. minimum site area 1200 m^2);
iii. The land owner makes a reasonable financial contribution to the Town of Kwinana as agreed to by Council, with this based upon an equitable funding arrangement for a community centre to be developed on the site;
iv. The community centre under iii is that chosen by the Council of the Town of Kwinana;
v. The land owner enters into a suitable agreement with the Town of Kwinana guaranteeing requirements i to iv are met.

To encourage non-vehicle transport modes (i.e. walking, cycling) dual use pathways will also be developed throughout the subdivision. This will assist reduce the level of vehicle emissions and stimulate a healthy local population by encouraging walking/cycling activities.

A comprehensive path network will serve to connect usable high quality passive recreational space dispersed throughout the subdivision, and add to the permeability of the area. The rehabilitation and enhancement of on site wetlands and surrounding buffer bushland will also add to the level of amenity and recreational opportunities in the development.

As part of the ongoing consultation process, the developers will focus on ensuring that these spaces and facilities are activated and linked to the broader project and regional objectives. In all instances, community facility planning and development will be based on established need and emerging recreation trends to ensure that there are no service duplications, and community needs are satisfied.

6.3.2.1 Neighbourhood Node

The Neighbourhood Node's primary objective is to establish a focal destination for the localised community (within 400m). It should offer a small commercial (convenience store between 100-200m^2 GLA) and community based use, and thus offer both convenience and service type facilities from this. It should exist on a single street block of approximately 1500m^2 in area.

The built form of Neighbourhood Node should include the following attributes:

i. Street based, with a reduced setback to the primary street boundary;
ii. Incorporate on street car parking where practical, as well as off street parking;
iii. Verge areas between kerb lines and building fronts treated as a hard paved side walk, including street furniture, and appropriate street trees;
iv. Footpath areas afforded weather protection by awnings;
v. Buildings at nodes architecturally contributing to the street, and providing an active edge.

A Detailed Area Plan must be submitted and approved by Council for development of the Neighbourhood Node.

6.3.3 Education

Current Education Department guidelines require the provision of one primary school for every 1500-1800 lots created. Based on the estimated population yields for Wellard Village, and recent discussions with the Education Department regarding their anticipated catchment requirements for the Wellard and Parmelia Districts, two primary school sites have been identified within the Structure plan area.

The northern primary school site is to comprise 4 hectares with access close to Parmelia Avenue to services the catchment to the north. The southern primary school site is to comprise 3.5 hectares and be co-located with the Mid School.

The proposed school site will have frontage and direct access to four roads. There is the opportunity at the detailed design phase to review the boundaries of the site and public open space with the possibility of locating school buildings amongst existing trees and wrapping around the oval in an 'L' shape. It is considered that this is best determined at the detailed design phase in consultation with Council, Education Department and their architect.

The Education Department has also indicated a requirement for a Mid School to be provided south of the railway line. This has been accommodated consistent with the requirements of the MRS and Kwinana Town Planning Scheme No. 2, although in a modified configuration.

Discussions have also been held with the Education Department regarding opportunities for School in Shops in the first stages of development. These initiatives will be pursued concurrently with development.

6.3.3.1 Private Facilities

A 9.0 ha site has been identified for a possible private K-12 site. Preliminary enquiries of interest have been received and expressions of interest will be sought.

6.4 Structure Plan Yields

The estimated lot yields and population projections for the Structure Plan area are provided below in **Table 6.1**. Succinctly, the total Structure Plan area comprises approximately 320.5888 hectares, subtracting the non-residential land uses and applying appropriate POS credits for wetlands, results in the net subdivisible area of 257.2468 hectares.

Table 6.1: Public Open Space Calculations

Lot 254	255.7210
Part 277	22.2438
Part 271	34.8123
Part 272	7.2087
Part Lot 242	0.6030
Total Structure Plan Area	**320.5888**
DEDUCTIONS FOR CALCULATING NET SITE AREA	
D1 Primary School (x2) and High School Sites	15.2100
D2 Transit Village Commercial	2.8873
D3 Park and Ride	1.1000
D4 Less Railway Reserve Area 1	4.6100
D5 Less Railway Reserve Area 2	6.1600
D6 Bus Interchange	0.3153
D7 Bush Forever Site	17.3000
D8 Wetland 1 (8.98 ha - 50% only)	4.4900
D9 Wetland 2 (1.156 ha - 50% only)	0.5780
D11 Private K-12 Site	8.6000
Total Deductions:	**61.2506**
Nett Subdivisible Area (GSA)	**259.3374**
10% POS Required	25.93 ha
Total POS Provided (including drainage 100% credit):	33.5394 ha 12.93% + 2.93% or + 7.61 ha

Notes:

*i) Whilst the Structure Plan shows POS as detailed above and in Section **Error! Reference source not found.**, the use and purpose of each POS area is subject to further detailed design and discussion with the Town of Kwinana and the Department for Planning and Infrastructure, with an intention to refine the POS provision through the detailed design phase.*

ii) The POS calculations may change subject to the establishment of some of the non-residential uses and the ultimate development of commercial uses.

iii) The community purpose site is subject to negotiation with the Town of Kwinana.

Table 6.2: Anticipated Lot Yields/Population Projections

Lot Yields	
Proposed number of lots	2,631 lots
Estimated Population Projections	
Say, 2,630 lots x 3 persons per dwelling	7,890 persons

6.5 Residential Densities

Residential densities have been proposed based on the principles outlined within Element 3 of Liveable Neighbourhoods, together with specific site assessment. In this regard, consideration has been given to the character of the existing communities surrounding the subject land, the requirements for density to support transit oriented development and market considerations.

A variety of housing types and lot sizes will ensure a broad spectrum of the public can be accommodated within the development and to ensure an acceptable community profile to encourage the most vibrant of communities possible.

The following elements have been incorporated into the Structure Plan:

- Higher residential densities supporting the rail service, commercial and retail facilities within the Neighbourhood Centre.
- Higher residential densities located adjacent public open space.
- Identification of live/work opportunities within the Neighbourhood Centre.
- Ensure the seamless integration of public housing with conventional housing stock.
- Larger residential lots on the eastern edge of the property as a transition to the existing development of Homestead Ridge in Wellard.

Importantly, the Structure Plan is based on a robust design to enable the development of smaller lots in response to market demands.

6.6 Town Centre

6.6.1 Introduction

The design of the proposed Wellard Neighbourhood Centre (refer **Figure 17**) is based on a number of economic, social and environmental principles.

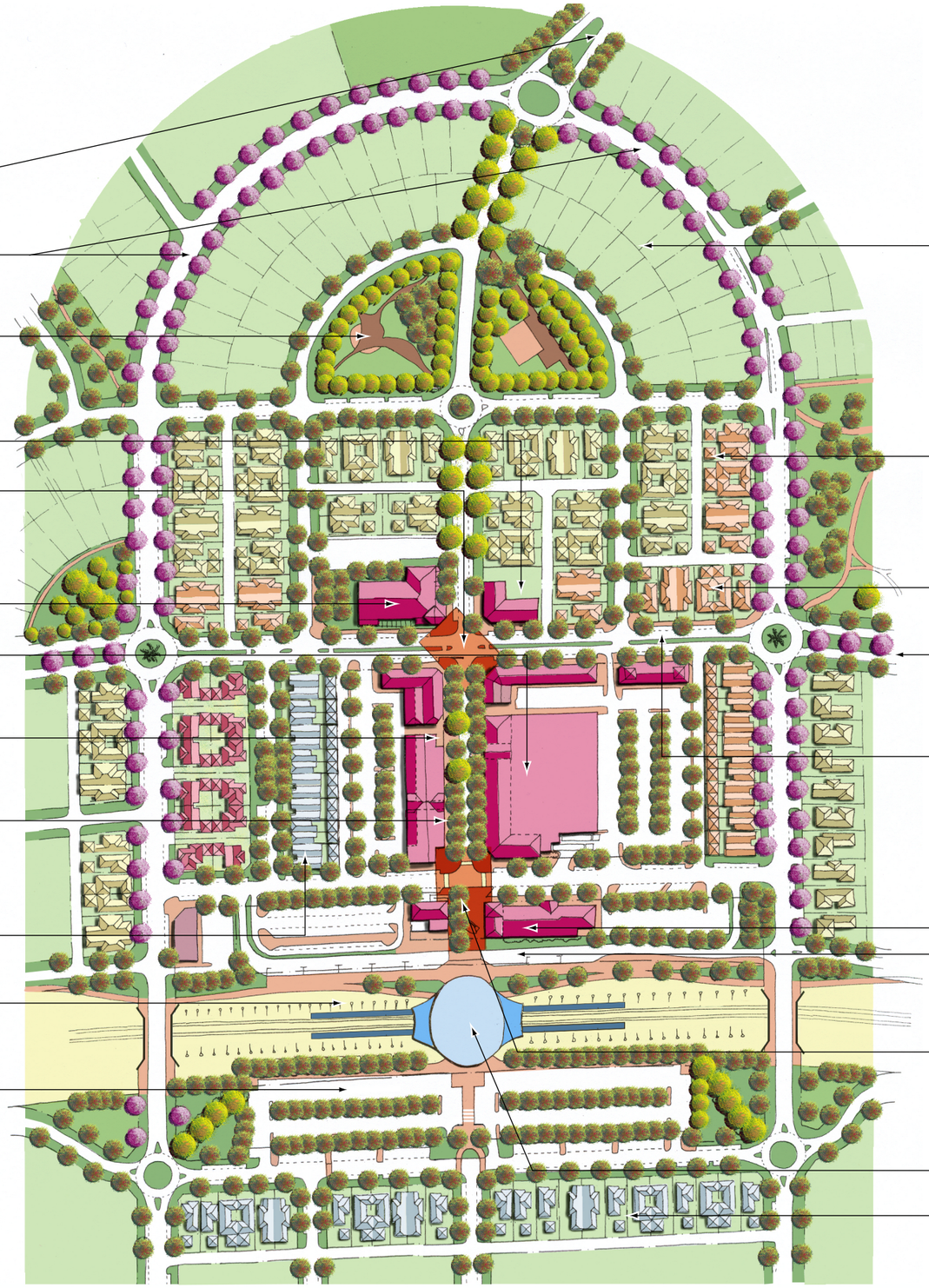
The Neighbourhood Centre is proposed to be street-based, not a shopping mall for the following reasons:

- It provides a democratic focus for community life and social exchange.
- It provides the opportunity for a broader base of jobs in the future.
- It improves security along the access to the rail station.
- It provides an improved interface with higher density residential development around the centre.
- It delivers a sense of place – currently absent from much of the commercial zones in the area.
- It improves public domain performance.
- It provides greater flexibility for future economic development in the area.

6.6.2 Design and Planning Philosophy

The design of the village is based around a series of principles, that afford good overall community performance.

The design is based around a perimeter-block approach with active edges to streets and no large massed buildings facing streets. Similarly, car parking is sleeved within each block, reducing its impact on the public domain. This approach reflects a strong desire to generate good public domain performance.



Major north-south road providing link between Neighbourhood Centre and Kwinana.

Major distributor roads designed to effectively and legibly direct traffic to bridge crossings over rail line.

Parks to serve as landscaped gateway into Neighbourhood Centre and provide amenity for residents with range of passive and active recreation options.

Possible site for child-care / community purposes facility / commercial.

Main Street Intersection designed to: announce destination; constrict traffic speeds, increase pedestrian/cyclist safety and amenity; and create an interesting public space

Possible site for civic/commercial uses

Neighbourhood Centre to accommodate up to 5000m^2 retail floorspace and approximately 2500m^2 of commercial floorspace with residential/commercial mixed use development.

Different size public spaces between train station and wetland POS area to provide a range of interaction and activity opportunities

High amenity Main Street situated between the Neighbourhood Plaza and main intersection to provide a focus for street-orientated retail development.

Encouragement of home-based business lots with workshops/businesses interfacing with carparks.

Kiss-and-Ride / short-term parking area in accordance with PURD requirements.

Park-and-Ride facility with perimeter drainage areas to accommodate 340 permanent and 60 public on-street carbays

Precinct Codes will be prepared for the Neighbourhood Centre to ensure a high quality architecture, public realm amenity and adaptable buildings in key areas.

Medium density residential within Neighbourhood Centre (60).

Opportunity for mixed use development along main traffic streets close to retail core

Boulevard providing link between Wellard Road and Gilmore Avenue, and directing traffic to the Neighbourhood Centre.

Major east-west road controlled through Neighbourhood Centre to provide a slow-speed environment conducive to commercial activity and pedestrian/cyclist amenity.

Possible site for Challenger TAFE Facility.

Bus-only street for drop-off / collection and lay-by in accordance with Transperth requirements.

Neighbourhood Plaza with pedestrian-priority surface and edges formed by active commercial buildings. The square serves as the focal community space and helps to accentuate the civic qualities of the train station.

Wellard Train Station building.

Encouragement of home-based businesses on residential lots orientated to provide natural surveillance over the park-and-ride facility.

Neighbourhood Centre Concept

Figure 17

Retail is a structural element in Neighbourhood Centres and forms a key focus for economic and community life. Its success or failure affects amenity, as vacant or under-performing retail in streets is not only an economic effect but also is an amenity issue as vacant shops are inherently ugly and deplete street-life. A reduction in amenity leads to a reduced desire for businesses to locate in the village.

The community will be investing heavily in public space and service infrastructure in the village, and this investment should be recognised in planning and design to ensure that it is not detrimentally affected by development without offsetting benefits.

In Planning Policy Guidance Note 1 (PPG1) in the United Kingdom, urban design is described as follows:

> *"... urban design should be taken to mean the relationship between different buildings; the relationship between different buildings and the streets, squares, parks and waterways and other spaces which make up the public domain; the nature and quality of the public domain itself; the relationship of one part of the village, town or city with other parts; and the pattern of movement and activity which are thereby established: in short, the complex relationships between all the elements of built and unbuilt space."*
>
> *(DoE, 1997 para. 14).*

The definition does not speak to land use, but of relationships established between buildings and spaces. These physical and geographical relationships define the quality of the town centre. Consequently, it will be important to ensure that delivery of the village is in harmony with the philosophies expressed by the design. For this reason it is likely that we will be seeking a design code for the Neighbourhood Centre.

The Prime Minister's Task Force (Australia) reported on cities and urban design as follows:

> *"Good urban design is concerned with visual meaning, functional efficiency and broad access to change in cities and towns. It does not depend on universal principles or national codes but is grounded in local characteristics and needs, so much that it is often hard to notice, being distinguished by a natural fit between site and context. Urban design manifests itself in many ways, but it always centres on the quality of the public realm."*[1]

An objective of this study is to consider ways of achieving good socio-economic outcomes through appropriate planning controls and guidelines. This requires an assessment of how improved environmental, social and economic performance might be achieved and the effects of development on the public realm.

Studies are showing that amenity is an issue that relates to the health and wellbeing of people and communities. Amenity in the public domain is a core principle of the design for the Neighbourhood Centre.

High amenity promotes and encourages walking – USA and Australian studies are showing a high correlation between high amenity areas, and improved physical and mental health and mortality rates.[2]

Sociologist James House concluded that positive contributions to health made by social integration and social support rival in strength the detrimental contributions of well-established biomedical factors such as cigarette smoking, obesity, elevated blood pressure, and physical inactivity.[3] Consequently, in the wellbeing of people and communities it is important to recognise that a nexus exists between well performing urban areas, where interaction and community transactions are at optimum, and health and happiness.[4]

1 "Urban Design in Australia", Report by the Prime Minister's Urban Design Task Force, November 1994
2 Gillham & Barnett "Decaying Interest in Burglary Prevention, Residence on a Block with and Active Block Club, and Communication Linkage: A Routine Activities Approach." Journal of Crime & Justice, 1994. Victorian Government Studies of Health of Victorian Communities and Links to Urban Form; 2001.

3 James House, Karl Landis, Debra Umberson, "Social Relationships and Health" Science 241 1988.
4 Stewart Wolf, The Rosetto Story, an Anatomy of Health; University of Oklahoma Press 1979

Good urban design should generate a variety of benefits including a more active and vibrant public realm, greater investment return over the life cycle of a project, more efficient movement patterns, less crime[5] and increased workforce productivity. A consequence of well performing places is improved health and welfare, less social exclusion, reduced maintenance costs and cash savings for the public purse.[6]

Social activity occurs as a consequence of people moving about in the same space. The more time people spend outdoors, the more frequently they meet and the more they talk.[7]

> *"Streets are as old as civilisation, and more than any other human artefact, have come to symbolise public life, with all its human contact, conflict and tolerance."*[8]

Neighbourhood Centres that are representatives of place are major community and national economic assets – they sell the nation to the world. They occur as a consequence of an almost seamless interface between public and private infrastructure. They enhance community values and improve economic performance.

For these reasons, we propose a Neighbourhood Centre at Wellard, based around streets and not an internally focused mall.

6.6.3 The Importance of the Local and Regional Structure

Whilst shopping centres can succeed with poor regional structure, mixed-use town centres as proposed by us require structural energy for success. This energy is present in the local and regional structure of the site and surrounding area. That is why it is important for the village to be proximate to strong traffic flows. This is also important for the success of the rail station.

The proposed Neighbourhood Centre is located perpendicular to the main traffic flows, on the journey to the rail station, which will form an anchor at the end of main street. The main street is designed to generate two large blocks that are flexible enough to allow for the requirements of a supermarket and intra-block parking.

Traditional Neighbourhood Centre design will encourage concentrations of activity and a variety of land uses. Such concentrations create a more efficient urban structure and use pattern resulting in lower vehicle trips, travel distances and reduced congestion throughout the network. Neighbourhood Centres are more efficient in their infrastructure use, relying to a greater degree on public transport and shared facilities and amenities. Mixing uses also leads directly to higher user and occupier satisfaction.[9]

6.6.4 The Neighbourhood Centre and Transport

Good accessibility and structural energy is a requirement for the success of town centres. Accessibility and traffic generation is an issue for planning[10]. Studies undertaken in USA has found that trip generation rates from residential areas in a traditional town or village are half those of suburban centres.[11]

A California EPA study[12] found that a significant portion of variations of vehicle trip generation rates at regional shopping centres can be explained by the amount and regional coverage of public transit services and the density and proximity of surrounding land uses. The village is designed to facilitate density, supporting higher levels of bus and rail use.

[5] Steve Thorn, City of Gosnells, WA. "Designing Out Crime" 2001. This study established a causal link between good and bad urban design, and crime, using space syntax analysis and statistics of the geography of 20,000 crimes in the city. See also Gerde Wekerle & Carolyn Whitzman, "Safe Cities: Guidelines for Planning, Design, and Management." USA 1998

[6] CABE (UK) "The Value of Urban Design" 2000

[7] Jan Gehl et al Melbourne University, Melbourne 1976 "The Interface Between Public and Private Territories in Residential Areas"

[8] Trevor Boddy, "Underground and Overhead: Building the Analogous City." 1992

[9] CABE (UK) 2000, "The Value of Urban Design"

[10] Studies are also showing that the more time spent in the private motor vehicle, the lower the level of civic engagement. "Between 1969 and 1995 the length of the average USA shopping trip increased by 29% and the average number of shopping trips per household almost doubled. Each additional ten minutes in daily commuting time cuts involvement in community affairs by 10%;" Professor Robert D. Putnam, Professor of Public Policy Harvard University.

[11] Rick Chellman, "Portsmouth Traffic / Trip Generation Study". (Half the trips means less than half the traffic, as urban trips are generally considerably shorter than suburban trips); Michael Bernick, Robert Cervero, "Transit Villages in the 21st Century".

[12] California EPA Air Resources Board, JHK & Assoc., "Indirect Source Trip Activity and Mitigation at Major "Regional" Shopping Centers" 1994.

6.6.5 Design Codes

Land use planning has largely failed to deliver memorable places. This is partly because it is written to prevent outcomes, not to encourage them. These plans often abrogate the public sector's responsibility for community making, relying instead on the private sector. The land use or zoning plan is overly reliant on use as the primary tool for organising relationships. However, in many cases, especially in the suburbs, a mix of uses is not allowed.

> *"Codes do not emanate from any physical vision. They have no images, no diagrams, no recommended models, only numbers and words. Their authors it seems, have no clear picture of what they want their communities to be. They are not imagining a place that they admire or buildings that they hope to emulate. Rather, all they seem to imagine is what they don't want: no mixed uses, no slow moving cars, no parking shortages, no overcrowding. Such prohibitions do not a city make."*[13]

We need to define other means of ensuring improved urban performance, especially insofar as community assets are concerned. The community is the owner of the streets, squares, waterways and parks within a city. The community's view of how these spaces perform and how other uses and buildings might relate to its spaces is an issue for planning.

An objective of the design is the creation of an active mixed-use node of activity. This is created by building design and land use relationships generating active streets and energetic public space.

For improved performance, the organisation of buildings on sites requires a focus on the public domain. Traditional town and Neighbourhood Centres, where no one use dominates and buildings face to and interact with the street, represent such places.

Today, good town centres are not necessarily delivered by a hands-off approach, or relying on the market to provide the best outcome. The market might be the most efficient means of delivering the use, but in many cases it has no broader interest in the community or in inspiring other activities to locate nearby.

In the experience of the consultants in this project, good outcomes for the Neighbourhood Centre can only be guaranteed by design codes.

6.6.6 Market Factors

The proposed Neighbourhood Centre is anchored by a mid-size supermarket of around 3,200 square metres. The balance of the retail floorspace is proposed at 1,800 square metres, bringing the total retail floorspace to 5,000 square metres.

At this size, the retail role of the centre is as a convenience-retail, weekly and daily shopping destination. In this sense it will be competitive with the existing Kwinana Hub centre. However, population growth within the proximate catchment (those that would regard the proposed village as their most convenient centre) is sufficient to justify the proposed amount of retail floorspace.

Typically, convenience retail centres, which are anchored by a supermarket require around 6,000 to 10,000 population.

The new subdivision around the site is expected to generate between 2,800 and 3,000 lots. Other surrounding areas will also contribute trade to the proposed centre.

Table 6.3: Wellard Neighbourhood Centre Retail Catchment

	Est. Lots/Household	Est. Population
JV Subdivision	2,800	7,840
Fringe Areas	1,200	3,360
Total:	**4,000**	**11,200**

Source: Town of Kwinana, Peet & Co

The development of a strong Neighbourhood Centre at Wellard is not considered to be detrimental to the long term health of the existing Kwinana Hub centre. This centre will receive additional support from new residents at Wellard and other areas. Ultimately, if it is council's wish, the Kwinana centre can support a discount department store. This usually requires a trigger catchment population of around 40,000 people.

[13] Andres Duany, Elizabeth Plater-Zyberk, Jeff Speck, "Suburban Nation," North Point Press 2001.

6.6.7 Neighbourhood Centre Staging

The retail demand profile is reasonably easy to quantify, and usually triggered by the anchor – the supermarket. In other words, the supermarket timing will influence the delivery of much of the fabric of the Neighbourhood Centre.

However, we propose that the main street be a combination of retail uses at ground level and commercial and residential above. If residential above, then we would recommend at least three storeys to improve the quality of the residential product.

Residential also brings the benefit of being able to be delivered early. This is why design codes are important. If residential is delivered early in the process, then we need to ensure that the ground floor condition is ideal for shops in the future.

Also commercial demand usually follows after the establishment of a successful place. This is because jobs in the new economy are attracted to good places. This means that we should provide flexibility in the design to cater for a broad mix of jobs after completion of the retail component of the Neighbourhood Centre. This of course assumes that the project does not attract a major employer as a 'seed' contribution in the meantime.

Therefore, the staging is likely to be as follows:

- Stage 1 – Residential apartment building on north east side of main street (possibly with schools in shops on ground floor).
- Stage 2 – Supermarket and completion of main street
- Stage 3 – Additional commercial and residential development on adjoining streets.

This staging program is indicative only a this stage and is clearly subject to review.

6.6.8 Neighbourhood Centre Design

The Neighbourhood Centre focuses on the intersection of the main east-west and north-south connectors, creating a central focal point to the development with linkages to the transit precinct, refer **Figure 17**. Key elements of the main street and village/transit centre include:

- A Neighbourhood Centre predetermined by the location of the railway station in a location central to its catchment.
- The establishment of an active relationship of buildings in order to foster the creation of lively, vibrant and active spaces within streets and the village square and piazza.
- Creation of a pedestrianised environment where street level activities of both a retail and entertainment nature predominate.
- Development of civic spaces in the form of a village square adjacent the station and village piazza at the northern end of main street. These spaces will provide a pedestrian focus and orientation point for pedestrian and vehicular traffic.
- Introduction of Challenger TAFE - post compulsory school and vocational education and other community facilities including a community hall/civic building.
- Higher density residential development within the Neighbourhood Centre which could also include Landstart's affordable housing and aged persons accommodation.
- Particular emphasis will be placed on the Neighbourhood Centre through differential streetscape and landscape treatment along with built form in order to establish a strong identity. This theme will also be transferred into other precincts.

The Neighbourhood Centre will be an intensely developed mix of town centre activities within a pedestrianised environment where street level retail and entertainment facilities predominate and an emphasis on shops, restaurants, alfresco dining, offices and residential will contribute to the 24 hour character.

The Station Square will be a major node of the Neighbourhood Centre, supporting retail and entertainment activities as well as being the interface between transportation modes.

A second civic square located at the junction of the east-west and north-south axis will reinforce its prominent position in the structure of the Neighbourhood Centre.

The concept plan encourages pedestrian dominant movements to and from the Station Precinct and throughout the estate, however careful attention has also been made to ensure a high level of accessibility by private and public transport to and from the station precinct.

Public car parking stations have been identified adjacent the Wellard Station Precinct and have been carefully positioned to have regard for the regional function they provide, respecting the urban form of the Neighbourhood Centre and surrounding residential development.

The scale of development within the Neighbourhood Centre should be sensitive to its highly pedestrianised nature. Accordingly structures will be promoted which offer a high level of amenity for pedestrians, ensuring an active relationship with the street.

6.7 Staging of Development

The staging of the development will commence in the north eastern sector of the site, with the Wellard Deviation providing the first entrance into the Village, refer **Figure 18** This will require the reconfiguration of the Parmelia Avenue, Wellard Road, Wellard Deviation intersection, which will comprise a T-intersection between Wellard Deviation and Parmelia Avenue, and the disconnection of Wellard Road with Parmelia via a cul de sac.

The intention of the staging program, consistent with commitments made to DPI and PURD through a draft Memorandum of Understanding, is to facilitate the early establishment of the Neighbourhood Centre and enable the creation of the transit village precinct to be integrated with the Wellard Railway station opening in December 2006.

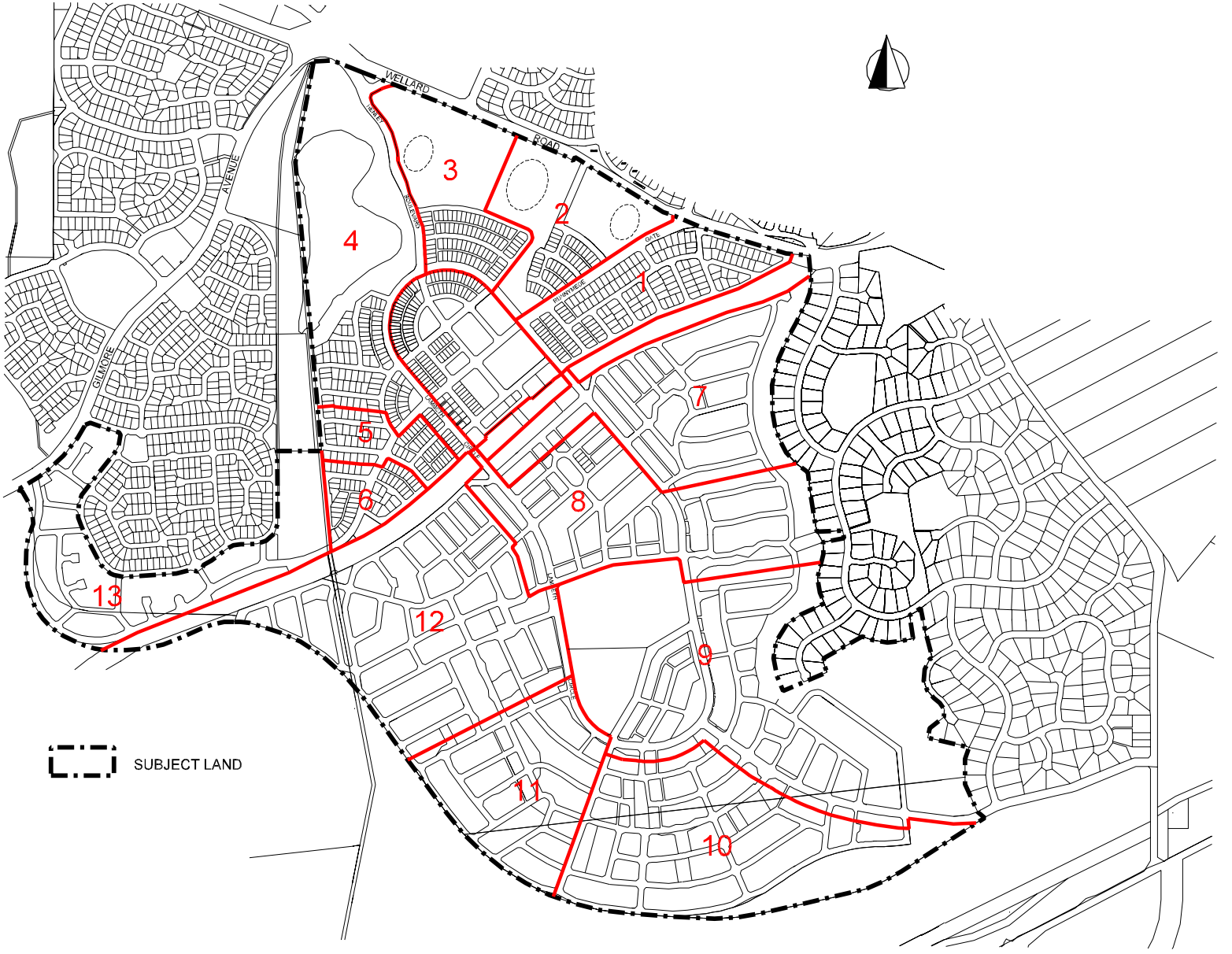
As the focal point of the Structure Plan, the Neighbourhood Centre will contain the primary retail, commercial and community facilities. Timing of facilities will depend on staging, however it is the Joint Venture's intention to establish a sense of place, through the Neighbourhood Centre at the earliest opportunity.

In addition, the development of the Neighbourhood Centre will facilitate the early establishment of a wide product range, housing options and mixed use development opportunities. Key ingredients to the framework of a successful community. In order to facilitate the economic sustainability of the Neighbourhood Centre, adaptable buildings will be established to enable change in uses over time. This will ensure that the needs of the growing community are met, as demands for commercial and community services increase.

The first stages of the development will occur in the north eastern sector of the Village through to the Neighbourhood Centre, and then south, along the eastern boundary of the village, adjacent the existing residential development of Homestead Ridge. This interface treatment, will see the introduction of a further product option, in larger lots, to attract an even broader market profile.

The first stages of the development include other important community infrastructure including a primary school, private k-12 educational facility and a major active open space area co-located between the two. The primary school site has been strategically located in accordance with Education Departments requirements, so that it may be considered for early construction depending on the Education Departments requirements. Opportunities for School in shops has also been made available to both the public and private sector, to assist with the creation of a sense of place in the Neighbourhood Centre.

This staging program has been provided as a guide for Council's information. Whilst the general principles of the staging program has been outlined, the Joint Venture reserve the opportunity to review this staging program to suit market requirements and changes in market conditions.



Staging Plan

Figure
18

7.0 PUBLIC OPEN SPACE

This section has been prepared with input from EPCAD Landscape Architects to support the Structure Plan.

7.1 Landscape Overview

The existing Wellard landscape presents a well vegetated, rolling landform that will be modified by urbanisation. The new landscape will conserve those areas identified as being of significant environmental value and will create a new urban landscape that will be a mix of parks, pocket parks, streets and open space linkages.

The overall landscape approach will be one of environmental integration. The detailed proposals will not only address visual amenity but will strive to minimise ongoing maintenance and to minimise the application of fertilisers. Public open space design will address the need for recreation but will also take into account fully the longer term maintenance and management costs. Where practical the POS will incorporate aspects of the drainage system to promote passive irrigation and storm water management.

The landscape design approach pursues the following objectives:

- Develop a landscape which is physically and visually stimulating.
- Create external spaces that are an integral part of the urban Create quality urban open space that is an amenity for the new and wider community.
- Provide diverse useable open spaces for informal and formal recreation.
- Provide vegetation for shade and to reduce wind velocities.
- Create a landscape that is modest in its use of water and fertilisers.
- Create safe public spaces that have surveillance from adjacent land uses.
- Provide a network of walks, pathways and dual use routes.

7.2 Parks and Pocket Parks

7.2.1 Introduction


CONSERVATION WETLAND BOARDWALK VIEWING PLATFORM

The parks and open spaces fall into three main categories, conservation parkland, recreation parkland and pocket parks. The conservation parklands consist the bush areas in the south east of the development area and the wetlands in the north west. The primary recreation parkland is situated in the north between two school sites to enable dual use of ovals and other potential recreation facilities.

The conservation wetlands will be an integral part of the emerging community and are considered an educational resource and local amenity as well as being an environmental asset. We intend to provide full environmental interpretation facilities, which will include managed access, signage, information boards and local facilities for group briefing. Any proposals for this sensitive area will be developed in association with appropriate authorities and stakeholder groups. Our approach will be to ensure the environmental integrity is secure while providing sufficient interpretive material and accessibility to encourage the community to value and respect the area. Community involvement will be encouraged and managed to include the use of local groups and local labour in the implementation of environmental and landscape works associated with the wetlands.

The final component uses to be accommodated in the open space will be determined through the community engagement programme. The needs of the existing community and the emerging new community will be researched and elicited through diverse feedback methods including workgroups and interviews. At this stage it is assumed that the parks will comprise:

- A senior oval;
- Incidental open areas for gatherings and informal games;

- Toddler and junior play installations (shaded);
- BBQ and picnic facilities;
- Teen facilities such as basket ball 1 on 1 courts; and
- Community public art installations.

The public spaces will be designed to be visually stimulating as well as useable. Views will be managed to create vistas and spaces will be designed to lead the user visually from one area to another to provide a sequence of experiences. In the case of the local pocket parks these will be designed to be a visual reference and orientation point within the neighbourhoods, aiding in creating a distinctive location.

7.2.2 Overall Principles

The primary goal of the open space, is to establish parks and spaces that create valued community assets, refer **Figure 19**.

A hierarchy of use areas is to be developed ranging from recreational open space areas to local pocket parks, which are intended to:

- Provide connections to and an interface with, existing residential development and facilities beyond.
- Provide clear orientation views to landmarks.
- Provide focal open spaces in each sub-neighbourhood and a variety of local parks to meet residents needs.
- Retain and make accessible conservation value vegetation.
- Create open space, which will achieve high environmental, visual, recreational and functional values to the community.
- Provide open space and recreational facilities for the residential community that meets realistic needs.
- Provide an appropriate and specific residential character within each sub-neighbourhood, set within a comprehensive landscape framework.

7.2.3 Security and Surveillance

The security of users and the need for active and passive surveillance has been a key feature of the urban design. The principles established by Crime Prevention Through Environmental Design (CPTED) will be applied to the detailed landscape design as the best practice.

Security of users of the public spaces is provided by passive surveillance from the surrounding buildings. Placement of shrubs and ground level structures will take into account views and the need to design out potential 'hidden spaces'. The articulation of spaces and the design of level changes will ensure that optimum security is provided.

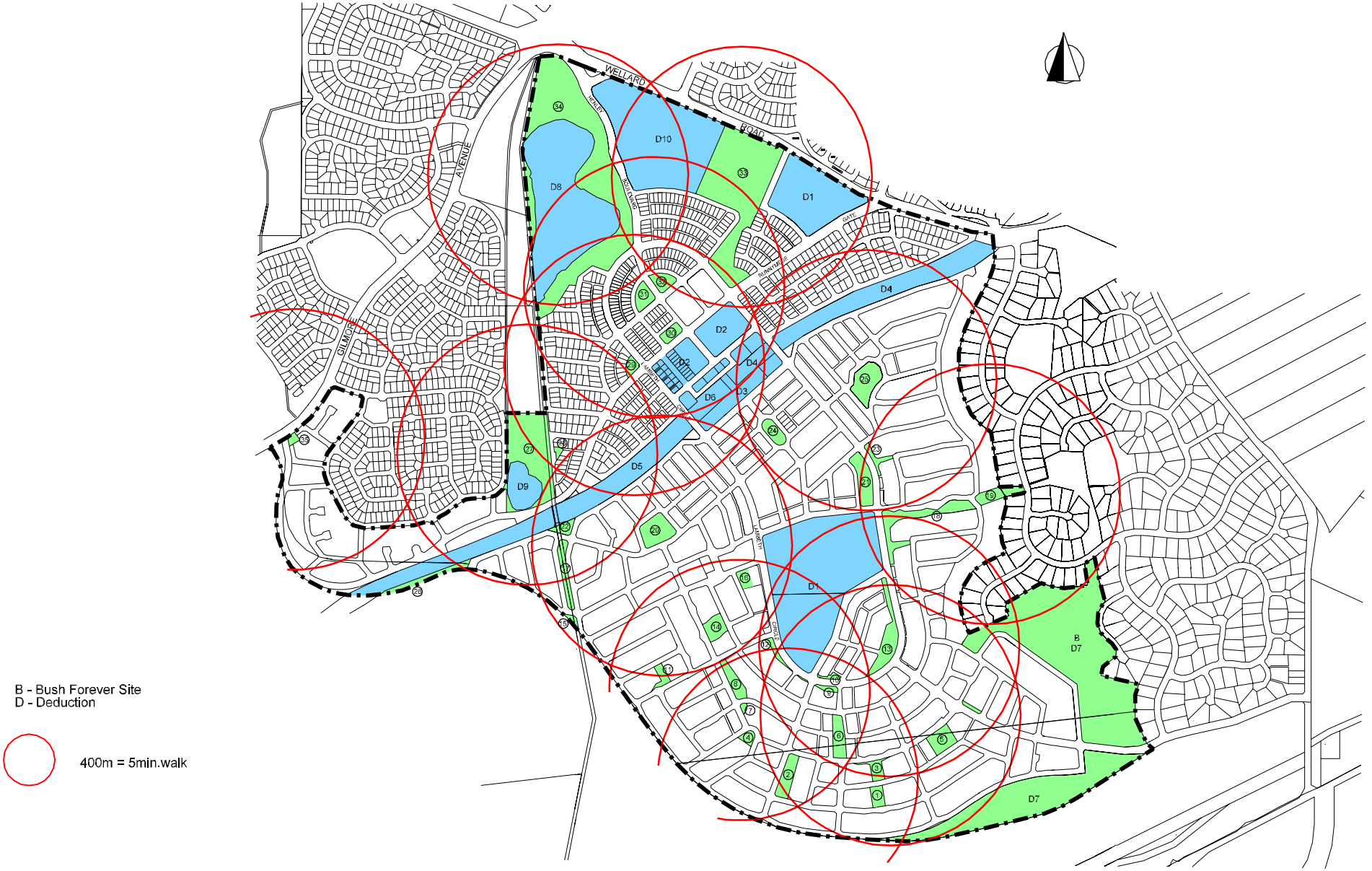
7.2.4 Public Art

The landscape strategy enables places, settings and trails where heritage and public art can be displayed and interpreted. The landscape itself can be seen as an element of art and in some circumstances may be created as an integral part of a community involvement exercise.

Public art will be incorporated as both major and incidental elements providing extra interest and interpretation of retained conservation landscapes. Locations and opportunities for inclusion will be identified at the detailed design stage.

7.2.5 Microclimate

The strategy creates a landscape which provides shade shelter and which reduces winds thereby improving the microclimate and making the parkland a more enjoyable place. Manipulation of the ground levels, the use of screens and fences, tree groups and shade structures will be used to modify local micro climatic conditions.



Public Open Space Distribution

Figure
19

7.3 Open Space Elements

Conservation Parklands will:

- Provide green breaks to the continuity of residential development in the area.
- Retain and enhance indigenous habitat.
- Manage public access and provide interpretive information.

Recreation parkland will:

- Allow for both formal active and passive uses;
- Be designed as a flexible venue for community events and sports uses;
- Have planting which contributes to the overall character of a precinct;
- Provide open space connectivity between the development and the adjoining open space through the provision of accessible pathways and cycleways;
- Adopt sound ESD planning principles;
- Have ornamental deciduous and evergreen plants to emphasise special areas with an overall framework of native and drought tolerant species.

Local pocket parks and incidental spaces:

- allow for both active and passive uses;
- aid in the amelioration of micro-climate within precincts through local vegetative structure;
- have active uses that are low key and low space uses;
- have planting which contributes to the overall character of a precinct;
- be situated in each sub-precinct local park space and will have integrated, small children's play equipment, seating areas, play areas and other park amenities;
- adopt sound ESD planning principles;
- have ornamental deciduous and evergreen plants to emphasise special areas with an overall framework of native and drought tolerant species.

7.4 Materials

All parks and open spaces will be detailed designed using a mix of materials that will be selected for their longevity, ease of maintenance, aesthetics and in compliance with environmental principles being adopted for the development. The predominate use of hard materials in external spaces will be in paving and walls.

Paving materials will be diverse to emphasise different sub precincts, spatial use and path hierarchy. In-situ coloured and textured concrete will be broadly used, however areas of unit paving ranging from setts to slabs will also be incorporated. Walls will be a mix of reconstituted and natural limestone with features of rendered and painted masonry.

7.4.1 Structures and Detailing

The detailed design of structures, such as shade shelters, decks, bridges, fences and the detail of such things as railings, balustrades, will be of a contemporary nature and be constructed of long lived materials. A common material will be galvanised steel, which shall be combined with timber and concrete to provide a range of robust modern installations that reflect the quality and design of built form.

7.4.2 Furnishing

Park and open space furnishing will wherever practical be designed into other elements as an integral part of fixtures to reduce the potential for theft and damage as well as reducing visual clutter. A complementary range of manufactured furniture will be chosen to coordinate with the built form and overall landscape approach. Lighting in open space will be included as an integral part of walls and steps to minimise stand alone fixtures. Mast lighting will be incorporated along major routes.

7.4.3 Species

The overall landscape will be formed with a mix of both exotic and indigenous species selected to suit the site conditions. This mix will create a rich parkland setting which will present year round colour, shade where required and winter solar access.

Species will be selected on the basis of:

- Low water requirements
- Flowering characteristics
- Foliage colour
- Longevity
- Low maintenance requirements
- Suitability to site soil conditions.

7.5 Streets

Street tree plantings are to utilise deciduous trees for solar access advantage and structuring evergreen trees in appropriate locations.

Road verges are to be primarily grassed to allow pedestrian movement with ground cover shrubs used in key locations.

7.5.1 Paving

Paving materials will also be utilised to create the neighbourhood character. Material differential, patterning and colour variation will highlight junctions, priorities and type of street. Pedestrian crossing locations will be heralded with platform paving as a traffic calming device, also creating a strong visual link where parkland and important pedestrian routes cross roadways.

7.5.2 Species

Street trees will be positioned to create shade, reduce wind velocities and be part of a solar access management strategy. Tree species will be selected and positioned to provide the best shade in summer and light access in winter. In selected locations the use of deciduous species will be appropriate and these will be selected to ensure they do not seed into or compromise indigenous environments.

7.5.3 Street Furniture and Signage

Selection of street furniture and fittings is important to ensure consistency, quality and long life. The final schedule and design must satisfy Town of Kwinana who will be responsible for maintenance in the long term.

Street furniture will consist of light columns, benches, tree guards, bollards, bins and signage. These elements will be coordinated in a suite of modern elements that are robust, low maintenance, quality fixtures that are designed to be complimentary with the landscape and structures of the development.

7.6 Maintenance and Management

The landscape will be designed to create an environment that meets the overall development objectives and is modest in its maintenance requirements. Landscape management throughout the progress of the project to completion will change as the environment matures.

Initially all landscape works will be subject to maintenance under the implementation contract, establishment period and defects liability period provisions. Subsequently, an annual maintenance contract will be let with an assessment of requirements being made prior to the time of renewal and also as normal inspections are carried out during the maintenance contract period.

The developer will maintain the public open space for a minimum period of three years. Public spaces will then be handed over to the local authority by agreement, with parties acknowledging the standard of maintenance being attained and to be achieved.

It is intended to supply new residents and land purchasers with guidance regarding the detailed design of landscapes to meet enhanced environmental standards. This will include information on waterwise gardening, waterwise plumbing, solar orientation and fertiliser use.

7.7 POS Distribution & Function

The following POS table outlines the approximate area and function of each POS area identified in **Figure 19**. They have been provided as a guide and will be subject to detailed design.

Table 7.1: Public Open Space

POS Area	Area (ha)	Function
1	0.2500	Passive Recreation
2	0.5123	Passive Recreation/Drainage
3	0.2637	Passive Recreation
4	0.1456	Passive Recreation
5	0.4077	Passive Recreation
6	0.4795	Green Corridor/Pedestrian Connection
7	0.0479	Passive Recreation
8	0.4066	Green Corridor Connection
9	0.0980	Passive Recreation
10	0.0484	Passive Recreation
11	0.2043	Green Corridor/Pedestrian Connection
12	0.1379	Passive Recreation
13	0.8065	Passive Recreation and Drainage
14	0.3989	Passive Recreation/Green Corridor
15	0.0912	Green Corridor/Passive Recreation
16	0.2051	Passive Recreation
17	0.4709	Green Corridor/Passive Recreation
18	1.06	Green Corridor/Passive Recreation
19	0.2893	Green Corridor/Passive Recreation
20	0.7486	Passive Recreation
21	0.6261	Passive Recreation
22	0.2049	Green Corridor/Passive Recreation
23	0.1903	Green Corridor/Passive Recreation
24	0.3434	Passive Recreation
25	0.7895	Passive Recreation and Drainage
26	0.6012	Passive Recreation
27	3.465	Wetland (50% credit) & Buffer (100% credit)
28	0.0626	Passive Recreation
29	0.1669	Passive Recreation
30	0.2340	Community Purpose Site
31	0.3600	Passive Recreation
32	0.2998	Passive Recreation
33	5.75	Green Corridor/Passive/Active Recreation
34	13.282	Wetland (50% credit) & Buffer (100% credit)
35	0.0913	Passive Recreation
TOTAL:	**33.5394**	**12.93% POS**

7.8 Key POS Spaces

7.8.1 POS Areas 31 & 32

Located at the gateway to the Neighbourhood Centre, POS Areas 14 and 15 will announce your arrival to the Neighbourhood Centre. Urban in style avenues of trees will line 'Main Street' and focus the view to the Station Precinct and retail core.

7.8.2 Pos Areas 33

POS Area 16 has been strategically located between the proposed private school and primary school and to retain a corridor area of existing vegetation. In addition, the POS has been designed to accommodate a community sized oval, which Council has indicated is needed in the area. It is intended that the oval is co-located with the adjoining schools and will be the shared responsibility of them.

POS Area 17, located on the Wellard Deviation provides a linear linkage for pedestrians from Wellard Road, through to the Neighbourhood Centre. This POS also acts as a gateway to the centre from the east, refer **Figure 21.**

7.8.3 Northern Wetland Buffer and POS Area 34

POS Areas 19 and 21 comprise the northern wetland, its buffer and additional POS used to complement the space. The wetland will play an important role in the community not just as a conservation area, but also for education purposes through viewing platforms and interpretive displays, refer **Figures 22** and **23**.

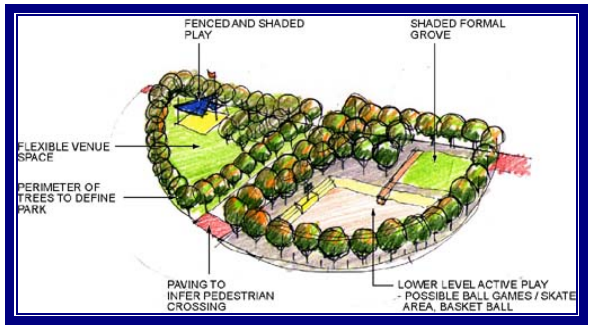


Figure 19 - Pos Areas 31 & 32

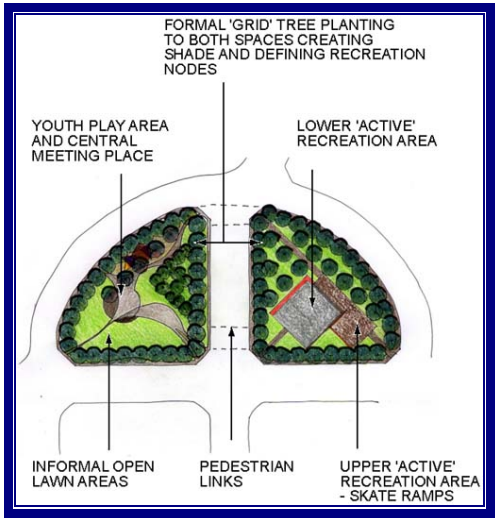


Figure 20 - POS Areas 31 & 32

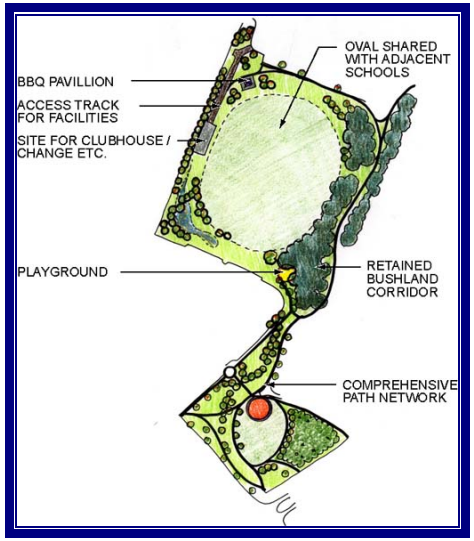


Figure 21 - POS Area 33

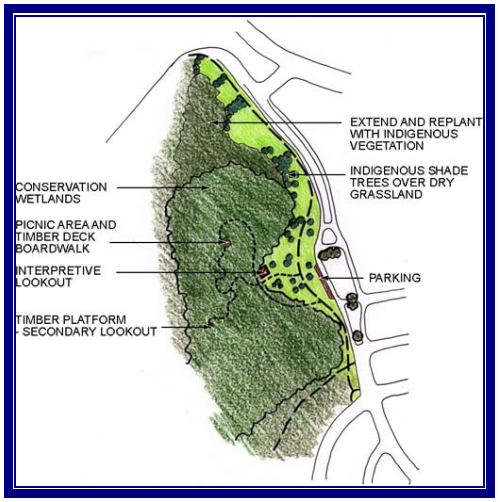


Figure 22 - POS Area 34

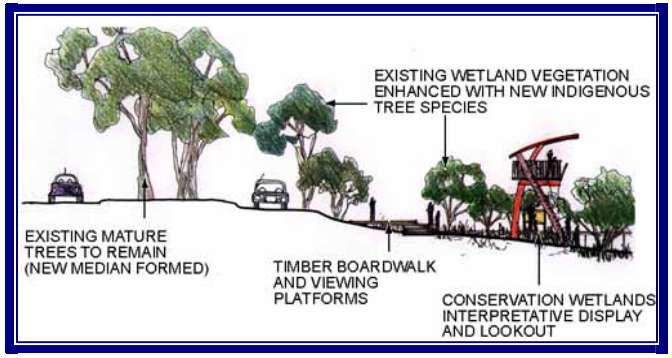


Figure 23 - POS Area 34

8.0 SERVICING

This Chapter has been prepared by TABEC Pty Ltd consulting engineers to support the Wellard Village Structure Plan.

Residential development is located to the north, east and west of the site. All essential services are therefore available within close proximity to the site.

From an engineering perspective, although the site requires substantial earthworks it can readily accommodate urban development, a fact that is reflected in the current urban zoning over the majority of the subject land.

8.1 Siteworks & Earthworks

The site is very undulating with natural surface levels ranging from RL 3.0m AHD along sections of the western margin, through the existing wetlands, to RL50.0m in the southeast corner of the site. The existing steep gradients across the site are not suited to the type of residential lot that the target market will readily accept, which is steeply sloping lots that require the owner to construct expensive retaining walls.

A preliminary bulk earthworks concept has been prepared which demonstrates that a cut and fill balance can be easily achieved, though significant bulk earthworks and walling are required in order to produce level building lots. To achieve a subdivision where walls on side boundaries are not excessive in height, earthworks cut and fill depths in excess of 10m will be required in the worst instances. A preliminary bulk earthworks plan and a plan indicating the area and depth of cutting and filling (**Figures 24 and 25** overleaf) demonstrate the proposed earthworks approach. **Figures 26 and 27** show cross sections at various locations within the site. Whilst this approach is more expensive at development stage, the finished cost to the landowner is less due to the reduction in individual site works costs at building stage.

Groundwater levels across the site vary from approximately 3.0m AHD along the western boundary and the wetland areas to around 7.0 to 8.0 on the eastern edge. Due to the steep gradients leading away from the wetlands along the western border there is only a very small portion of the site for which the finished surface levels will be within close proximity of the groundwater levels. Furthermore, as the wetland is 'A' category and thus requires a 50m buffer zone there will be almost no development occurring in areas with finished levels within 4m of the groundwater levels.

Preliminary geotechnical investigations indicate that the subsurface conditions across the site are generally comprised of sand with limestone formations resulting in the steep gradients throughout the site. A comprehensive geotechnical investigation is currently being undertaken.

The site is covered with medium to dense vegetation with some large trees. Whilst the objective is to maintain as much natural vegetation as possible, in many areas this is not possible. This is due to the requirement for substantial earthworks throughout the site as a result of the steep gradients, as detailed previously, as well as the constraints of the roads, railway and town centre. Where possible, POS has been located in areas where there is minimal cut or fill depths in order to provide the greatest opportunity for retention of existing trees and where feasible an allowance will be made to link larger adjoining POS areas with corridors of vegetation.

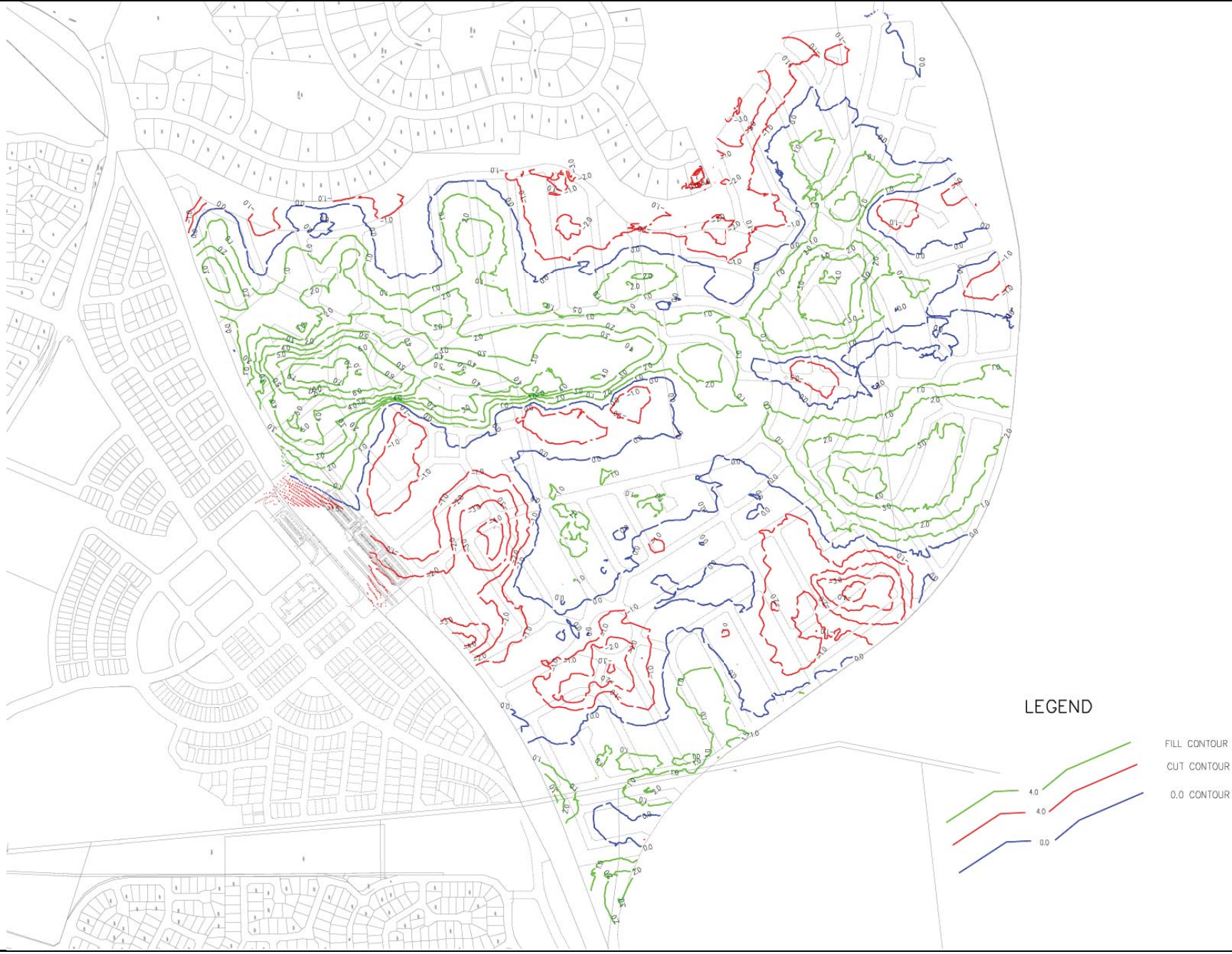
To support residential development with shallow footing systems, site works and earthworks preparation for the site will comprise the following:

- Earthworks cutting and filling throughout the site to achieve level building lots whilst minimising required retaining wall heights.
- Excavation, ripping and possibly screening of limestone within close proximity to the finished surface levels.
- It is not anticipated that imported fill will be required as there is excess available material on site to ensure sufficient freeboard above flood levels and estimated Average Annual Maximum Groundwater Levels.

Preliminary Bulk Earthworks

Source : TABEC

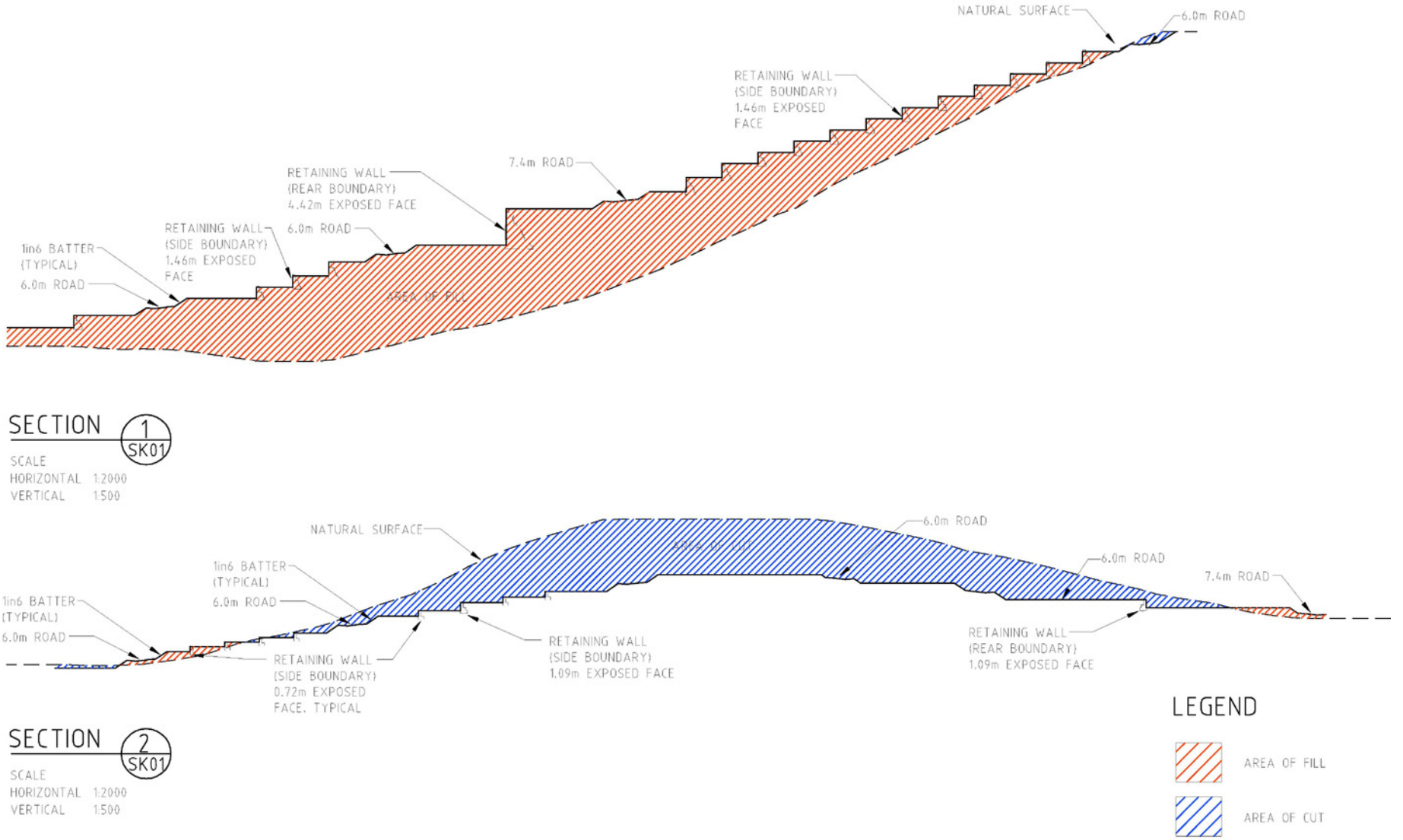
Figure
24



Preliminary Cut to Fill Contours

Source : TABEC

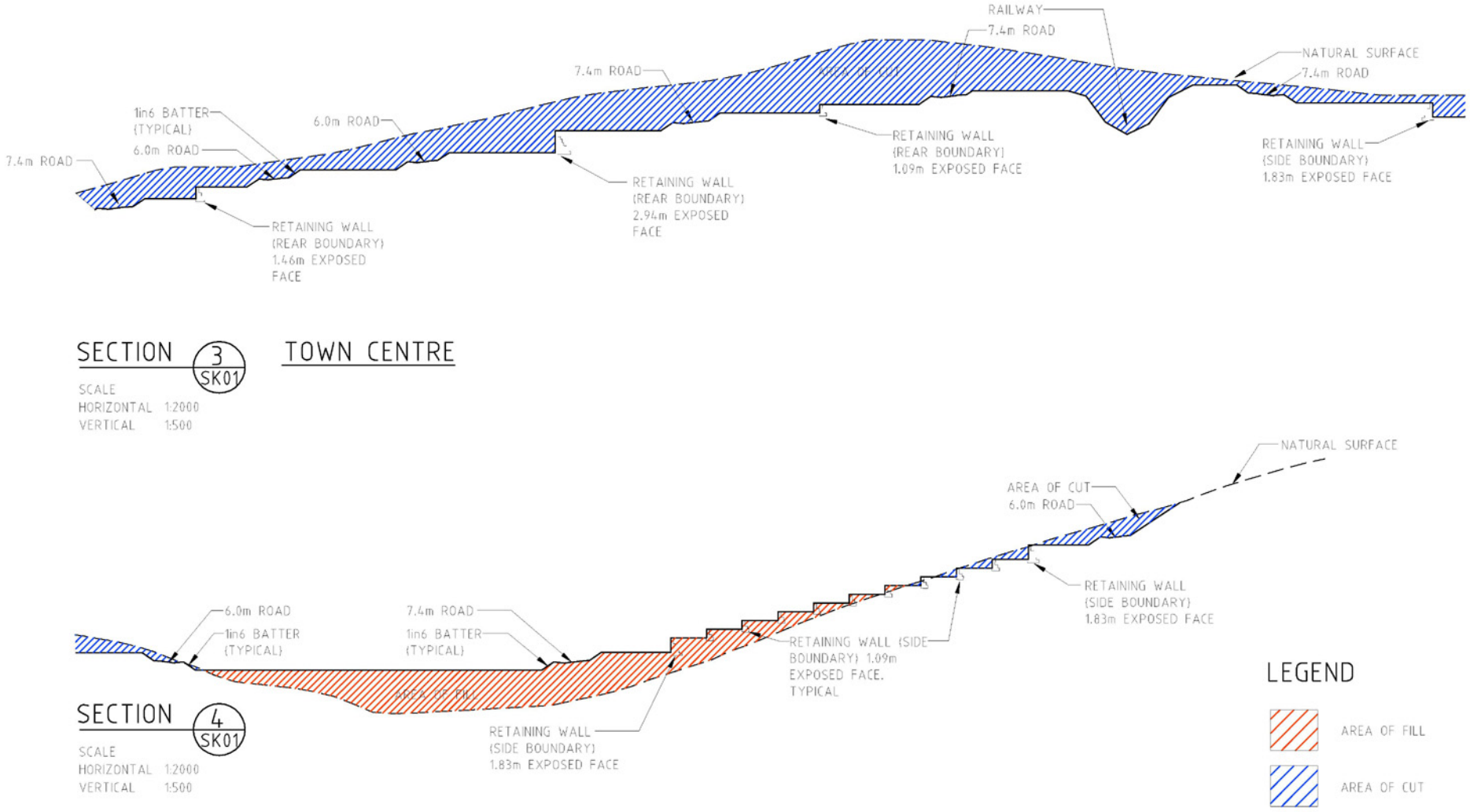
Figure
25



Preliminary Cross Sections - 1

Source : TABEC

Figure
26



Preliminary Cross Sections - 2

Source : TABEC

Figure 27

All earthworks will be carried out in accordance with the provisions of Australian Standard AS3978-1996 "Earthworks for Residential and Commercial Development".

8.2 Roadworks

Discussion on the traffic flows and resulting requirements for road layouts, widths and junctions with existing roads are included in Section 9.0 prepared by ERM and are therefore not discussed below.

All new roadworks constructed as part of the proposed development will be designed and built to the requirements of Town of Kwinana. The majority of roads constructed will have black asphalt wearing course and mountable kerbing adjacent to residential lots. Allowance has been made for areas of brick paving at intersection thresholds and for some red asphalt areas. Treatments at intersections will be designed to assist in indicating priority. These areas and treatments will be confirmed following future detailed design and consultation with Town of Kwinana.

Footpaths and Dual Use Paths will be constructed in accordance with the requirements of Town of Kwinana.

Adjacent to POS areas opportunities exist for Water Sensitive Urban Design where roads are graded towards the POS, flush kerbing is utilized and stormwater runoff is sheeted onto the POS areas. This approach is ideally suited to the subject area given the sandy / porous nature of insitu material and has been successful on other projects for which TABEC are the engineering consultant.

The road network allows for 2 bridges crossing over the proposed rail that are located either side of the future rail station. A pedestrian underpass beneath the rail is proposed near the western margin of the site, near the existing trunk water main.

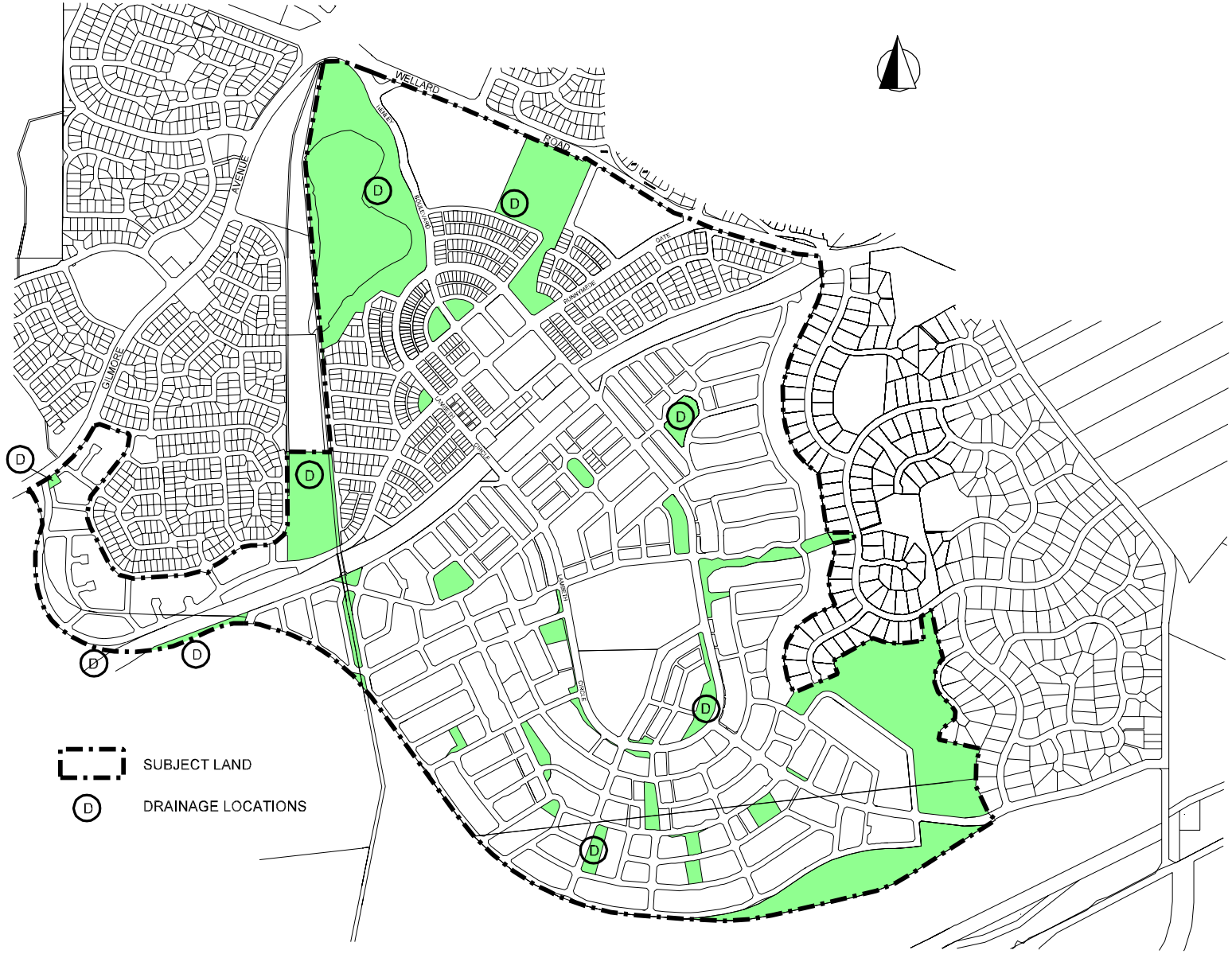
8.3 Stormwater Drainage

Figure 28, Drainage Catchment Plan, illustrates the proposed locations of all the drainage infiltration basins and their respective catchment boundaries. Table 8.1 below gives detailed information for each of these catchment areas and their respective infiltration basin or basins (combined).

Table 8.1: Drainage Requirements

Catchment Area/ Basin #	Equivalent Impervious Area (AIMP)	Sump Volume		Approx. Unfenced Basin Area
		1 in 10 Yr ARI	1 in 100 Yr ARI	
1	51,000 m^2	3,060 m^3	-	2,900 m^2
2	107,719 m^2	6,463 m^3	-	5,600 m^2
3	36,763 m^2	2,206 m^3	-	2,205 m^2
4	15,540 m^2	932 m^3	-	1,100 m^2
5	13,440 m^2	806 m^3	-	1,000 m^2
6	64,708 m^2	3,882 m^3	-	3,600 m^2
7	126,173 m^2	-	16,781 m^3	13,200 m^2
8	146,760 m^2	-	19,519 m^3	15,200 m^2
TOTAL	562,103 m^2	17,349 m^3	36,300 m^3	44,805 m^2

Where possible the catchment plan and information tabulated above has been determined as per the requirements and preferences of the Town of Kwinana and as such has been based upon the following: no more than 50% of any particular POS can be utilised as a drainage infiltration basin; all basins are to be unfenced / open infiltration sites and wherever possible will not impact on the use of the area as POS; all basins will have maximum batters of 1 in 6 and shall not exceed 1.5 metres in depth and; gross pollutant traps will be installed immediately upstream of all discharge points into unfenced / open basins.



Proposed Drainage Catchments

Figure
28

It should be noted that as the Town of Kwinana development guidelines do not stipulate any specific requirements with respect to the retention volumes for drainage basins the City of Wanneroo requirements have been used. This is due to a general recognition of the City of Wanneroo Guidelines as both a benchmark for the Perth metropolitan area and also that they are generally conservative with respect to sandy, free draining sites such as the one in question.

Stormwater drainage management strategies for the site will include both the design of the drainage system to the specified technical requirements and objectives of the Town of Kwinana, as well as the implementation of the most current methods and techniques of Water Sensitive Urban Design (WSUD) applicable to the site, which is also encouraged by the Town of Kwinana. The most significant objective of WSUD with regards to the site is the shift towards attempting to minimise the impact of development on the hydrological characteristics of the site via maximising infiltration of water throughout the catchment rather than the conveyance of water off site. The significance of this is due to the large depth to the water table over the majority of the site, the undulating nature of and the fact that the site is generally comprised of sandy porous soils, hence local infiltration of stormwater runoff can be maximised via retention and detention areas within the stormwater drainage system.

As indicated above, opportunities to infiltrate directly into the ground near the source will be utilised wherever possible. Though it is very important to note that due to the extreme gradients over much of the site it will not be possible or practical to construct infiltration basins high up in catchment areas where the land would have to fall several metres over the cross-section of the basin. As a result the majority of basins have been located at relative low points within the individual catchment areas, though it should also be noted that none of the individual catchment areas are particularly large.

Detailed calculations indicate that the area required for unfenced / open infiltration drainage basins to be incorporated within POS areas within the entire development will comprise approximately 4.2 Ha.

A detailed drainage and nutrient management plan is currently being undertaken by both ATA Environmental Consultants and Jim Davies and Associates. This will examine, amongst other things, the potential effects of the development on the future overall groundwater levels.

8.4 Sewer Reticulation

An existing sewer pumping station is located to the west of the site near the intersection of Dalrymple Drive and Djilba view and a temporary pressure main extends north abutting the existing development to beyond Wellard road. As there is no existing sewer within Wellard Road or the remainder of the site, sewer outfall from the development to the north of the future railway will be discharged via a sewer main to be constructed through the site to the existing pump station site in Dalrymple Drive. Existing agreements with Perth Urban Railway Development (PURD), in particular the MOU, require the initial stages of the development to proceed within the eastern and central regions of the site to the north of the future railway. Due to the substantial distance between these proposed initial stages of development and the existing Dalrymple Drive pumping station, and the resulting economic constraints of constructing the sewer main required to link these, it may be necessary to create temporary tankering points for the sewer during these early stages of development.

Development of the site to the south of the future railway will require the construction of a permanent Type 40 pumping station at a later date. The pumping station will have built in emergency storage in accordance with the requirements of Water Corporation and Department of Environmental Protection. This pump station will then discharge via a pressure main to the existing pump station in Dalrymple Drive. Water Corporation planning indicates a future 450 mm diameter gravity sewer in Wellard Road and a 750 mm diameter gravity sewer between Wellard Road and the existing pump station that skirts around the east of the low area in the north-west corner of the site. The development plan includes a route for these sewers to be installed by Water Corporation at a future time.

Reticulation sewers within the proposed development will for the most part be 150 mm diameter PVC and all new lots will be provided with a connection point to the gravity sewer.

8.5 Water Supply

A 760 mm diameter steel water main is located along the western margin of the site and a 460 mm to 500 mm diameter water main is located within Wellard Road.

The Water Corporation has indicated that the existing mains have sufficient capacity for the creation of around 1000 lots in the area. Once capacity in the existing system is reached, offsite upgrades will be required. Funding for offsite upgrades will be the responsibility of Water Corporation provided they are kept informed on development program.

A duplication of the 760 mm diameter water main will be required in the future. Its alignment will be immediately next to the existing pipe. The Water Corporation will fund the installation of this main.

8.6 Power Supply

An existing 132 kV power line runs in a north-south direction and is located along the western edge of the site. There are also existing 22 kV lines within the existing developments surrounding the site to the west, north and southeast. These existing services have the capacity to be extended into the development to serve the proposed number of lots.

Along the western border of the site a 22 kV overhead power line runs from the south and terminates at Dalrymple Drive, at which point a high voltage station exists that can service the subdivision. As the development progresses to the south this overhead line will have to be placed underground. A 132 kV high voltage overhead power line also exists along the western border and extends south from Gilmore Avenue and will require a section to either be relocated along existing roads or within the proposed development. Along the northern edge of the development another 22 kV overhead line exists along Wellard Road and may need to be placed underground, in which case at least one but possibly two switching station sites will be required in order to commence the development from this point.

To the south-east, at the end of Leda Boulevard, a 185 HV cable exists that will be extended west along the southern border of the site to eventually connect to the power lines to the west and/or north of the development.

The power reticulation network will consist of underground cabling and on-ground padmount transformers and switching stations. Where possible, the transformers will be located within POS to reduce the intrusion into residential lots. Street lighting will be provided by Western Power standard streetlights.

8.7 Gas

Alinta Gas has existing medium pressure gas supply pipes in Wellard Road and surrounding subdivision roads. The existing infrastructure has the capacity to service the proposed development.

It is proposed to have either Alinta Gas or the civil works contractor install the gas service in a common service trench at the time of subdivision construction.

8.8 Communications

Telstra have infrastructure installed in Wellard Road and surrounding subdivisions. As for gas supplies as indicated above, it is proposed to have Telstra install their cable within conduits laid by the civil works contractor in a common service trench at the time of subdivision construction.

9.0 ROADS, TRANSPORT AND TRAFFIC MANAGEMENT

ERM were engaged as part of the consultant team to undertake a traffic assessment in relation to this project. The following chapter details the findings of this report. An independent report can be made available upon request.

9.1 Regional Road System

This chapter describes the regional road system from the perspective of the Perth Metropolitan Road Hierarchy and the Metropolitan Region Scheme (MRS) road classifications. **Figure 29** shows the MRS zonings and road/rail reservations for the Town of Kwinana.

The reader is directed to Section 9.3 for information on local road planning as provided in the *Town of Kwinana Transport Structure Plan* (BSD Consultants, 2002). Section 9.3 also includes some recommended changes to the functional classification for Wellard Road, Gilmore Avenue and Bertram Road.

9.1.1 Kwinana Freeway

Approximately 27000 vehicles per day, MRWA 1999.

This is a Primary Distributor (Perth Metropolitan Road Hierarchy) and a Primary Regional Road (MRS classification). It provides high speed, high capacity travel for longer distance trips and is part of the Primary Freight Network.

Freeway interchanges are currently provided at Thomas Road and Bertram Road. The Bertram Road interchange provides the most direct access to Wellard Village.

An interchange is also provided at Mundijong Road, in the City of Rockingham. The future westward extension of Mundijong road will provide an additional convenient access route to the City of Rockingham (i.e. Kwinana Freeway, Mundijong west, Mandurah Road, Dixon Road).

The Kwinana Freeway is currently constructed to Safety Bay Road in the City of Rockingham.

9.1.2 Thomas Road

Approximately 25,000 vehicles per day, MRWA 1999 counts.

Thomas Road is a Primary Distributor (Perth Metropolitan Road Hierarchy) and a Primary Regional Road (MRS classification). It links Rockingham Road to the Kwinana Freeway, Nicholson Road and finally to the South Western Highway at a location south of the City of Armadale.

From the Kwinana Freeway, Thomas Road and Gilmore Avenue provide convenient access to the Kwinana Town Centre (adjacent to Gilmore Avenue) and in future will provide good access to Wellard Village – but will not be as direct as the Kwinana/Bertram Road route.

In future, Thomas Road will have connections to the Fremantle-Rockingham Controlled Access Highway (FRCAH) in the east and to the Tonkin Highway Extension in the west.

9.1.3 Rockingham Road/ Patterson Road

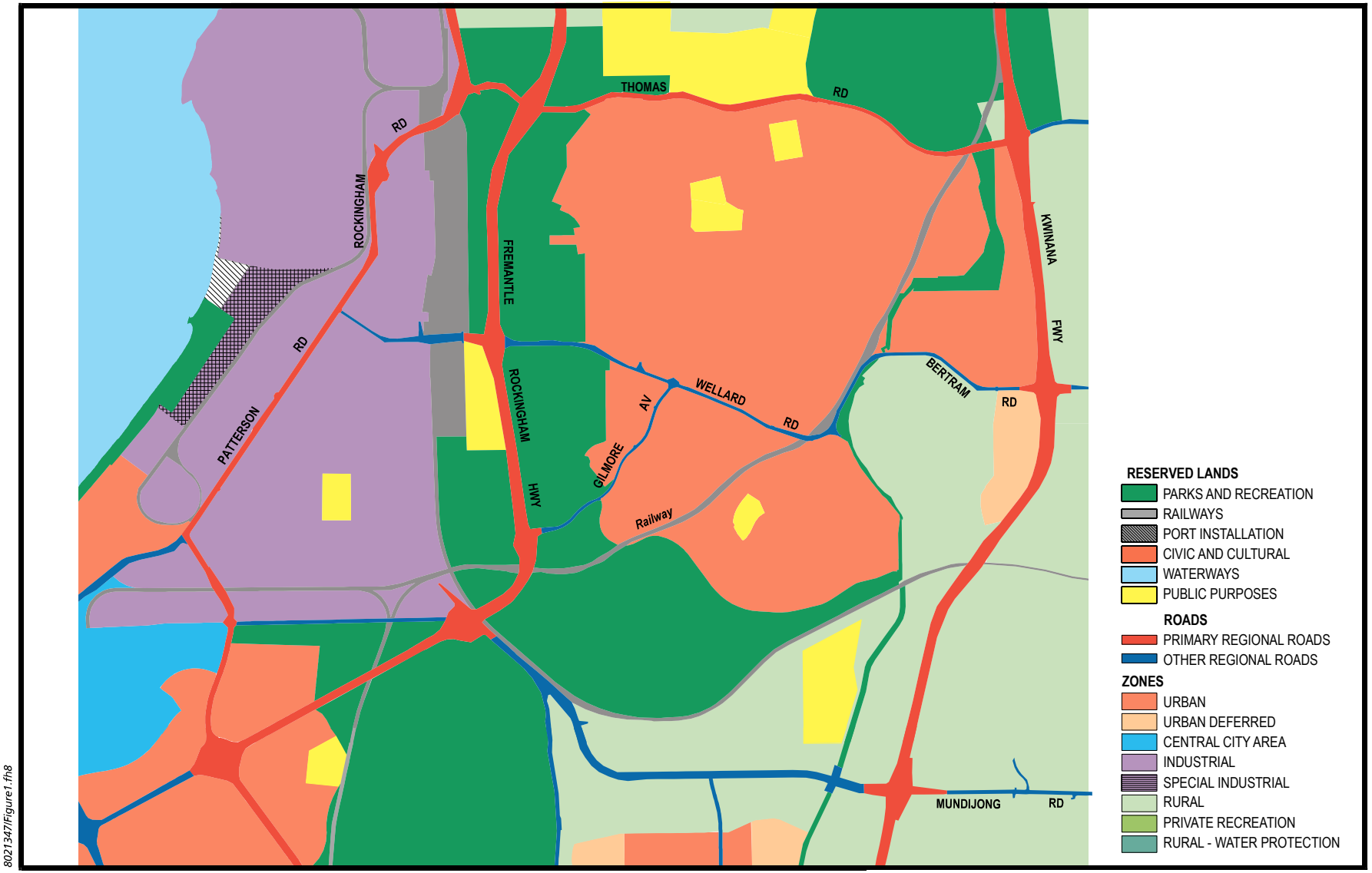
Approximately 36,000 veh/day west of Mandurah Road, MRWA 1999.

This is a Primary Distributor Road (Perth Metropolitan Road Hierarchy) and a Primary Regional Road (MRS). It forms an important north-south coastal route connecting Fremantle to Rockingham and provides access to the Kwinana Industrial Area. From Rockingham Road, access to Wellard Village is via Wellard Road (west).

9.1.4 Mandurah Road

Approximately 10,000-18,000 veh/day, MRWA 1999.

Mandurah Road is a District Distributor A (Perth Metropolitan Road Hierarchy) and is an Other Regional Road (MRS) south of Dixon Road. This road links to Rockingham Road and provides a north-south route past the City of Rockingham and Town of Kwinana en-route to the City of Mandurah. Access to Wellard Village from Mandurah Road is via Gilmore Avenue (south).



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ERM

Regional Road Reservations (MRS)

Figure
29

9.1.5 Dixon Road

3300 veh/day at Mandurah Road, MRWA 1999 - but no traffic data since Gilmore Avenue connection, likely to be between 5,000-10,000 veh/day.

Dixon Road is a District Distributor B east of Day Road (Perth Metropolitan Road Hierarchy) and is an Other Regional Road (MRS). It links the East Rockingham area to Ennis Avenue and Patterson Road but at the east end it connects to Gilmore Avenue to give a direct connection to Wellard Village and the Kwinana Town Centre.

9.1.6 Mundijong Road

Mundijong Road is a District Distributor A (Perth Metropolitan Road Hierarchy) and is an Other Regional Road (MRS). It is currently constructed from Baldivis Road in the west (near the Kwinana Freeway interchange) to the South Western Highway in the east. As stated above, Mundijong Road will eventually be extended west to link to Mandurah Road (and thus to Dixon Road). Eventually, it will also connect to the FRCAH, when that is constructed.

The future Mundijong Road connection from the Kwinana Freeway westward to Mandurah Road is expected to take some southbound Rockingham through traffic off the Bertram/Wellard/Gilmore route through the Town of Kwinana. It is also expected to take some northbound Kwinana Freeway traffic to the Kwinana Industrial Area, thus relieving the Thomas Road route and/or the Bertram-Wellard route of heavy vehicle traffic.

It is understood that the project is not on the Main Roads 10 year plan and would require some funding contribution and pressure from the City of Rockingham to improve its priority on the budget.

9.1.7 Gilmore Avenue

Approximately 10,000 veh/day at Dalrymple Street, Town of Kwinana November 1999.

Gilmore Avenue is a District Distributor A (Perth Metropolitan Road Hierarchy) and is an Other Regional Road (MRS) south of Wellard Road. North of Wellard Road there is no MRS reservation for Gilmore Avenue.

Gilmore Avenue is the main north-south distributor road in the Town of Kwinana and provides direct access to the town centre. As mentioned previously, it links Thomas Road in the north to Mandurah Road and Dixon Road in the south. It serves as part of the Fremantle-Rockingham Transitway and will soon have exclusive bus lanes.

9.1.8 Wellard Road

Approximately 8500 veh/day east of Gilmore Avenue, MRWA 2001.

Wellard Road is a District Distributor B (Perth Metropolitan Functional Hierarchy) and an Other Regional Road (MRS). It connects Mandurah Road in the west to Bertram Road (and thus the Kwinana Freeway) in the east. There is also a southward connection to Baldivis Road.

Wellard Road provides the northern boundary to the Wellard Village site and provides the most direct access to the Kwinana Freeway. In association with Gilmore Avenue it provides excellent access to Wellard Village from all directions.

In previous structure plans (including the Town of Kwinana Transport Structure Plan, 2002), a downgrading of the existing Wellard Road and construction of a 'Wellard Road Deviation' has been proposed. The proposed Wellard Road Deviation has been incorporated into the Wellard Village Structure Plan and is integral to the successful development of the future Wellard railway station and railway precinct. Refer also to Section 9.2.1.3 for traffic forecast information for Wellard Road and the Wellard Road Deviation.

In accordance with Council's report, 'Kwinana Transport Structure Plan', this Structure Plan acknowledges the downgrading of Wellard Road. The removal of the ORR status currently forms part of MRS Amendment 1099/33.

The proposed downgrading was originally supported by the Transport Committee and hence the proposal was included as part of Amendment No. 1099/33. The amendment was initiated by the Western Australian Planning Commission and the downgrading is supported by both the Commission and the Town of Kwinana.

9.1.9 Fremantle Rockingham Controlled Access Highway (FRCAH)

The FRCAH is a Primary Distributor (Perth Metropolitan Functional Road Hierarchy) and a Primary Regional Road (MRS).

Originally, the FRCAH was intended to include the Fremantle Eastern Bypass (FEB) at its north end. The state government has made a commitment to remove the FEB from the MRS and is currently reviewing the freight network in the metropolitan area.

When the Freight Network Review is complete it is understood that the planning for the portion of the FRCAH south of the FEB will be reviewed. Currently there is no indication that there will be any changes to the FRCAH through the Kwinana Area.

9.1.10 Conclusion

The regional road system provides multiple routes to/ through the Town of Kwinana and provides excellent access to Wellard Village. In future the network will be supplemented with:

- The westward extension of Mundijong Road from the Kwinana Freeway to Mandurah Road and Dixon Road. It is expected that this will relieve Thomas/Gilmore and Bertram/Wellard/ Gilmore of some Rockingham bound through traffic. It may also take some Baldivis freight traffic off Wellard Road.
- FRCAH will have intersections with Thomas Road, Wellard Road and Gilmore Avenue. It will provide improved north-south travel in the region and will further improve access to Rockingham taking through traffic pressure off Gilmore Avenue and Wellard Road.

This chapter has provided a review of the regional road network. Section 9.2 provides information on road network planning specific to the Town of Kwinana and in particular the roads affecting Wellard Village.

9.2 Town of Kwinana Transport Structure Plan

In January 2002, BSD Consultants finalised the *Town of Kwinana Transport Structure Plan* report. The report documents the findings of a traffic modelling and road network planning study for the Town of Kwinana. The main objective of that study was to:

> *".. assist the Town of Kwinana in planning for a local and district road network that would provide the community with convenient access to the regional road network without attracting unacceptable levels of through traffic in the urban area."*

The key findings of that study (as they relate to Wellard Village Structure Plan) are summarised below.

9.2.1 Summary of Findings

9.2.1.1 Road Hierarchy Recommendations

The report recommended a strategy for reclassifying selected roads in the Town of Kwinana based on the Main Roads Western Australia (Main Roads) Metropolitan Functional Hierarchy document. The results for roads near Wellard Village or of particular interest to this study are provided below:

- Gilmore Avenue: **Downgrade to District Distributor 'B'** from District Distributor 'A'.
- Wellard Road: Introduce speed restrictions along Wellard Road east of Gilmore Avenue in the short term along with the Wellard Road Deviation in the medium term thereby justifying a **downgrade to Local Distributor by 2011**. Turning Wellard Road between Meares Avenue and Parmelia Avenue into a cul-de-sac is not recommended at this time. Refer to Section 9.2.1.3 for further discussion of this issue. No change for Wellard Road west of Gilmore Avenue.
- Bertram Road: No change in the short to medium term. **Downgrade Bertram Road to District Distributor 'B'** from District Distributor 'A' in the long term based on the success of speed restrictions imposed on Wellard Avenue east of Gilmore.

A copy of the current road hierarchy plan and a copy of the plan showing recommended changes is provided in **Figures 30** and **31** respectively.

9.2.1.2 Timing of Road Upgrades

The *Town of Kwinana Transport Structure Plan* also presented recommendations on the most likely timeframe for upgrading the various roads in the municipality. The key findings for roads in/ near Wellard Village are summarised below:

- Gilmore Avenue: Upgrade Gilmore Avenue south of Wellard Road to a four lane road by 2011.
- Wellard Road (west of Gilmore Avenue): Upgrade to a four lane road by 2011.
- Bertram Road: Upgrade to a four lane road by 2011.

9.2.1.3 Traffic Forecasts for Wellard Road and Wellard Road Deviation

Traffic modelling for the *Town of Kwinana Transport Structure Plan* evaluated three network scenarios:

- Network A: Wellard Road on current alignment.
- Network B: Wellard Road with restricted speed environment with a 'Wellard Road Deviation' in place through the new Wellard Village.
- Network C: Wellard Road with a cul-de-sac between Meares Avenue and Parmelia Avenue and with a 'Wellard Road Deviation' in place through the new Wellard Village.

Network C represents the road network proposed in the Wellard Village Structure Plan but was only tested for the 2006 horizon year. It is not stated why this network was excluded from investigation at year 2011 and year 2021. **Appendix C** contains copies of the 2021 network plots from the BSD traffic model for each of the network options.

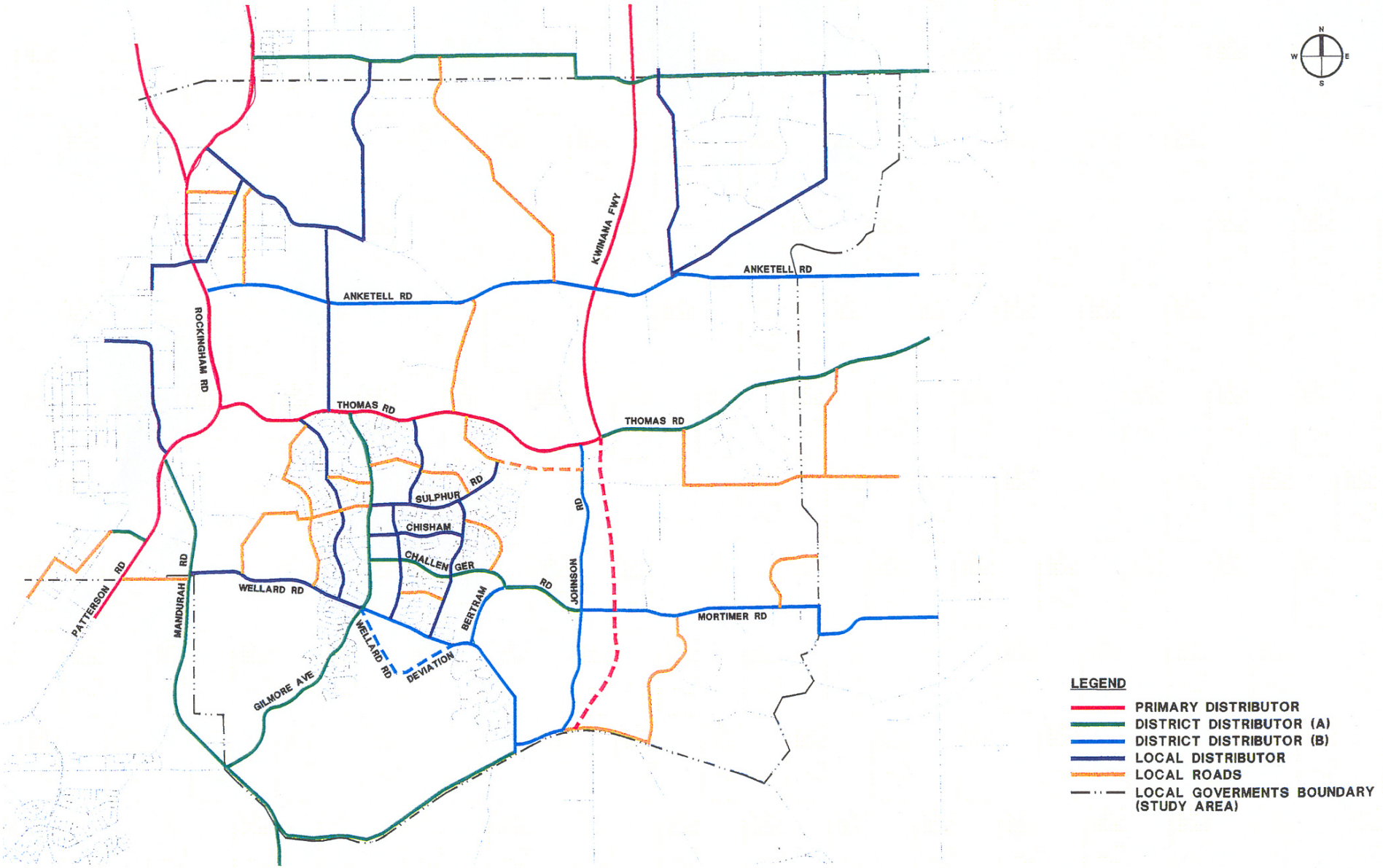
One possibility is that beyond year 2006 an improved regional road network would lessen unwanted regional through traffic pressure and thus reduce the need for the Wellard Road cul-de-sac. At the same time local traffic growth would be increasing (via Wellard Village and Casuarina developments, etc) and result in a greater need for a continuous east-west road to serve local movements.

Network B is the next most similar to that proposed in the Wellard Village Structure Plan. In order to understand the forecast traffic pressure on Wellard Road, and the 'Wellard Deviation', the BSD modelling results are reproduced in **Table 9.1** for Network B. The results are presented for a north-south 'screenline' drawn across both Wellard Road (east of Gilmore Avenue) and the 'Wellard Road Deviation'.

Table 9.1: Screenline Traffic Forecasts – Vehicles/day on Wellard Road and Wellard Road Deviation

Network Description and Road Link	Year 2006	Year 2011	Year 2021
Network B: Wellard Deviation added and speed control on Wellard			
Wellard Road (east of Gilmore)	1,582	4,858	14,530
Wellard Deviation (south of Wellard Road east end)	2,996	3,944	3,842
TOTAL:	**4,578**	**8,802**	**18,372**
Network C: Wellard Deviation added and Wellard cul-de-sac Wellard (east of Gilmore) Wellard Deviation (south of Wellard Road east end)			
Wellard Road (east of Gilmore)	2,141	NA	NA
Wellard Deviation (south of Wellard Road east end)	2,304		
TOTAL:	**4,445**		

(*Kwinana Transport Structure Plan, 2002*)

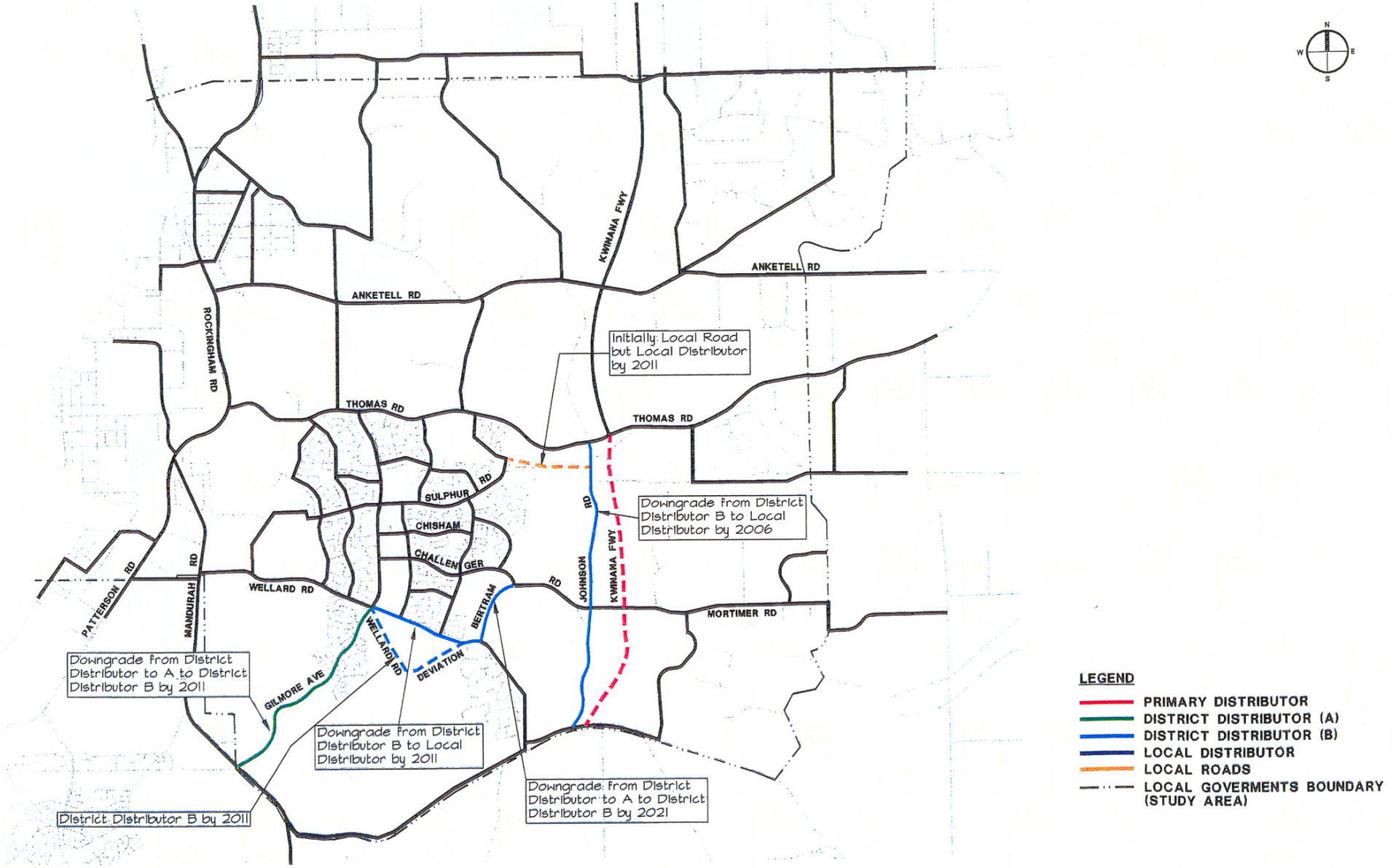


Kwinana Transport Structure Plan

Base Case Scenario - Roads to be Modelled

Source : BSD

Figure
30



Kwinana Transport Structure Plan

Functional Hierarchy Strategy

Source : BSD

Figure 31

Table 9.1 shows that the Network B 'screenline' traffic is expected to grow from approximately 4600 veh/day to 18,400 veh/day in the period from 2006 to 2021.

Some portion of this traffic will be Meares Avenue traffic that uses Wellard Road. If Wellard Road were made a cul-de-sac (as with Network C) then some of the 2011 and 2021 Meares Avenue traffic would use Parmelia Avenue instead.

Assuming that 50% of the Meares Avenue traffic growth would use Parmelia Avenue yields the following adjusted traffic figures for the screenline:

- Year 2011: 8802 veh/day
  50% x 2104 = 7,750 veh/day at screenline.

- Year 2021: 18372 veh/day
  50% x 3817 veh/day = 16,463 veh/day at screenline.

Based on forecast traffic volumes (and the adjustment to Network B figures for Meares Avenue traffic shifted to Parmelia Avenue), the following conclusions are proposed for year 2021:

- A minimum screenline capacity (i.e. Wellard Road and Wellard Road Deviation) of 17,000 vehicles per day is required at Year 2021.

- If Wellard Road is a cul-de-sac as proposed in the Wellard Village Structure Plan, the majority of the year 2021 screenline capacity is required for the Wellard Road Deviation. In this case, a capacity of 15,000-20,000 veh/day is suggested. **This requirement is met by a 2-lane divided District Distributor B road with right turn lanes at intersections**.

- Wellard Road east of Gilmore Avenue (cul-de-sac at Parmelia Avenue) will require a minimum capacity of 3,000 veh/day at year 2021. **This capacity requirement is met by a 2-lane undivided Local Distributor road**.

These conclusions for year 2021 suggest the same road hierarchy to that recommended in the *Town of Kwinana Transport Structure Plan* (refer to **Figures 30 and 31**). Refer to Chapters 4 and 5 for additional discussion of the traffic and design standards for the Wellard Deviation.

9.2.2 Conclusions

This chapter has reviewed the findings of the *Town of Kwinana Transport Structure Plan* (BSD, 2002). The key results of that study (as they relate to the Wellard Village Structure Plan are:

- the recommended downgrading of Gilmore Avenue functional status to District Distributor B by 2011 but capacity upgrade to 4-lane road;

- the recommended inclusion of the Wellard Deviation as a District Distributor B road and the downgrading of Wellard Road to Local Distributor by 2011; and

- the recommended downgrading of Bertram Road functional status to District Distributor B dependent on the success of the Wellard Road downgrading but capacity upgrade to 4-lane road by 2011.

Although Network C (including the cul-de-sac of Wellard Road at Parmelia Avenue and the Wellard Road Deviation) was not tested at year 2011 and 2021 in the BSD study, the analysis presented here suggests that this option is viable under the following circumstances:

- Wellard Deviation is constructed to provide a capacity of 15,000-20,000 vehicles/ day. This requirement is met by a 2-lane divided District Distributor B with the appropriate turn lane provision and intersection control.

- Wellard Road (west) with cul-de-sac at Parmelia Avenue has a minimum capacity of 3,000 vehicles per day. This requirement is met by a 2-lane Local Distributor Road.

- Wellard Deviation is designed with adequate pedestrian and cyclist crossing opportunities to mitigate the potential for community severance associated with District Distributor B level traffic.

Finally, the above findings are supported by independent analysis of the site traffic generated by Wellard Village as determined by detailed local traffic modelling undertaken by ERM for this project (refer to Section 9.3 below).

9.3 Local Traffic Estimates

This chapter discusses the land use as provided by Taylor Burrell and the daily traffic generation for Wellard Village as estimated by ERM. It also summarises the traffic forecasts presented in the *Kwinana Transport Structure Plan* (BSD Consultants, 2002) for roads adjacent to Wellard Village (i.e. Wellard Road and Gilmore Avenue).

9.3.1 Wellard Village Landuse and Daily Traffic Forecast

The daily traffic estimates for land uses within Wellard Village used the following data:

- 2,900 dwellings: (2436 conventional dwellings, 464 medium density dwellings);
- 5,000m^2 retail floorspace; and
- 2,500m^2 business/commercial floorspace.

6.27 vehicle trip ends/day was used for the low-density dwellings and a trip rate of 5.16 trip ends/day was used for the medium density dwellings. These assumptions are consistent with average trip productions for the Perth Metropolitan Area as provided by the Future Perth Strategic Transport Evaluation Modelling Section (**Appendix D**). Given that Wellard Village will have excellent bus and rail transport services these trip production rates should provide a conservative (high side) estimate of local trip production.

The daily retail land use attraction rate was assumed at 60 vehicle-trips/ 100m2 floor area and the daily business/commercial attraction rate was assumed at 25 vehicle trips/100m2 floor area.

Table 9.2 shows the assumed trip distribution to/from the external road system. The assumptions in **Table 9.2** are based on the assumed relative attractiveness of these routes for vehicle trips to/from local, district and regional attraction points.

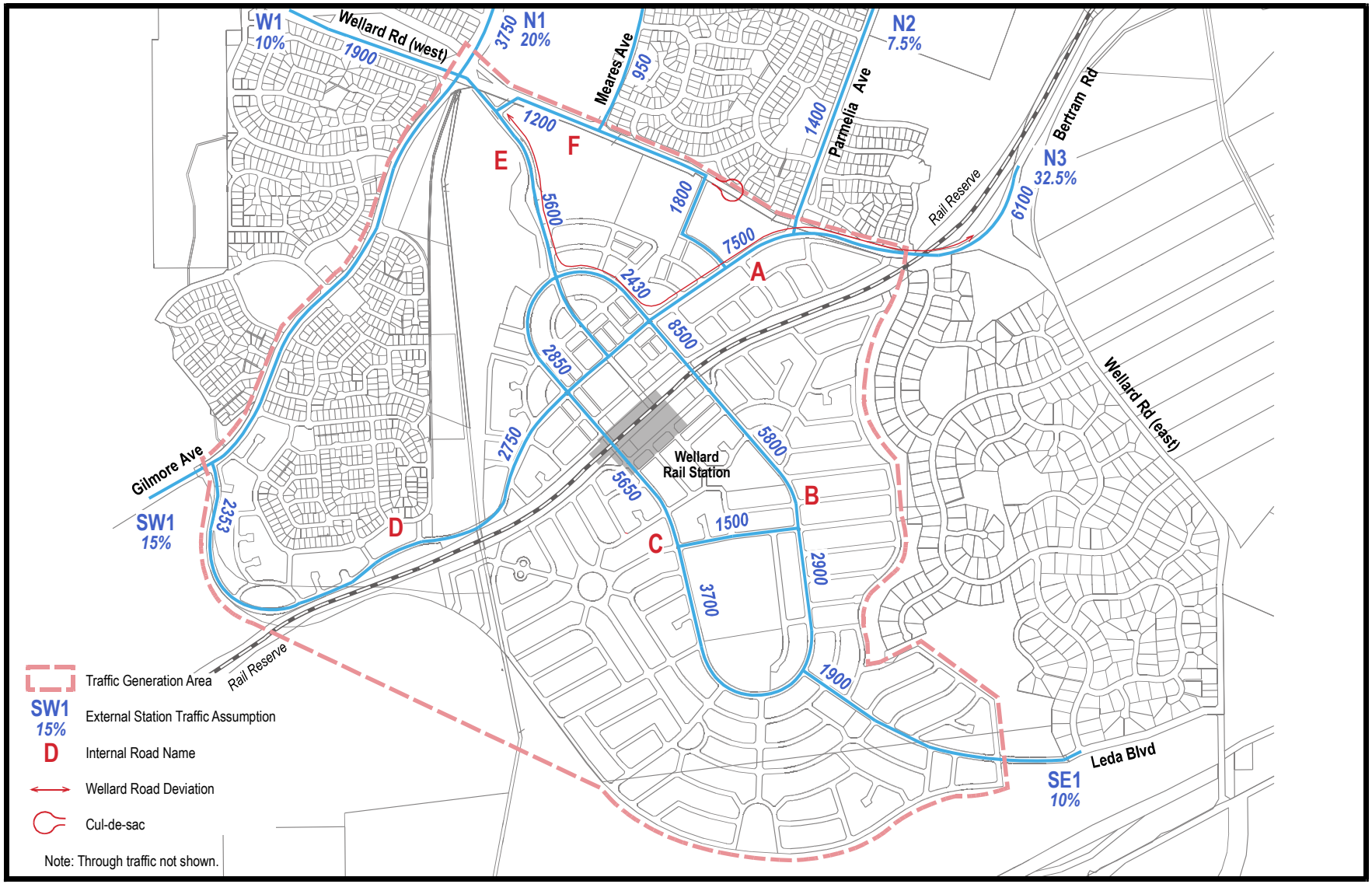
Table 9.2: Assumed Wellard Village Daily Vehicle Trip Distribution to External Roads

N1 – Gilmore Avenue, North	20%
N2 – Meares Avenue	5%
N3 – Parmelia Avenue	7.5%
E1 - Wellard/Bertram Road, East	32.5%
SE1 – Leda Boulevard	10%
SW1 – Gilmore Avenue, South	15%
TOTAL	100%

Figure 32 shows daily traffic generated from Wellard Village as assigned to the proposed street network. The local traffic is also summarised in **Table 9.3** for selected streets. Traffic volume plots from the model are provided in **Appendix D.**

Table 9.3: Local Traffic From Wellard Village – Vehicles/Day

Road Name/ Description	Traffic Range – Vehicles/day
Road A – District Distributor 'B' Provides link to Wellard/ Bertram Roads	6000-7500
Road B- Neighbourhood Connector Forms the eastern half of a loop road serving to distribute traffic through Wellard Village (southern residential area) (station park n' ride area)	 2900-5800 8500
Road C- Neighbourhood Connector Forms the western half of a loop road serving to distribute traffic through Wellard Village	2850-5650
Road D – Neighbourhood Connector Provides link to Gilmore Avenue (south)	2300-2750



Ultimate Development - Site Traffic Only (vehicles / day)

Figure
32

Road Name/ Description	Traffic Range – Vehicles/day
Road E – District Distributor 'B' Forms the Main Street leading to Wellard Station and is part of the 'Wellard Road Deviation'.	5600
Road F – Neighbourhood Connector Section of Wellard Road between Gilmore Avenue and Parmelia Avenue. Cul-de-sac at Parmelia end.	1200
Leda Boulevard – Neighbourhood Connector	1900

The locally generated traffic estimates for Wellard Village streets are within the *Liveable Neighbourhoods* thresholds listed below:

- District Distributor B <15,000-20,000 veh/day
- Neighbourhood Connector < 7000 veh/day
- Wider Access Street < 3000 veh/day
- Narrower Access Street < 1000 veh/day

9.3.2 Preliminary Estimation of Through Traffic on the Wellard Deviation

Although the local traffic estimation (**Figure 32**) doesn't capture 'through traffic', it is possible to estimate the amount of through traffic on Wellard Road and Wellard Road Deviation by comparing the modelling outputs reported in the *Town of Kwinana Transport Structure Plan* with those in **Figure 32**.

Table 9.4 lists traffic forecast outputs for the long term development case (i.e. year 2021) by which time it is assumed that Wellard Village is fully built out.

Table 9.4: Comparison of Local vs. Total Traffic for Estimation of Through Traffic on Wellard Village Roads at Year 2021

	ERM Local Traffic Estimate	Kwinana Transport Structure Plan: Network B	Difference = Estimated Through Traffic*
Wellard Deviation (east) & Wellard Rd	7300 (6100 +1200)	16462 (3842+14530-1910**)	9162
Wellard Deviation (west) & Wellard Rd	6800 (5600 + 1200)	19588 (6968 +14530-1910**)	12788
Link to Gilmore (south)	2350 veh/day	5921	3571

* *Assumes that local traffic generation from the BSD and ERM traffic models are similar.*

** *With assumed cul-de-sac of Wellard Road, Meares Avenue traffic from east is redirected to Parmelia Avenue*

The estimated through traffic on Wellard Deviation is thus in the range of 9,000 to 13,000 vehicles per day. The estimated through traffic on the road linking Wellard Village to Gilmore Avenue (south) is approximately 3500 vehicles per day.

The estimates in **Table 9.4** are the best that can be produced with the information currently available. A specific traffic modelling exercise has been commissioned by the Joint Venture to provide more definitive estimates of both through traffic and total traffic on Wellard Road Deviation at year 2021 (under the assumption that Wellard Road is cul-de-sac at Parmelia Avenue).

With the information currently available, the road network in the Wellard Village Structure Plan provides enough capacity to cater for local and through traffic at ultimate development. As mentioned in Chapter 3, this result is not the only criteria that must be satisfied. The design of Wellard Deviation must also achieve a high level of amenity and safety for pedestrian and cycle movement (parallel to and across the road) to overcome any potential community severance impacts.

These findings will be updated with a supplementary report at the completion of the additional traffic modelling investigation. Design options for achieving the necessary pedestrian/ cyclist amenity and safety on the Wellard Deviation will also be investigated further. Refer to Section 5.3 for further discussion of the design of Wellard Deviation.

9.4 Street Types and Arterial Access

This chapter discusses the local street network proposed for Wellard Village including the proposed access to adjacent regional roads. The street types described are from *Liveable Neighbourhoods Community Design Code Edition 2* (June 2000, DPI).

9.4.1 Residential Street Types

Figure 33 shows the street type plan for Wellard Village and the proposed intersections with the arterial road network. Cross-sections for the *Liveable Neighbourhoods* street types are shown in **Figures 34 and 35.**

The proposed street types are suited to the specific traffic, parking and pedestrian/cyclist needs of each location. Typical characteristics for the various street types are:

- **Narrow Access Streets – Figure 34**
  (6m pavement/15m reserve)

  Narrow Access Streets provide a more limited travel/ parking width and are effective in constraining vehicle speeds. The majority of residential streets in Wellard Village will be Narrower Access Streets because parking demand will be moderate adjacent to low density residential uses and traffic volumes will be low.

- **Wide Access Streets – Figure 34**
  (Type B: 7.4m pavement/16m reserve)

  Wider Access Streets are typically used where traffic and/or parking demand is expected to be higher and a 7.4 metre wide street pavement is needed.

- **Neighbourhood Connector – Figure 35**
  (3.0m travel lanes and 3.8 m shared parking/cycle lanes in 20-25m reserve. A 2.0m-3.0m median is optional depending on pedestrian crossing needs, driveway access controls, landscaping theme etc).

  Neighbourhood Connector streets perform local traffic distribution roles and serve as bus routes through the local street system. The Neighbourhood Connectors also provide important connections to the regional road system (i.e. at Gilmore Avenue and Wellard Road).

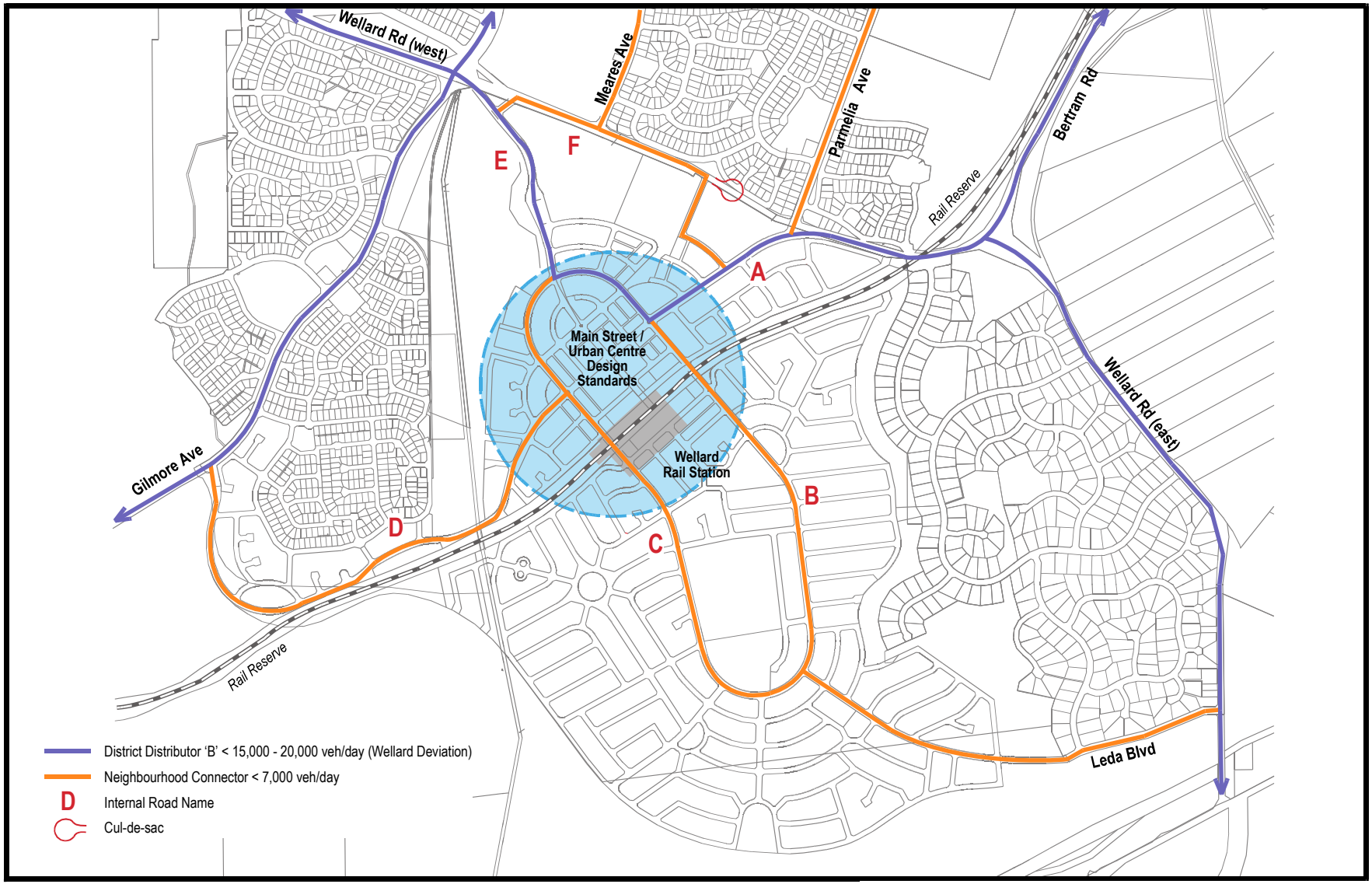
9.4.1.1 District Distributor B (Integrator Arterial B)

The Wellard Road Deviation is shown in **Figure 35** as a District Distributor B (Integrator Arterial B). According to *Liveable Neighbourhoods* these are minor arterial roads with a capacity of 15,000-20,000 vehicles per day. These roads typically have the following characteristics:

- 2-lane divided road (6m+ median with right turn lanes at important junctions);
- 50-60 km/hr speed limit and relatively frequent intersections (i.e. 100m spacing);
- Reserve width of 28-32m;
- Parking allowed on-street in embayments through urban centres. Residential areas do not typically have on-street parking;
- Some direct property access depending on the land use and alternatives for indirect access (i.e. frontage access streets); and
- On-road cycle lanes, shared paths, footpaths and street trees.

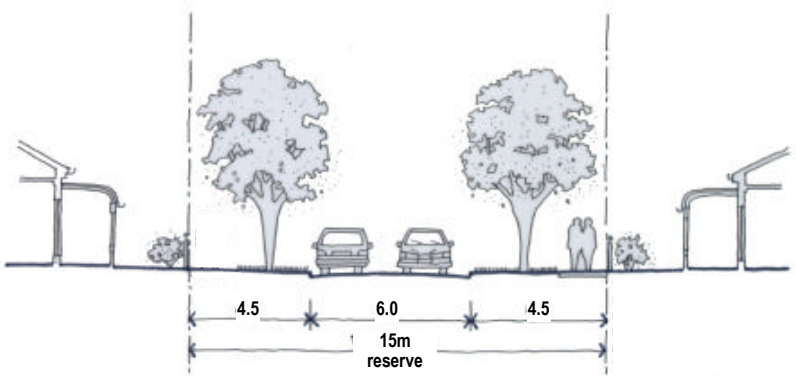
These roads have both an 'access' and a 'movement' function. They rely on good urban design for fronting land use and typically serve a wide range of users including:

- District through traffic;
- Local traffic distribution;
- Access seeking traffic to driveways and on-street parking; and
- Pedestrians, Cyclists, Bus Patrons.



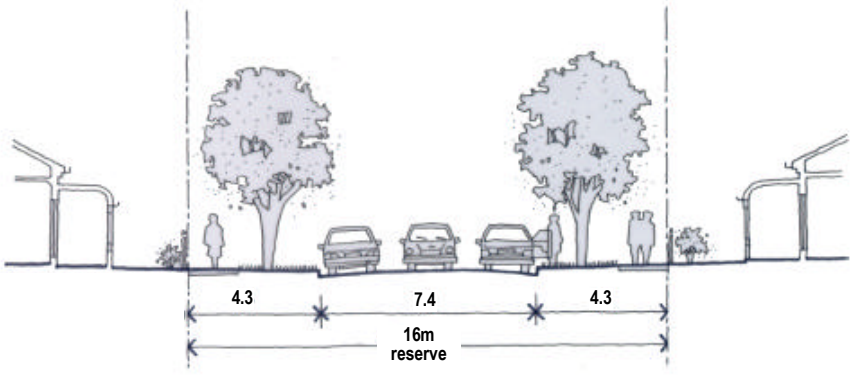
Street Types Plan

Figure
33



Not to Scale

Narrower Access Street (6.0m pavement) in 15m Reserve.



Not to Scale

Wider Access Street (7.4m pavement) in 16m Reserve.

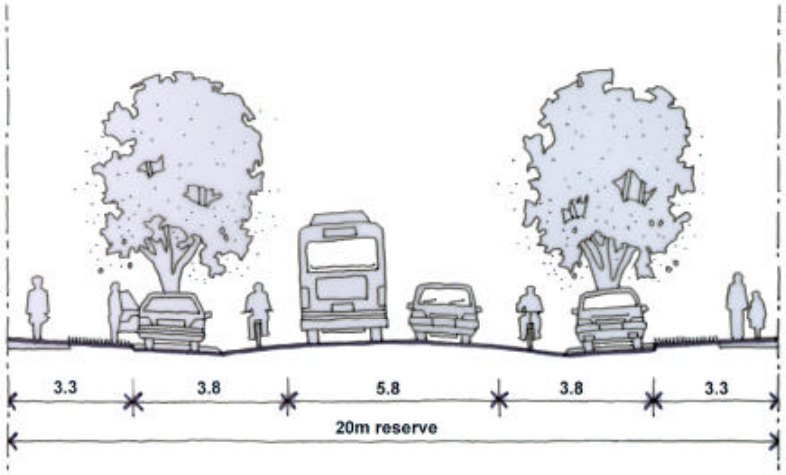
8021347/Figure6.fh8

ERM

Access Streets

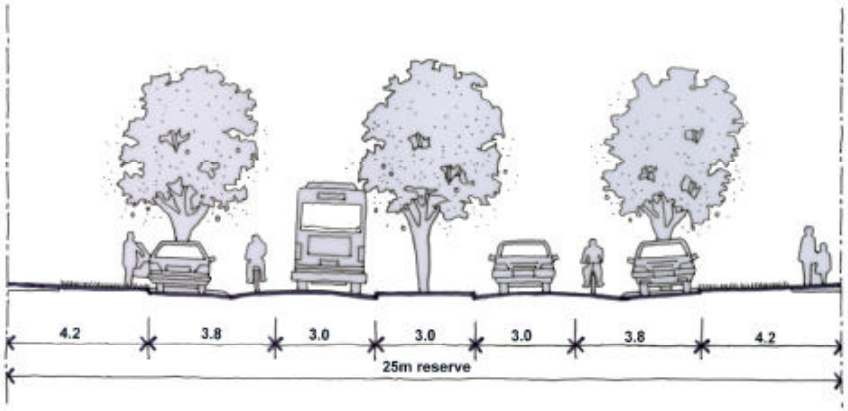
Figure
34

(The cross sections below illustrate how the basic design elements are dimensioned at traffic volumes below and above 3000 vehicles per day. Neighbourhood Connectors normally require specific design cooperation between traffic engineers and urban designers to suit each circumstance.)



Neighbourhood Connector
(no median, with parking embayments)

Note: 1. To reduce the perceived travel width, coloured pavement may be used to define the shared parking/bike lane.
2. For traffic volumes <3000vpd, the 3.8m shared parking/bike lanes are replaced by 2.3m parking lanes and the reserve width is reduced to 17m.



Neighbourhood Connector
(central median, with parking embayments)

Note: For traffic volumes <3000vpd, the 3.8m shared parking/bike lanes are replaced by 2.3m parking lanes and the reserve width is reduced to 22m.

8021347/Figure7.fh8

ERM

Neighbourhood Connector
Typical Cross sections

Figure
35

As discussed in Sections 9.3 and 9.4, the design of the Wellard Deviation must achieve the required capacity but also must minimise community severance impacts. In this regard pedestrian/ cycling safety and amenity are most important. Fortunately, the design options available for a District Distributor B type road offer the means to achieve an 'environment of care' with an associated lower traffic speed (i.e. 50 km/hr and short sections of 40km/hr if needed).

Discussions will be undertaken in coming months with the town planners/urban designers (Taylor Burrell) as well as the Town of Kwinana engineers and planners to arrive at the appropriate road cross-section, pedestrian/ cyclist facilities and intersection treatments for Wellard Deviation.

9.4.1.2 Wellard Village Rail Station Precinct – Main Street Design Standards

The town centre adjacent to the Wellard Railway Station will have the following distinct 'urban' characteristics:

- Buildings will be constructed to the reserve boundaries to frame the streets.
- Verge areas will comprise wide paved footpaths for pedestrian activity, street furniture, street trees and outside café/ alfresco areas.
- On-street parking, kerbside bus stops, and taxis waiting space will be provided.
- Reserves will be of traditional 'main street' width (i.e. 20-22m wide).
- 2-lane undivided street with pavement of 6.0-6.5m adjacent to 2.3-2.5m wide parking embayments.

Photo 9.1 shows a picture of Mends Street in South Perth. The photo illustrates the features described above.

General Note on Street Types and Cross-Sections:

Variations on the paved width and reserve dimensions are sometimes required to accommodate special demands (eg. trunk water or sewer main, street-front parking in the case of properties with rear laneways, or 2.5m shared path within the reserve). The reserve widths throughout Wellard Village have been determined to accommodate these needs. The design of individual streets within these reserves will be undertaken by TABEC Engineering Consultants and will be subject to review and approval by the Town of Kwinana.

Photo 9.1 - Mends Street, South Perth – An Example Of 2-Lane Undivided 'Main Street' In A 20m Reserve

9.4.2 Access to the Regional Road System

9.4.2.1 Key Intersections

Full access T-junction at Gilmore Avenue (south)

Road D (**Figure 35**) is the minor leg of this T-junction and will be stop controlled. The requirement for a dedicated right turn pocket on Gilmore Avenue should partially be guided by the design approach taken at other local road junctions (i.e. Dalrymple Street, Fielman Drive, etc). Advice will be offered on this requirement when the supplementary traffic report is completed (refer to Section 9.3.2)

Gilmore/Wellard Roundabout

The roundabout eastern leg (Photo 9.2) will be closed and switched over to the newly constructed Wellard Deviation. It is expected that the Wellard Deviation leg will have two entry and two exit legs at the roundabout. These will transition to a 2-lane divided boulevard (District Distributor B) cross-section over an appropriate distance.

Photo 9.2 - Wellard Road/Gilmore Avenue Roundabout. View East along Wellard Road

Existing Wellard Road (east) will no longer connect to the roundabout. Instead it will connect into the Wellard Deviation at a point close to the roundabout.

Wellard Deviation (east)/ Parmelia Avenue

Parmelia Avenue will form the minor leg of a new T-junction with Wellard Deviation (east). Wellard Road will be a cul-de-sac near Parmelia Avenue. Photo 9.3 shows existing Wellard Road near Parmelia Avenue.

Photo 9.3 - Wellard Road looking west from Parmelia Avenue intersection

This treatment fully downgrades Wellard Road (shifting traffic to Wellard Deviation) and provides Parmelia Avenue (Photo 9.5) with a high level of access to the Wellard Deviation and thus to Wellard railway station.

Photo 9.4 - Parmelia Avenue: View looking north from Wellard Road

9.4.3 Staging of Wellard Deviation

Only preliminary consideration has been given to the staging options for Wellard Deviation. However it seems apparent that a high level of accessibility by car will be important to early housing sales and the early establishment of the Wellard rail station and the incubator retail, commercial, and community facilities in the centre.

Discussions with the Town of Kwinana officials are recommended to identify the best manner and timing for effecting the Wellard Road Deviation.

9.5 Public Transport

This chapter focuses on the proposed public transport service in the Wellard Village Area at completion of the South West Metropolitan Railway (SWMR). Transperth's proposed bus services linking to Wellard Station (Leda Station in the SWMR Masterplan document) are discussed and some comments are provided about the proposed rail service to Wellard Station.

9.5.1 Future Rail Service and Wellard Rail Station

According to the SWMR Supplementary Masterplan (PURD, August 2002) the railway will be complete from Perth to Mandurah by the end of 2006. It will provide frequent service (six trains per hour in the peak) from Mandurah and even higher frequency (twelve trains per hour in the peak) from Thomson's Lake. The travel time to Perth by rail is estimated to be 48 minutes from Mandurah, 33 minutes from Rockingham, and 16 minutes from Thomson's Lake.

The Masterplan states that funding has been allocated for various stations including Wellard station. However, the Masterplan also states that:

The construction of Leda (Wellard) *railway station requires to be examined with regard to patronage demand in the catchment. Timing of its construction will be negotiated with the developer.*

It is understood at the time of this report that a Memorandum of Understanding is being finalised between the Joint Venture and Perth Urban Rail Development (PURD) to ensure that the Wellard rail station is developed in a timely fashion. At this stage it is expected that the station will be operational at approximately the same time that the railway is functioning (i.e. the end of year 2006).

Because the railway is intended to be the spine of an integrated public transport system, every effort will be made to maximise the bus feeder services. The bus services planned for the Kwinana area will provide a good feeder network linking to the rail stations (i.e. Kwinana Station and Wellard station). These services are discussed in Section 6.3 below.

The design and construction of the various stations along the railway is being undertaken by PURD. A copy of the concept plan for Wellard Station as provided in the Masterplan is provided in **Appendix E**. The concept plan shows the bus/ rail interchange on the north side of the rail line and the kiss n' ride and park n' ride on the south side of the rail line.

Vehicle access across the rail line is accommodated in the Wellard Village Structure Plan via two road over rail bridges on either side of the station. Pedestrian access will also be available through a platform building. It is expected that the railway will be in cutting at Wellard Station thus patrons will descend from street level to the rail platforms.

It is important that the station and the associated the feeder bus access roads, kiss n' ride and long-term parking facilities be designed to integrate well with the remainder of the station precinct. Taylor Burrell Consultants will be working with PURD appointed architects to achieve a functional and attractive arrangement.

9.5.2 Future Bus feeder Services for Wellard station

9.5.2.1 Routes

Transperth have provided preliminary information for the two bus services planned to feed Wellard Station (**Figure 36**). These routes will connect to the Kwinana Town Centre bus interchange on Gilmore Avenue and then travel on to also serve the Kwinana Station near Oroton Road and Johnson Road.

- **Route 541**
  This route is proposed to use Marlow Road, Calista Avenue and Wellard Road (west) to the Gilmore Avenue roundabout and then travel south along Gilmore Avenue. At Dalrymple Drive the route turns east to link into Wellard Village and to access Wellard Station.

  The route crosses the railway using one of the two bridges and proceeds toward the southern part of Wellard Village - near the site of two proposed schools. A timed stop/bus terminus will be required at this southern point to allow buses to turnaround and 'layover' until their next journey is scheduled (usually a few minutes). The turnaround manoeuvre typically occurs at a suitably located roundabout or alternatively the bus travels around a nearby street block to access the appropriate bus stop prior to the return leg of the route.

- **Route 542**
  From Kwinana Town Centre Bus Station Route 542 will follow Gilmore Avenue south to the Wellard Road roundabout. It will then travel east along Wellard Road past Meares Avenue and turn into Wellard Village en route to Wellard Station. Route 542 also crosses the railway and proceeds south along a parallel local street to access the aforementioned bus terminus.

9.5.3 Service Frequencies and Coordination with Rail Operations

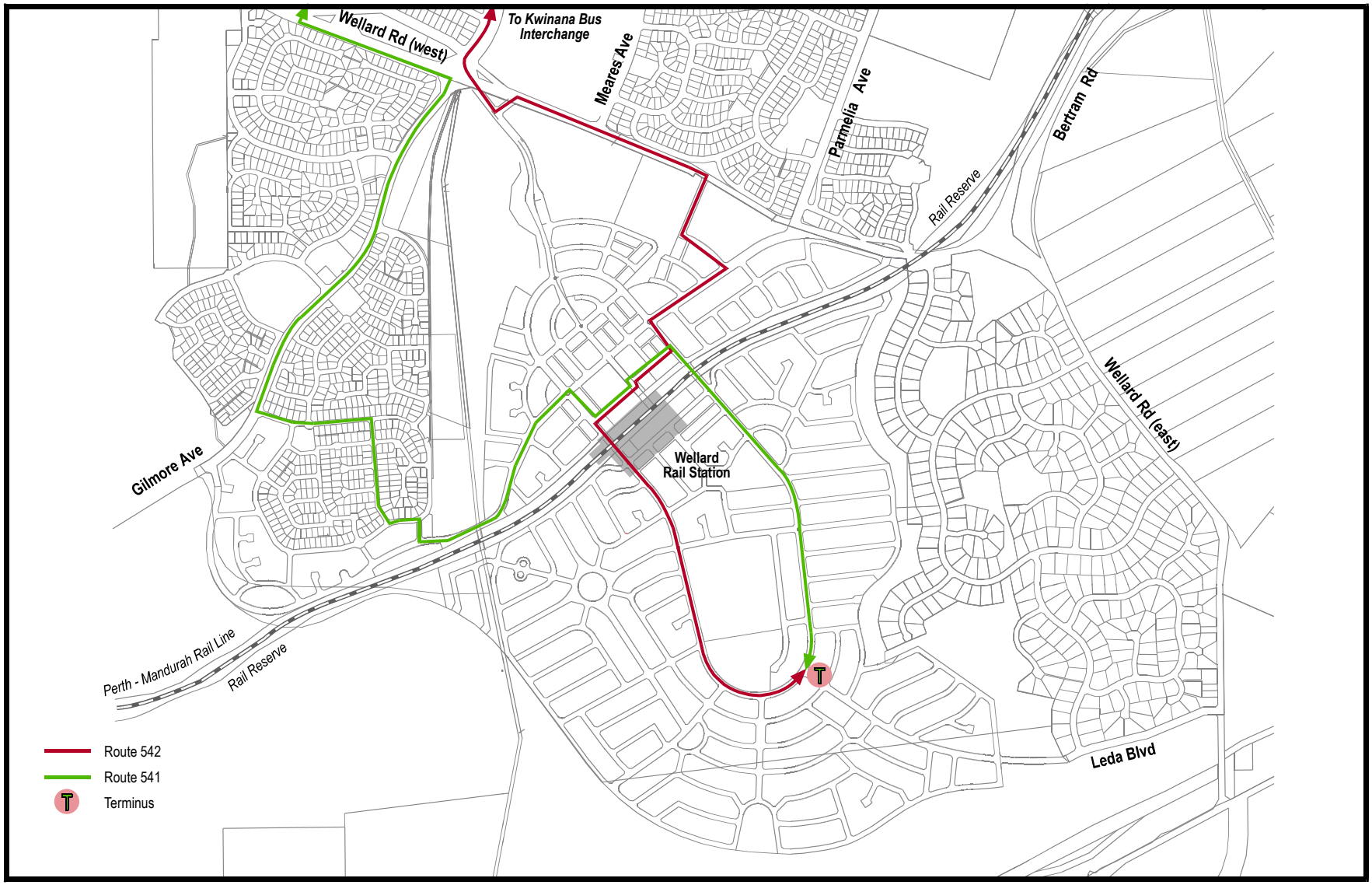
Transperth indicate that these routes will initially operate on 30 minute and 60 minute frequencies in the peak and off-peak periods, respectively. If the two routes are staggered or offset by 15 minutes, they will provide double this frequency for travel from Wellard Station to both the Kwinana Bus Station and the Kwinana Train Station (albeit via different routes).

Ultimately, when the surrounding area is fully developed and demand warrants, the service will be increased to 15 minute and 30 minute frequencies in the peak and off-peak, respectively.

Transperth indicate that the likely priority for scheduling the buses will be as follows:

- First priority: Co-ordinate with train arrival and departures at Kwinana Rail Station;
- Second priority: Co-ordinate with Fremantle-Rockingham bus services at the Kwinana Town Centre Bus Station; and
- Third priority: Co-ordinate with trains arriving/ departing at Wellard Village Station.

Given the above scheduling priority, it is likely that Routes 541 and 542 will not have a timed stop with layover facilities at Wellard Station. Rather the buses will conduct short duration pick up/ drop off at the Wellard Station. Layover capability should nevertheless be designed for the bus/rail interchange area because the need could develop if the scheduling priorities change.



Future Bus Routes Linking Wellard Station to Kwinana Bus Interchange

Figure 36

9.6 Cyclist and Pedestrian Facilities

9.6.1.1 Perth Bicycle Network Plan – Local Bike Route SW22

Figure 37 shows Local Bike Route SW22 (Kwinana Beach to Wellard) along Bertram Road and Wellard Road. This is an on-road route that uses the paved shoulder area of these roads to provide a safe cycling environment.

When the Wellard Road deviation is undertaken as part of the Wellard Village development, it will be necessary to make some adjustments to allow SW22 to continue operating.

At the time of the deviation, existing Wellard Road (west of Parmelia Avenue) will become a cul-de-sac and Parmelia Avenue will form a T-junction with the Wellard Road Deviation. This means that a short section of cycle path will be needed from the Wellard Deviation/ Parmelia Avenue intersection to the Wellard (west) cul-de-sac.

The Wellard Road Deviation will be designed to include on-road cycle lanes and will thus connect SW22 directly to the Wellard Neighbourhood Centre and rail station.

9.6.1.2 Principal Shared Path Along The Railway

The Department for Planning & Infrastructure (DPI) have recently requested tenders to undertaken the master planning for a PSP along the new Perth-Mandurah rail reserve. It is understood that PURD have not budgeted for the PSP and that it must be funded separately from the railway.

PSP's provide direct, long distance connections within the Perth Bicycle Network and are highly valued by recreational and commuter cyclists in particular. A PSP through the Wellard Village area would be a great asset.

It is expected that the PSP will be located on the north side of the railway through Wellard Village and past the station. In discussions with DPI, Taylor Burrell have suggested that the path should be accommodated in the road reserve adjacent to the railway. This will allow the rail reserve to be kept as narrow as possible through Wellard Village.

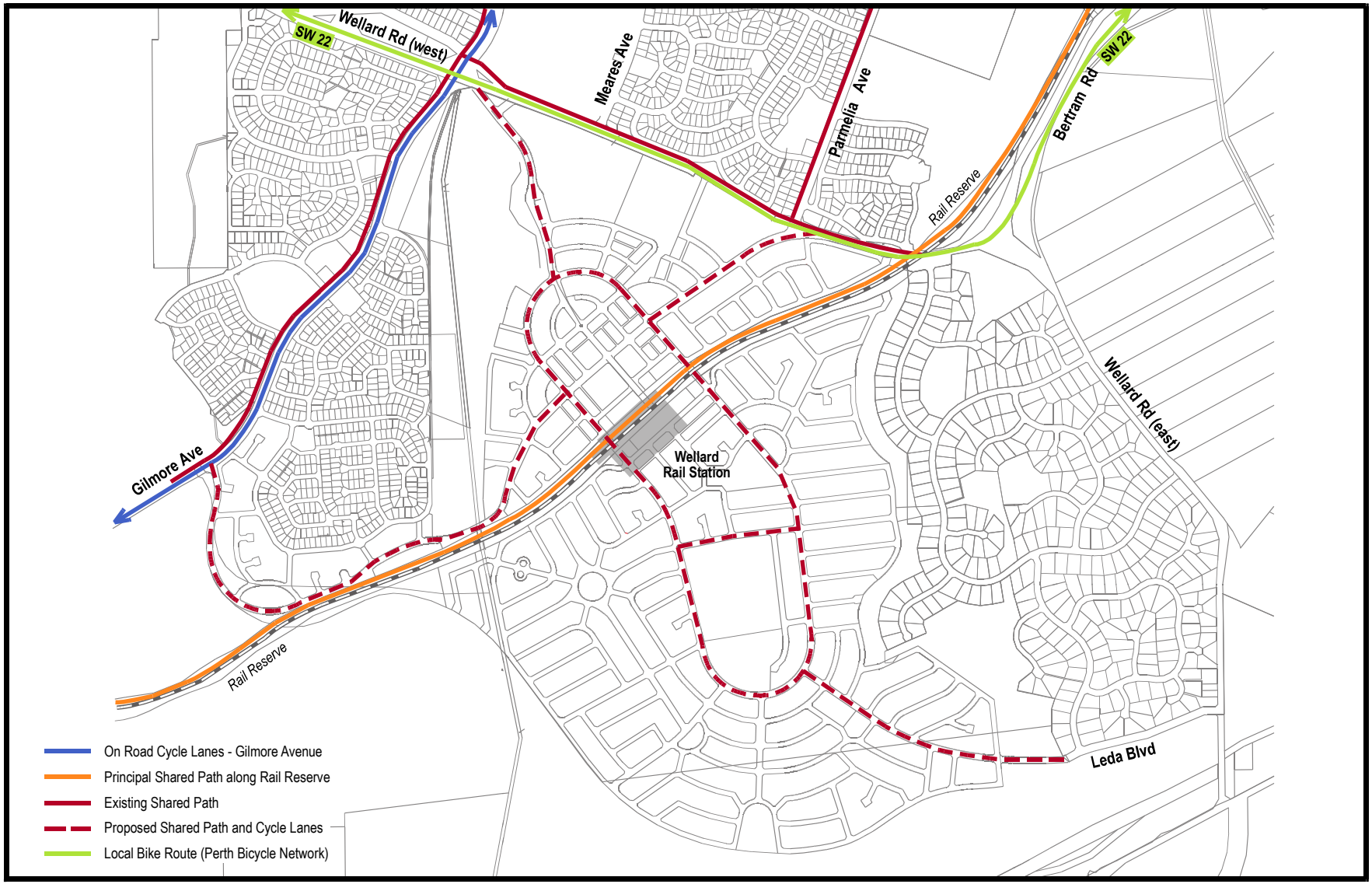
Through the station area it will be important to design the PSP to slow cyclists for safe interaction with pedestrians moving to/from the station platforms. This has been done at other stations in Perth and it should be possible at Wellard Station.

9.6.1.3 Gilmore Avenue Cycling

Gilmore Avenue currently has off-road shared paths but provides a relatively unfriendly on-road cycling environment north of Dalrymple Street (Photo 9.5)

Photo 9.5 - Gilmore Avenue: View north from Fielman Drive

The Town of Kwinana is currently preparing the design of the Gilmore Avenue bus lanes that form part of the Fremantle-Rockingham Transitway. The Kwinana Bike Plan (ERM, 1999) indicated that on-road cyclists could travel in the kerb side lane in mixed traffic until the Gilmore Bus Lane project was undertaken. It also stated that the needs of cyclists should be reviewed at the time the bus lanes are introduced. A copy of the 1999 Kwinana Bike Plan is provided in **Appendix F.**



Cycle Routes, Paths

Figure
37

Given the importance of Gilmore Avenue to cycling within and through the Town of Kwinana it is suggested that urgent discussions be held between the DPI and the Town of Kwinana to resolve how on-road cyclists will be catered for on Gilmore Avenue when the bus lanes are implemented. Two basic options appear viable:

- Cyclists ride adjacent to the kerb in a slightly widened bus lane (i.e. 4.5-5.0m wide instead of 4.0m wide). Buses would be able to safely pass cyclists in this width.
- Cycle lanes are marked out adjacent to the kerb, next to the bus lanes. Separately designated spaces would likely result in a wider total width and thus would be more expensive.

9.6.1.4 Shared Paths and Cycle Lanes in Wellard Village

Figure 37 shows a network of shared paths proposed for Wellard Village. These paths will be provided in the verge of the more important streets in the local network. The paths will be used by pedestrians and less experienced cyclists and have a width of 2.5m.

Streets carrying more than 3000 vehicles per day will have on-road cycle lanes (1.5m wide) or alternatively will have shared parking/ cycle lanes (3.8m wide). The streets shown with shared paths in **Figure 37** are expected to carry 3,000 veh/day or more and thus will also have these cycle lanes. Refer to Chapters 3 and 4 for traffic estimate information.

In the heart of the Wellard Station Precinct, 'main street' design standards will apply (refer to Chapter 5) and on-road cycle lanes will not be provided. In these low speed environments, cyclists will share the street with other users.

9.6.1.5 Footpaths in Wellard Village

Streets in Wellard Village adjacent to higher density residential development or linking important activity sites will be provided with 1.5m footpaths on both sides (or a shared path on one side and a footpath on the other side).

In accordance with *Liveable Neighbourhoods* policy, residential streets with very low traffic volumes and low traffic speeds are provided with a footpath on one side only.

As indicated in Section 5.4, the heart of the Rail Station Precinct will be a mixed-use environment with 'urban main street' design standards, including buildings constructed to the reserve boundary and wide footpath/verges. Footpath/verges would typically be in the order of 3.5-4.0m wide in these areas.

9.7 Summary and Conclusions

This report has provided transport planning information for the Wellard Village Structure Plan. Summary points/ conclusions are as follows:

9.7.1.1 Regional Road System

The regional road system provides multiple routes to/ through the Town of Kwinana and provides excellent access to Wellard Village. In future the network will be supplemented with:

- The westward extension of Mundijong Road from the Kwinana Freeway to Mandurah Road and Dixon Road. It is expected that this will relieve Thomas/Gilmore and Bertram/Wellard/ Gilmore of some Rockingham bound through traffic. It may also take some Baldivis freight traffic off Wellard Road.
- The FRCAH will have intersections with Thomas Road, Wellard Road and Gilmore Avenue. It will provide improved north-south travel in the region and will further improve access to Rockingham taking through traffic pressure off Gilmore Avenue and Wellard Road.

9.7.1.2 Traffic Forecasts

The total traffic (year 2021) estimated for the Wellard Deviation is approximately 15,000-17,000 veh/day. Preliminary estimates of through traffic on Wellard Road Deviation suggest that it will comprise approximately 10,000 veh/day of the total at year 2021. The majority of the 'through traffic' is expected to be Town of Kwinana traffic and not regional traffic.

The total traffic estimated for Road D (i.e. Neighbourhood Connector linking Wellard Village to Gilmore Avenue -south) is approximately 6000 vehicles per day. Through traffic is estimated to comprise approximately 3500 veh/day of the total.

Although the Wellard Road Deviation (with cul-de-sac of Wellard Road at Parmelia Avenue) was not tested at year 2011 and 2021 in the traffic modelling undertaken for the *Town of Kwinana Transport Structure Plan* (BSD, 2002), the analysis presented here suggests that this option is viable under the following circumstances:

- Wellard Deviation is constructed to provide a capacity of 15,000-20,000 vehicles/ day. This requirement is met by a 2-lane divided District Distributor B with the appropriate turn lane provision and intersection control.
- Wellard Road (west) with cul-de-sac at Parmelia Avenue has a minimum capacity of 3,000 vehicles per day. This requirement is met by a 2-lane Local Distributor Road.
- Wellard Deviation is designed with adequate pedestrian and cyclist crossing opportunities to mitigate the potential for community severance associated with District Distributor B level traffic.

The above findings are supported by independent analysis of the site traffic generated by Wellard Village as determined by detailed local traffic modelling undertaken by ERM for this project (refer to Chapter 4).

A specific traffic modelling exercise has been commissioned by the Joint Venture to provide more definitive estimates of both through traffic and total traffic on Wellard Village roads at year 2021 (under the assumption that Wellard Road is cul-de-sac at Parmelia Avenue).

The findings presented here will be updated with a supplementary report at the completion of the additional traffic modelling. Design options for achieving the necessary pedestrian/ cyclist amenity and safety on Wellard Road Deviation will also be identified.

9.7.1.3 Wellard Village Streets

The Access Streets and Neighbourhood Connector Streets of *Liveable Neighbourhoods* have been used in planning the street reservations in the Wellard Village Structure Plan. These designs are tailored to the particular traffic, parking, pedestrian and cycling needs for each area of Wellard Village.

Special 'main street' or 'urban' design standards will be applied to the mixed-use Neighbourhood Centre at the rail station. These standards will ensure adequate parking and pedestrian amenity while maintaining slow vehicle speeds.

9.7.1.4 Future Bus Services

The local street layout and street cross-sections have been designed with bus routes in mind and in consultation with Transperth. Routes 541 and 542 are feeder bus services linking Wellard rail station to the Kwinana Town Centre Bus Station on Gilmore Avenue. These routes extend to the southern limit of Wellard Village near the Leda Boulevard extension where they will have a timed stop/ turnaround facility. The turnaround facility will be provided via a roundabout near the terminus (i.e. on Road B or C in **Figure 34**) . Alternatively, buses may do a short loop around a nearby street block. Transperth will be consulted as street design is undertaken near the planned terminus.

9.7.1.5 Network of on-road cycle lanes, shared paths and footpaths

The Wellard Village street system will provide on-road cycle lanes or shared parking/cycle lanes on the busier Neighbourhood Connectors and along the Wellard Deviation. It also includes off-road shared paths and footpaths to promote walking and cycling for short trips.

Wellard Village facilities will integrate with important regional facilities such as PBN route SW22 along Wellard Road, a new Principle Shared Path along the railway and the new on-road cycle lanes being planned for Gilmore Road.

10.0 COMMITMENTS AND RESPONSIBILITIES SCHEDULE

To ensure the successful implementation of the project, it is necessary that the commitment to undertake the works and ongoing responsibilities be clearly defined at the outset of the project.

The commitments and responsibilities that will be carried out by the stakeholders are defined below:

Item	Action	Responsibilities
Land Assembly		
Memorandum of Understanding between Joint Venture, State and Local Government.	Joint Venture, State and Local Government to establish responsibilities for the development.	Joint Venture, Town of Kwinana, Department for Planning and Infrastructure
Modify Town Planning Scheme to facilitate Structure Plan proposals	Prepare and implement all necessary modifications to the Town Planning Scheme to facilitate the Structure Plan proposals and initiate appropriate scheme amendments with the support of the Town of Kwinana.	Joint Venture, Town of Kwinana
Management Plans		
Drainage Management Plan	Prepare and implement drainage management plan.	Joint Venture, Town of Kwinana
Wetland Management Plan	Prepare and implement Wetland Management Plan	Joint Venture, Town of Kwinana, DEWCAP
Environmental Management Plans	Prepare as required, necessary management plans to ensure the proper protection of significant areas of vegetation and to address other environmental issues as they arise.	Joint Venture, Town of Kwinana, DEWCAP
Provision of Services		
Internal Service Infrastructure	Joint Venture to design and implement to the satisfaction o the Town of Kwinana.	Joint Venture, Town of Kwinana.
External Services Infrastructure	The subdivider to upgrade external services as agreed with the Town of Kwinana and other service authorities to facilitate the Structure Plan proposals	Joint Venture
Public Open Space		
Maintenance	Landscaping to be established by the subdivider and maintained for a period of one year following clearance of diagrams by Council or as agreed by the Joint Venture.	Joint Venture

Item	Action	Responsibilities
	Council to accept handover of landscaping and public open space after this maintenance period, and continue maintenance of POS, including drainage to a standard previously determined by the Joint Venture.	Town of Kwinana
Construction, Staging and Timing of Railway Line and Station		
	Establish Memorandum of Understanding between DPI, PURD and Joint Venture regarding construction, staging and timing of completion.	Joint Venture, Department for Planning and Infrastructure, PURD
Access	PURD to coordinate staging and access implications of railway construction to staging of development.	Joint Venture, PURD
	Coordinate construction and access, and provision of services with PURD regarding construction of busway, kiss'n'ride, passenger setdown and park'n'ride.	Joint Venture, PURD
Other		
	Establish timing of staging in relation to construction of railway line and station.	Joint Venture, Department for Planning and Infrastructure, PURD
	Investigate opportunities for school in houses or shops as an interim school with EDWA and private establishments	Joint Venture
	Consultation with existing adjoining residents during development.	Joint Venture
	Investigate opportunities for co-location and joint use of active recreation facilities between Council and the EDWA and other private institutions.	Town of Kwinana, EDWA, Others
	Investigate opportunities to create a community house.	Joint Venture, Town of Kwinana

11.0 IMPLEMENTATION

11.1 Process

Prior to development occurring within the Wellard Village Structure Plan, the following action is required:

- Adoption of Structure Plan;
- Subdivision Approval;
- Preparation of Management Plan; and
- Agreements, as required with Key Agencies, i.e. DPI (MOU).

11.2 Adoption of Structure Plan

The Structure Plan provides the basis for guiding subdivision, development and broad design requirements of all areas within the subject land. In accordance with the requirements of Council's Town Planning Scheme, the Structure Plan requires the approval of Council and the Western Australian Planning Commission.

11.3 Modifications to the MRS and TPS

In addition, the Structure Plan will form the basis of an application to the Department for Planning & Infrastructure and the Town of Kwinana in support of a request to modify the Metropolitan Region Scheme and Town of Kwinana TPS No. 2 as outlined below:

MRS Amendment	to reflect the modified location for the High School site; and
Town of Kwinana TPS No. 2	to support a request to include the subject land within Schedule 4 with appropriate development provisions and references to the Structure Plan.

11.3.1 Metropolitan Region Scheme

Modifications will be required to the Metropolitan Region Scheme to reflect the final location of the proposed High School site, south of the Perth-Mandurah Railway line. Upon final approval of this Structure Plan, Council is requested to seek the WA Planning Commission's support to the modification to the Metropolitan Region Scheme.

11.3.2 Town Planning Scheme No. 2

The Structure Plan which forms the basis of this application will require a statutory framework to guide the allocation of land uses within the context of a residential zoning. On this basis, this Structure Plan will also provide the basis of a request to Council to initiate a Scheme Amendment to Town Planning Scheme No. 2, to:

1. Modify Clause 4.3 of the Scheme – Area 19 – Leda to:
   a. Rename it consistent with the suburb name.
   b. New clauses to reflect the commitment by State and Local Government and the developer to create a transit oriented development focused around the new Wellard Railway Station and Town Centre.
   c. New clauses to reflect the 'Main Street' focus of development.
2. Amend the Policy Map to reflect modifications outlined above.
3. Including Wellard Village within the Fourth Schedule of Council's Scheme and relevant provisions related to its development, including density codings and landuse classifications.
4. Modifications to the Scheme Maps as required.

11.4 Environmental Management Principals

11.4.1 Wetland Management

The following management objectives are made in made with respect to the two wetland areas within the Structure Plan area:

- A Dual Use Path will be constructed within the wetland POS area to provide opportunities to appreciate the wetland and associated upland vegetation. The DUP will also provide a hard edge to vegetation where higher density development is located adjacent to the POS. The DUP will be located as to provide part of the firebreak required where housing is adjacent to remnant vegetation.

- The wetland vegetation within northern POS area is generally in very good condition with little requirement for revegetation. Care should be taken to avoid disturbance associated with any works needed to create paths or boundaries to the wetland. If revegetation works are required local native species should be used wherever possible. Selection of species should be in accordance with the existing vegetation types that occur within the wetland area within the POS

- A hard edge to the wetland areas will be required where grassed areas are adjacent to remnant wetland vegetation. This may include limestone blocks, or fencing as appropriate.

- No stormwater from the proposed subdivision will drain directly into the wetland areas. Drainage design for the subdivision collects and transports all surface runoff via piped drainage into stormwater detention basins or swales within the northern wetland buffer.

- The southern wetland area should remain vegetated to provide refuge for fauna, particularly birds within the Structure Plan area.

11.4.2 Vegetation Management

Remnant vegetation will be retained in the wetland POS area and within the southern wetland area. In addition, vegetation will be retained in some parkland areas and Eucalypts will be retained within road verges and around formal recreational areas where possible. The following guidelines are made with respect to retention of remnant vegetation within the Structure Plan area:

- Vegetation should be retained where practicable within future subdivision design. Eucalyptus woodland is present in the POS areas and mature trees should be retained within grassed park areas where possible. Formally landscaped areas of POS will contain grassed areas for recreation such as ovals. In such areas it may not be practicable to retain native vegetation. In formal POS areas mature trees should be retained surrounding grassed areas to provide recreational amenity in addition to providing bird habitat.

- All areas of vegetation to be retained should be marked or fenced as appropriate prior to any site works commencing. This will prevent any unnecessary clearing or disturbance to areas intended to be retained within the Subdivision Plan area.

- The roads surrounding the POS area and Bush Forever Site 349 will provide a firebreak between remnant vegetation and housing areas. In most cases the development of the land surrounding the POS area is separated by a road reserve up to 12m wide. The DUP within the POS area will provide a firebreak between remnant vegetation within the POS and adjacent housing. Access for fire fighting purposes will be via the DUP and roads adjacent to remnant vegetation.

- Species native to the Subdivision Plan area should be used where practicable in landscape planting.

11.4.3 Fauna Management

Given the presence of the Southern Brown Bandicoot *Isoodon obesulus fusciventer* within the wetland POS area the following recommendations are made.

- Discussions with CALM officers have indicated that no relocation of the Bandicoots is necessary (David Mitchell, pers. comm.). The Bandicoot population should be retained within the POS area.
- It is recommended that vegetation is managed for minimal disturbance as the quality and density is important for the preservation of Bandicoot habitat. This includes management of fire. Fire may result in a decrease in the area of dense understorey vegetation. Given the small size of the remaining habitat and lack of linkage to nearby habitats, fire has the potential to severely impact on the survival of the population.
- Residents of houses adjoining the POS area should be made aware of the significant impact that domestic pets can have on native fauna inhabiting the area.
- In addition, all habitat material such as fallen logs and dead trees will not be removed from the POS area as these items may provide nesting or roosting sites for different species of vertebrate fauna.

11.4.4 Noise and Vibration

Background noise measurements undertaken by Lloyd Acoustics in the Parmelia/Leda area indicate that the existing environment is relatively quiet and noise mitigation would be considered beneficial in areas where noise exceeds the criteria. A noise barrier 1.5m high positioned on the boundary of the railway reserve would provide sufficient attenuation to achieve *Criteria 2*. It should be noted however that background noise levels do not take into account future development of the area. It is likely that as infrastructure is developed for future housing that background noise levels will increase and noise mitigation may not be as beneficial.

Vibration management requiring ameliorative measures will require implementation as part of the railway project as they can not be readily implemented following construction of the line. Given that existing housing is already present close to the receiver exceeding the criterion, it is likely that mitigation measures will be implemented by PURD if deemed necessary.

The PER for the South West Metropolitan Railway from Perth to Mandurah contains a number of commitments relating to noise and vibration impacts resulting from the proposed railway line traversing the Structure Plan area. These relate to the preparation of impact management plans and include the mitigation of potential impacts, monitoring and reporting relating to noise and vibration from the proposed railway line.

APPENDIX A
Species List

APPENDIX A
Wellard Village
Flora Species List January 2003

FAMILY	SPECIES
GYMNOSPERMS	
CYCADACEAE	*Macrozamia fraseri*
MONOCOTYLEDONS	
AGAVACEAE	**Agave americana*
ANTHERICACEAE	*Arnocrinum preissii*
	Arthropodium capillipes
	Corynotheca micrantha
	Dasypogon bromeliferus
	Laxmannia ramosa
	Lomandra sp.
COLCHICACEAE	*Burchardia umbellata*
CYPERACEAE	*Baumea* sp.
	Isolepis nodosa
	Lepidosperma angustatum
	Lepidosperma costale
	Lepidosperma longitudinale
	Mesomelaena pseudostygia
	Schoenus grandiflorus
HAEMODORACEAE	*Conostylis aculeata*
	Haemodorum laxum
IRIDACEAE	**Gladiolus caryophyllaceus*
	**Romulea rosea*
PHORMIACEAE	*Dianella divaricata*
POACEAE	*Austrostipa semibarbata*
	**Avena fatua*
	**Briza maxima*
	**Eragrostis curvula*
	**Ehrharta calycina*
	**Ehrharta longiflora*
	**Lagurus ovatus*
	**Lolium perenne*
	**Pennisetum clandestinum*
	Sporobolus virginicus
RESTIONACEAE	*Desmocladus flexuosa*
XANTHORRHOEACEAE	*Xanthorrhoea preissii*
DICOTYLEDONS	
AIZOACEAE	**Carpobrotus edulis*
AMARANTHACEAE	*Ptilotus polystachyus*
	Ptilotus drummondii
APIACEAE	*Eryngium pinnatifidum*
ASCLEPIADACEAE	**Gomphocarpus fruticosus*
ASTERACEAE	**Cirsium vulgare*
	**Conyza albida*
	Helichrysum cordatum
	**Hypochaeris glabra*
	**Hypochaeris radicata*
	Olearia axillaris
	**Taraxacum officinale*
	**Ursinia anthemoides*
BRASSICACEAE	**Heliophila pusilla*
	Lepidium sp.
CASUARINACEAE	*Allocasuarina fraseriana*
	Allocasuarina humilis
CARYOPHYLLACEAE	**Petrorhagia velutina*

FAMILY	SPECIES
DILLENIACEAE	*Hibbertia hypericoides* *Hibbertia racemosa*
EPACRIDACEAE	*Leucopogon propinquus*
EUPHORBIACEAE	**Euphorbia terracina* *Phyllanthus calycinus*
GERANIACEAE	**Pelargonium capitatum*
GOODENIACEAE	*Dampiera alata* *Scaveola canescens*
LAURACEAE	*Cassytha racemosa*
LOGANIACEAE	*Logania vaginalis*
MENYANTHACEAE	*Villarsia albiflora*
MIMOSACEAE	*Acacia huegelii* *Acacia pulchella* *Acacia rostellifera* *Acacia saligna* *Acacia stenoptera*
MYOPORACEAE	*Myoporum caprarioides*
MYRTACEAE	*Baeckea camphorosmae* **Chamelaucium uncinatum* *Corymbia calophylla* *Eucalyptus gomphocephala* *Eucalyptus marginata* *Eucalyptus rudis* *Kunzea ericifolia* *Melaleuca rhaphiophylla*
OROBANCHACEAE	**Orobanche minor*
PAPILIONACEAE	*Bossiaea eriocarpa* *Daviesia triflora* *Gompholobium tomentosum*

FAMILY	SPECIES
	Hardenbergia comptoniana *Jacksonia furcellata*
	Jacksonia sternbergiana *Kennedia prostrata* **Lupinus cosentinii* **Trifolium campestre*
PRIMULACEAE	*Samolus junceus*
PROTEACEAE	*Banksia attenuata*
	Banksia grandis *Banksia illicifolia* *Banksia menziesii* *Dryandra lindleyana* *Dryandra sessilis* *Hakea lissocarpha* *Hakea prostrata* *Grevillea vestita* *Petrophile linearis* *Persoonia comata* *Persoonia saccata* *Stirlingia latifolia* *Synaphea spinulosa* *Xylomelum occidentalis*
SCROPHULARIACEAE	**Dischisma capitatum* **Verbascum virgatum*
SOLANACEAE	*Anthoceris littorea* *Solanum symonii*

* Introduced Species

APPENDIX B
Aboriginal Heritage Site Search

DEPARTMENT OF INDIGENOUS AFFAIRS

Register of Aboriginal Sites

RPGSR V1.57

Report run onJanuary 29, 2003 11:14 AM

Reference No: IQ-RPGSR-3568

Selection Criteria

Site Search within specified polygon
Coordinates Type: MGA Coordinates - MGA Zone: 50
Coordinates: Easting: 388298 Northing: 6430419
Easting: 389318 Northing: 6430023
Easting: 389383 Northing: 6428944
Easting: 389589 Northing: 6428932
Easting: 389759 Northing: 6428431
Easting: 388932 Northing: 6428140
Easting: 388156 Northing: 6428584
Easting: 387707 Northing: 6429111
Easting: 387162 Northing: 6429017
Easting: 387094 Northing: 6429409
Easting: 387779 Northing: 6429379
Easting: 387731 Northing: 6430094
Easting: 387826 Northing: 6430565

Legend

Status
- I Interim Register
- P Permanent Register
- S Stored Data

Access
- C Closed
- O Open
- V Vulnerable

Restriction
- F Female Access Only
- M Male Access Only
- N No Gender Restrictions

Reliability
- R Reliable
- U Unreliable

Site Types
- C Ceremonial
- RP Repository / cache
- S Man-Made Structure
- T Modified Tree
- E Engraving
- ART Artefact
- HIST Historical
- M Mythological
- BUR Skeletal material/Burial
- F Fish Trap
- P Painting
- Q Quarry
- MD Midden / Scatter
- G Grinding patches / grooves

Map coordinates (Latitude / Easting & Longitude / Northing) are based on the GDA94 datum. Coordinates are indicative locations and may not necessarily represent the true centre of sites, especially if access to specific site information is tagged as "Closed" or "Vulnerable". The metric grid on Site Search Maps are for a specific MGA zone, and does not cater for MGA metric coordinates for a different MGA zone.

Site Id	Status	Access	Restriction	Latitude/ Easting	Longitude/ Northing	Reliability	Site Type	Site Name	Informants	Site No

No Sites Found within selection area.

WESTERN AUSTRALIA

Aboriginal Sites Register

Site Search Overview Ma

Sites may exist that are not yet entered into the Register system, or are on the Register and no longer exist. The Aboriginal Heritage Act 1972 protects all Aboriginal site in Western Australia whether they are known to the Dept of Indigenous Affairs / Aboriginal Cultural Material Committee or not. On-going consultation with relevant Aboriginal communities is required to identify any additional sites that may exist.

Legend

Selection Area (User Polygon, LGA, Land Claim, ...)

Site Search Map

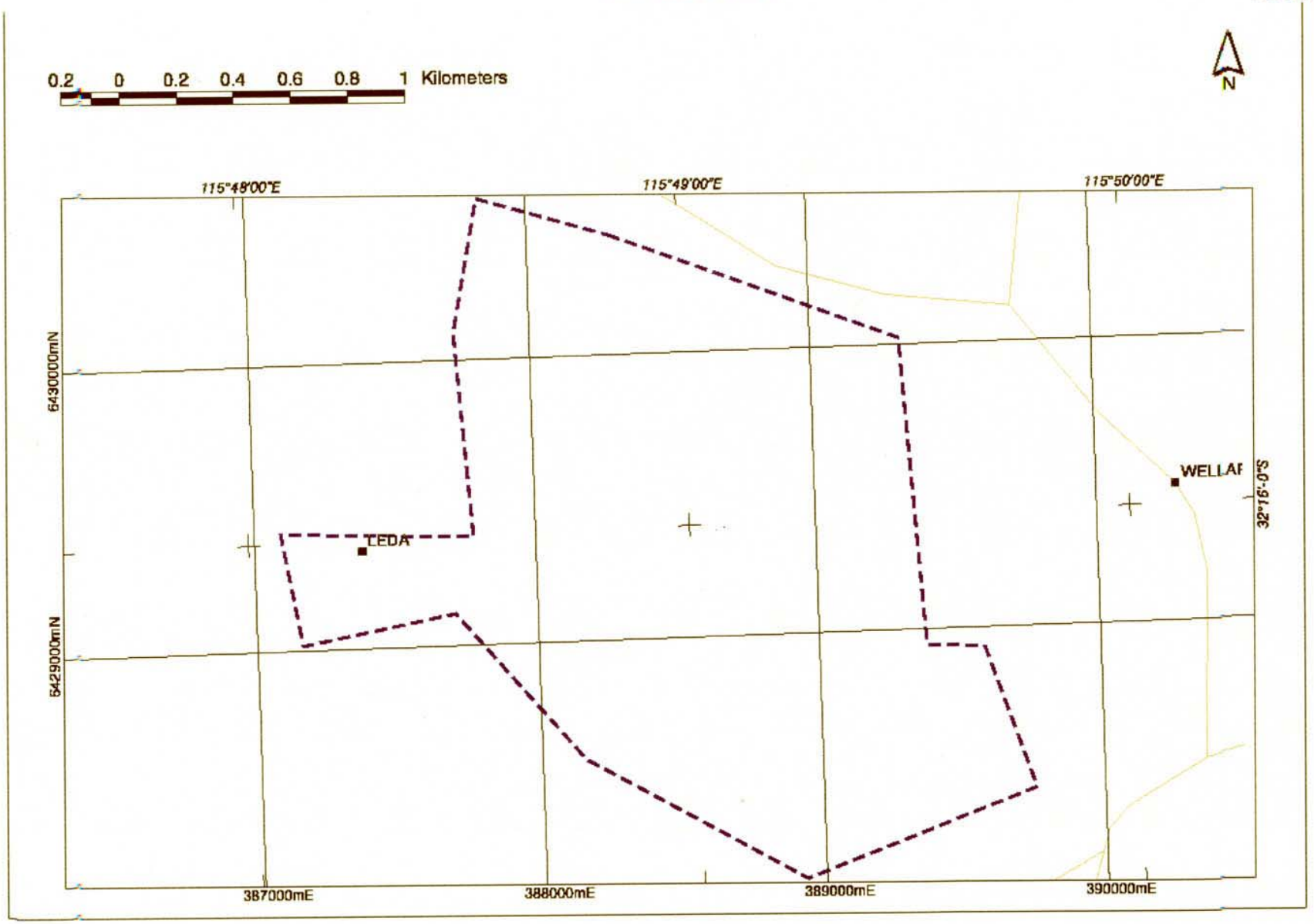
Selected Sites

DEPARTMENT OF INDIGENOUS AFFAIRS

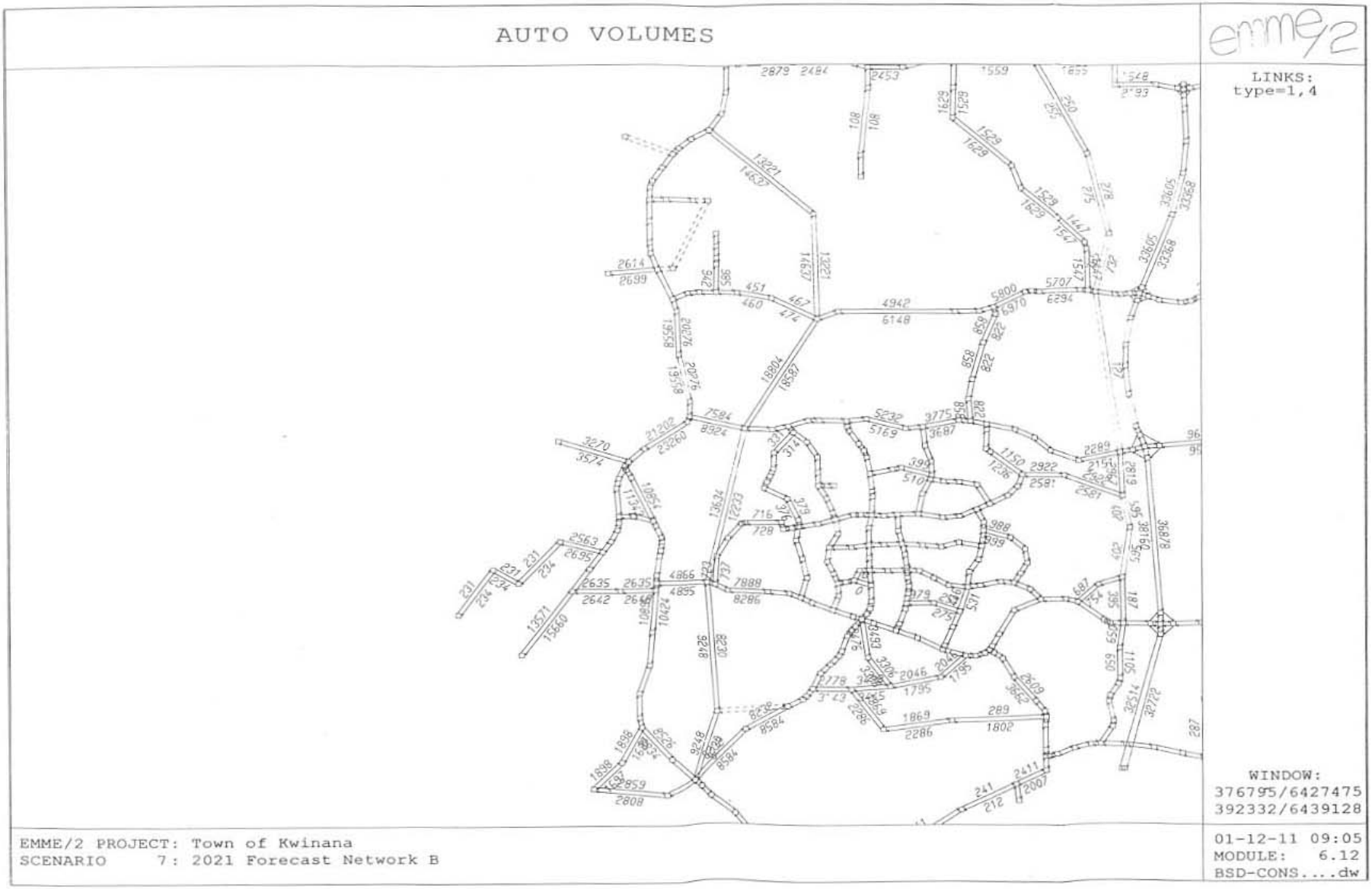
WALIS

Geographical Coordinates
Projection: Lambert
Datum: GDA94

Site Search Map



APPENDIX C
Year 2021 Traffic Forecasts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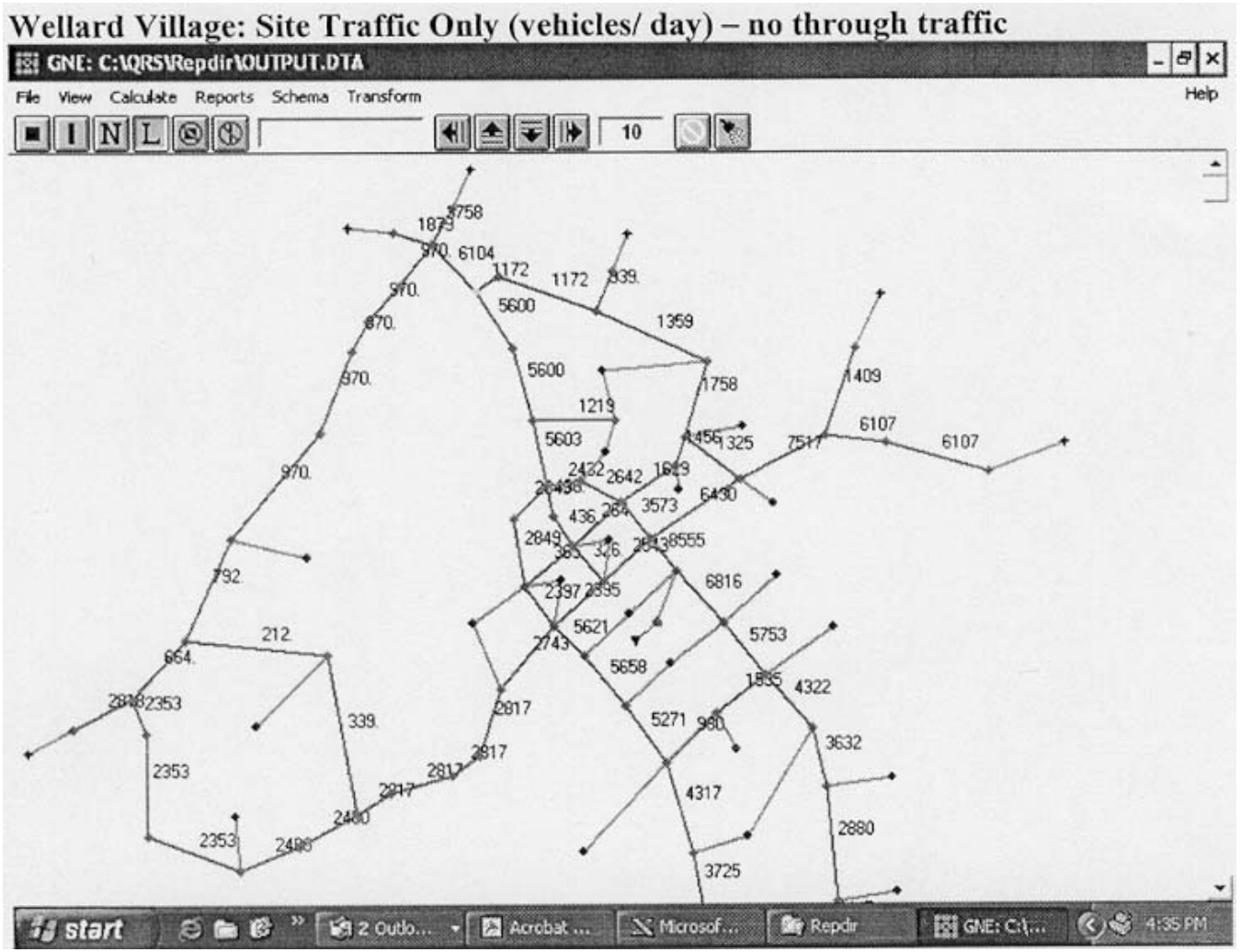
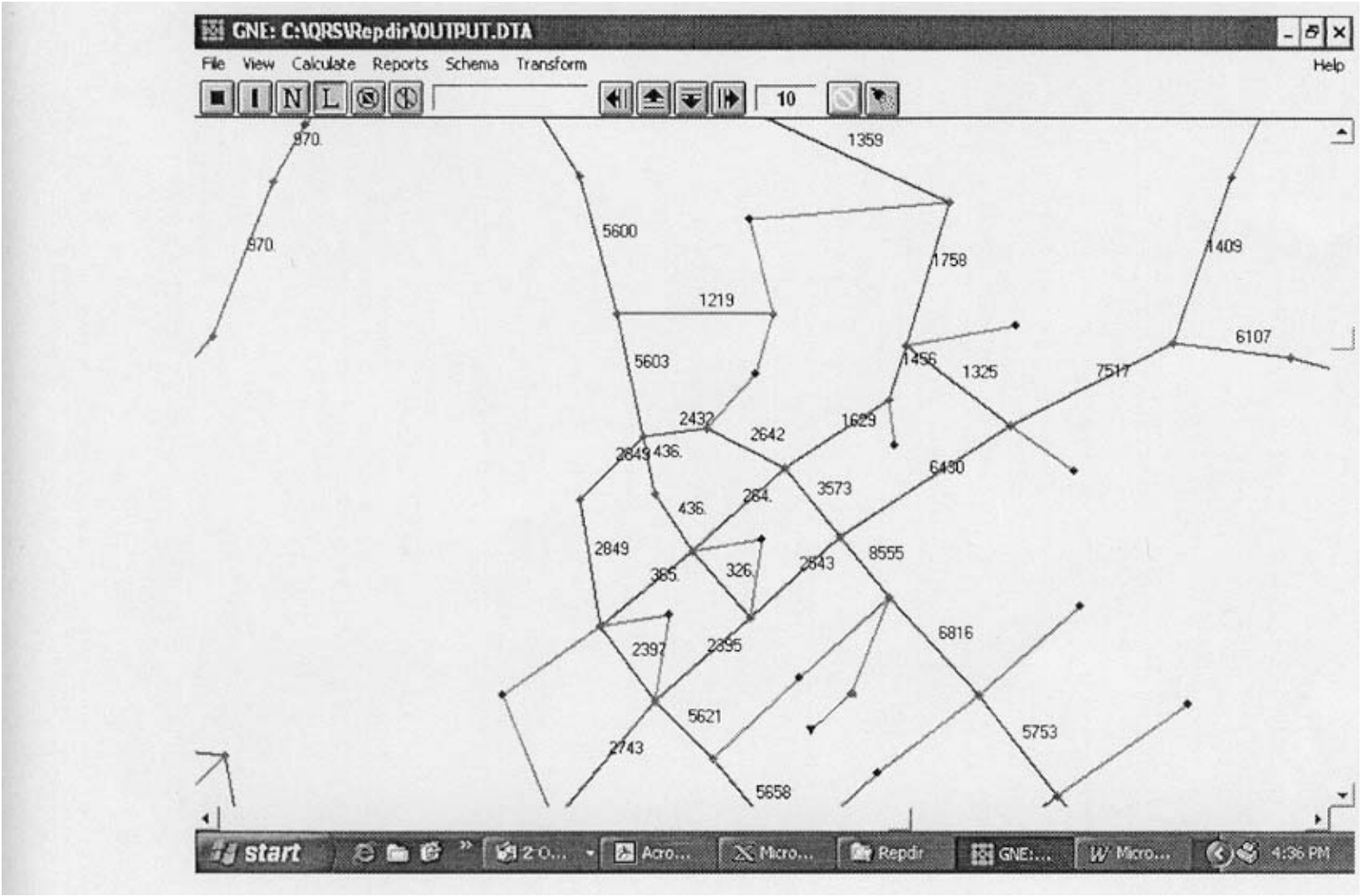
APPENDIX D
ERM Local Traffic Model

APPENDIX D

ERM Local Traffic Model

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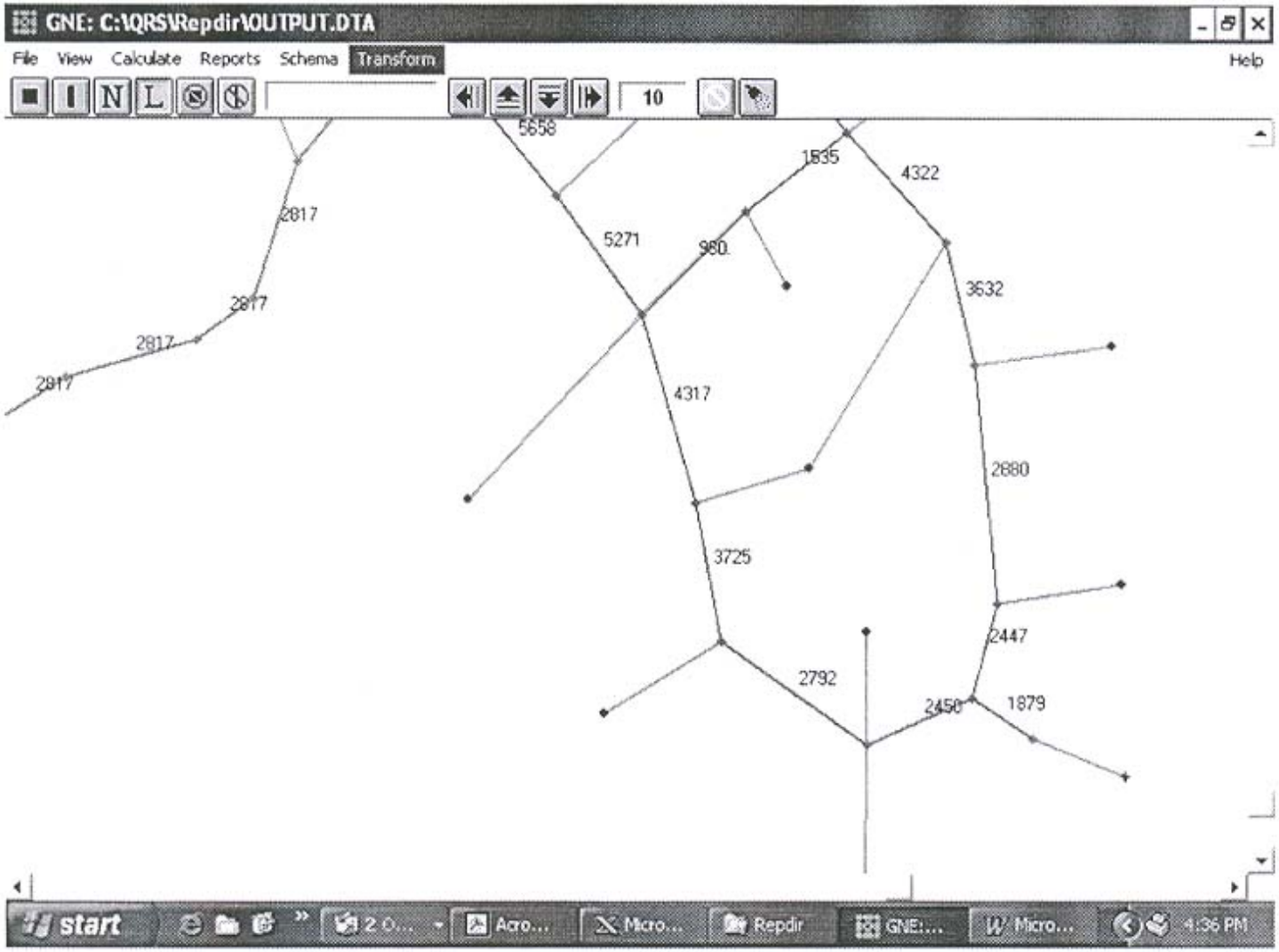
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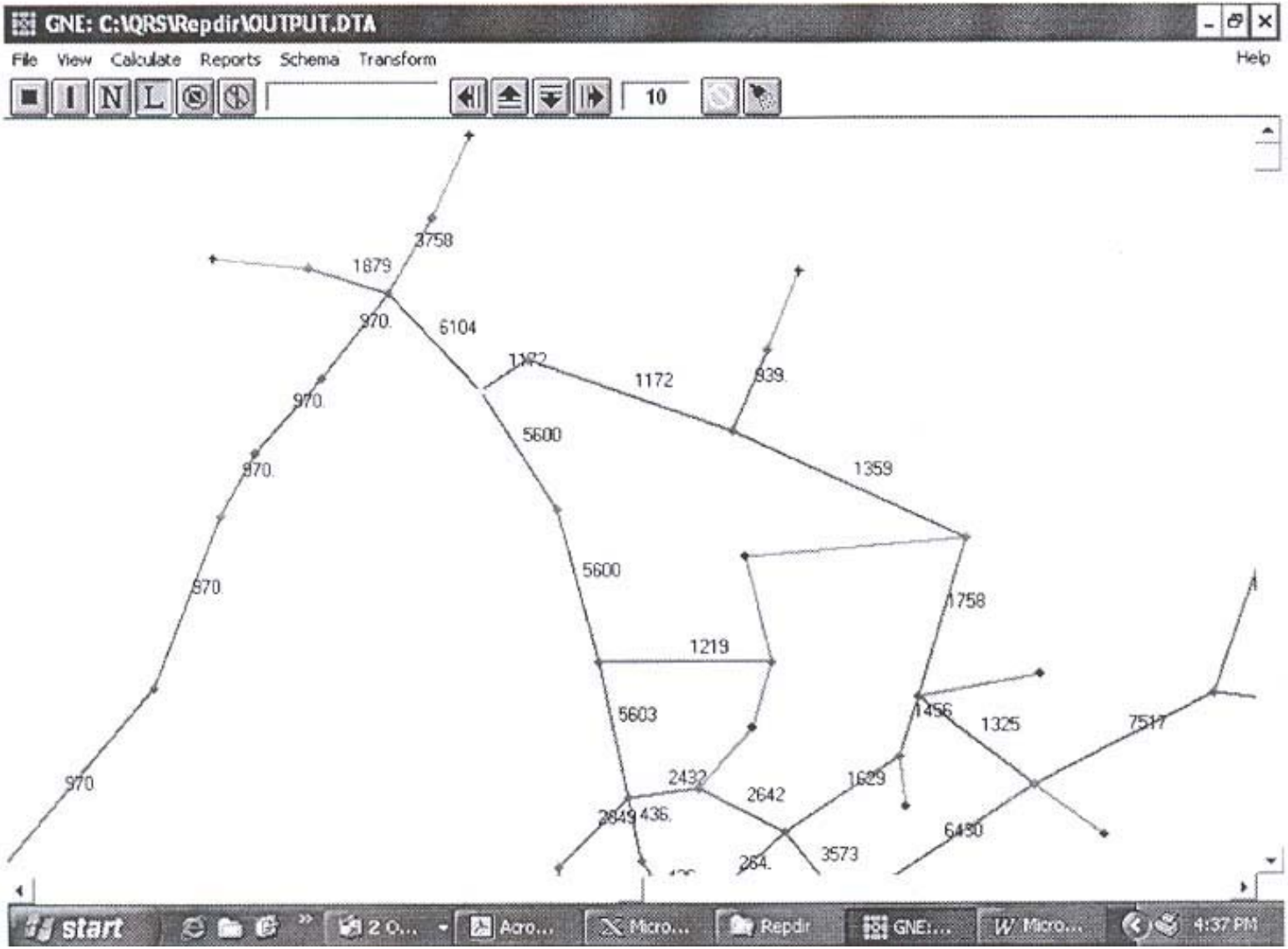
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Future Perth Data - Peter Lawrence September 25, 2002

12 Zones bounded by Ocean Reef Road, Wanneroo Road, Reid Highway and Marmion Avenue

ZONE	HHOLDS	HBW	HBE	HBS	HBO	TOTAL PROD	CAR DRIVER MODE SHARE HBW	HBE	HBS	HBO
66	2298	4204	1847	3714	5662	**15427**	0.809	0.161	0.578	0.695
67	2782	6216	3429	5069	8663	**23377**	0.845	0.216	0.621	0.716
69	3152	6244	2733	5164	8108	**22249**	0.831	0.146	0.597	0.714
70	2396	5036	2568	4156	6859	**18619**	0.845	0.227	0.631	0.722
71	2136	4672	2193	3609	6014	**16488**	0.837	0.161	0.604	0.714
73	3163	6849	2868	5176	8390	**23283**	0.839	0.155	0.587	0.706
74	2097	4552	1777	3306	5406	**15133**	0.843	0.174	0.600	0.710
75	1569	3327	1333	2548	4042	**11250**	0.847	0.165	0.600	0.710
76	2052	4784	2172	3548	5935	**16439**	0.854	0.233	0.636	0.722
77	1411	2934	1101	2263	3488	**9786**	0.841	0.208	0.619	0.710
79	1876	4402	2027	3256	5487	**15172**	0.854	0.231	0.627	0.720
80	1981	4094	1531	3170	4884	**13679**	0.858	0.231	0.646	0.722
TOTAL	**26913**	**57314**	**25579**	**45069**	**72940**	**200902**				

7.46 Average person trip production per dwelling excluding NHB trips
8.96 add 20% for non-home based trips (e.g. shop to office)
70% assumed weighted average driver mode split

5.23 Average vehicle trip productions per dwelling excluding non-home based trip productions
6.27 Average vehicle trip productions per dwelling including non-home based trip productions

warwick&whitfords prods

Extract from SKM Technical Note regarding trip rates in Mandurah:

"The following Table from the Future Perth Study shows the average weighted **person trips** per household for the Perth Metropolitan Area in the 1986 travel survey

Future Perth Study - Household trip generation rate, based on 1986 travel survey

Household Category	trips per household					total households	total trips
	work	education	shopping	other	total		
1	0	0.04	1.27	0.86	2.17	63143	137020
2	0	1.37	1.88	3.13	6.38	15039	95949
3	0	0.15	2.53	1.57	4.25	58556	248863
4	0	1.77	2.72	3.25	7.74	14788	114459
5	1.49	0.04	0.49	0.93	2.95	52705	155480
6	1.55	0.13	1.51	1.72	4.91	30844	151444
7	3	0.08	1	1.71	5.79	62069	359380
8	3.34	0.64	1.98	2.84	8.8	47959	422039
9	1	1.98	0.82	2.72	6.52	13157	85784
10	1.64	1.31	1.77	2.83	7.55	41523	313499
11	2.61	1.85	1.49	3.42	9.37	52698	493780
12	3.21	2.64	2.59	4.78	13.22	28205	372870
					Total	480686	2950566

weighted average person trips/household	6.14

Steve Piotrowski of Future Perth Project's Strategic Transport Evaluation Team provided the following clarification (as related to Bruce Aulabaugh of ERM):

These person trip productions exclude Non-Home Based (NHB) Trip Productions. Adding 20% this amount to account for trips not involving the home as the origin or the destination leads to average person trip productions per dwelling of:

- **7.4 person trips/ dwelling (including NHB trip productions)**

Note by Bruce Aulabaugh of ERM: The NHB trips are added into the 'home source trip rate' so that traffic modelling programs (which generate all trip productions from the number of dwellings) create enough trip productions to cover trips between other uses (e.g shops to offices, etc).

Using a weighted average driver mode split of 70% yields a metro wide weighted average 'daily vehicle trip production' rate of 5.2 per dwelling. The 1996 Metropolitan Transport Strategy indicates that 1991 driver mode split was 63% and climbing towards 70% if trends continue to year 2021.

Please note that there can be reasonable variability around this weighted average, for instance year 2006 forecasts for the Leeming zone show 5.72 vehicle trips per dwelling per day.

Future perth productions - daily vehicle trip productions per dwelling

Suburb Zones - south of the river, near kwinana freeway including Leeming

Zone	HBWW	HBWB	Hbedu	Hbshop	HBO	Productions	
345	276	172	216	661	446	1771	276
346	3987	2468	3289	9126	5637	24507	3987
347	146	92	106	320	211	875	146
348	686	423	464	1462	959	3994	686
307	5875	3636	3404	6866	10287	30068	

future perth production trip type split

Zone	Trip Purpose %'s						
345	15.58%	9.71%	12.20%	37.32%	25.18%	100.00%	
346	16.27%	10.07%	13.42%	37.24%	23.00%	100.00%	
347	16.69%	10.51%	12.11%	36.57%	24.11%	100.00%	
348	17.18%	10.59%	11.62%	36.60%	24.01%	100.00%	
307	19.54%	12.09%	11.32%	22.83%	34.21%	100.00%	
estimated avg		26%	13%	37%	24%	100.00%	avg's without nhb added
	100%	22%	11%	31%	20%	15.00%	avg's with nhb added
zone 307							
avg	115%	32%	11%	34%	23%	15.00%	avg's without nhb added
	100%	27%	9%	29%	20%	15%	avg's with nhb added

Zone	future perth dwellings	Productions total	Prod/ Dwelling	total with NHB	trip/dwelling with NHB
345	281	1771	6.30	2036.65	7.247864769
346	3400	24507	7.21	28183.05	8.289132353
347	125	875	7.00	1006.25	8.05
348	613	3994	6.52	4593.1	7.492822186
use	4419	31147	7.21	35819.05	
			8.105691333	with NHB added	
zone 307	4264	30068	7.05	34578.2	8.109333959
			8.11	with NHB added	

Avg other zones
Driver only
mode split

work	edu	oth	shp	nhb		
78%	21%	70%	74%	86%		
0.171496	0.022984	0.2185775	0.150756	0.12915	0.69	weighted avg driver mode split
individual trip type contributions to weighted avg driver mode split						
					5.62	veh/day/dwelling with NHB added

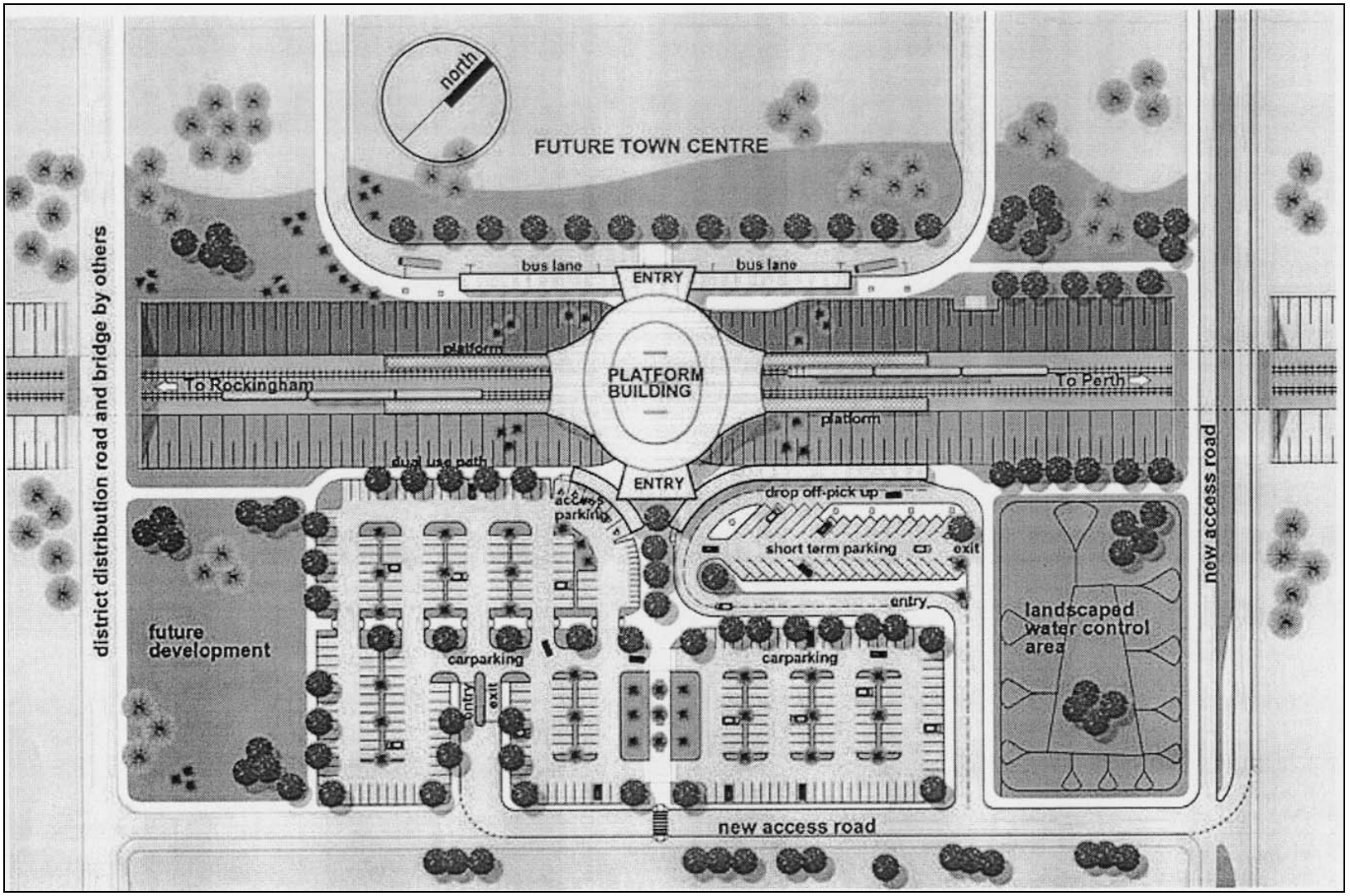
Zone 307						
0.211072	0.019448	0.200855	0.1444745	0.12915	0.7049995	weighted avg driver mode split
						veh/day/dwelling
					5.72	with NHB added

FutPerthTripRates

APPENDIX E
Wellard Station Concept Plan

APPENDIX E

Wellard Station Concept Plan



APPENDIX F
1999 Kwinana Bike Plan

APPENDIX F

1999 KWINANA BIKE PLAN

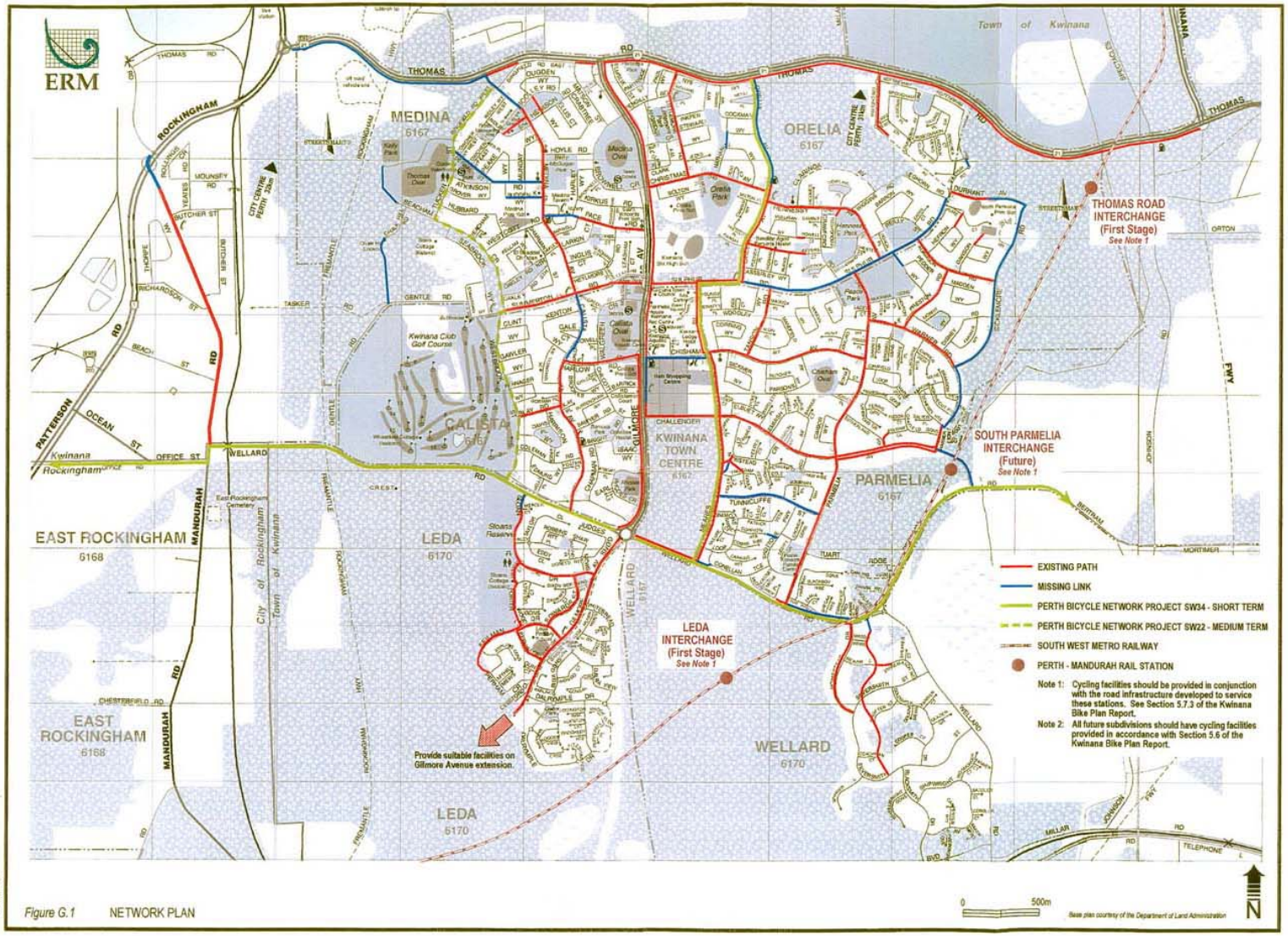


Figure G.1 NETWORK PLAN

Table 3.1: Screenline Traffic Forecasts – Vehicles/day on Wellard

Road and Wellard Road Deviation:
(Kwinana Transport Structure Plan, 2002)

Network Description and Road Link	2006	2011	2021
Network A: No change to Wellard			
Wellard (east of deviation)	**7022**	**12376**	15410
Network B: Wellard Deviation added and calming of Wellard			
Wellard (east of deviation)	1582	4858	14530
Wellard Deviation (south of Wellard Road east end)	2996	3944	3842
	4578	**8802**	**18372** TOTAL
Network C: Wellard Deviation added and Wellard cul-de-sac			
Wellard (east of deviation)	2141	NA	NA
Wellard Deviation (south of Wellard Road east end)	2304		
	4445		

Table 3.1: Screenline Traffic Forecasts – Vehicles/day on Wellard Road and Wellard Road Deviation: (*Kwinana Transport Structure Plan, 2002*)			
Network Description and Road Link	Year 2006	Year 2011	Year 2021
Network A: No change to Wellard			
Wellard (east of deviation)	7022	12376	**15410**
Leda Boulevard	1882	4945	• 6823
TOTAL AT SCREENLINE	8904	17321	22233
Network B: Wellard Deviation added and calming of Wellard			
Wellard (east of deviation)	1582	4858	14530
Wellard Deviation (south of Wellard Road east end)	2996	3944	3842
Leda Boulevard	996	2654	4054
	5574 total	**11456** total	**22426** TOTAL
Network C: Wellard Deviation added and Wellard cul-de-sac			
Wellard (east of deviation)	2141	NA	NA
Wellard Deviation (south of Wellard Road east end)	2304		
	4445 total		