

ELLENBROOK TOWN CENTRE
COMMUNITY/LEARNING PRECINCT

DEVELOPMENT PLAN

DECEMBER 2004

ROBERTS DAY TOWN PLANNING + DESIGN

ENDORSEMENT PAGE

This structure plan is prepared under the provisions of the City of Swan
Local Planning Scheme No.17

IT IS CERTIFIED THAT THIS STRUCTURE PLAN WAS APPROVED BY RESOLUTION OF THE
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In accordance with Schedule 2, Part 4, Clause 28 (2) and refer to Part 1, 2. (b) of the *Planning
and Development (Local Planning Schemes) Regulations 2015*.

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ELLENBROOK TOWN CENTRE
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DEVELOPMENT PLAN

PREPARED BY: ROBERTS DAY TOWN PLANNING + DESIGN

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DECEMBER 2004

CONTENTS

OVERVIEW

LOCATION

STATUTORY PLANNING STRUCTURE

Zoning

Existing Town Centre Development Plans

THE SITE

COMMUNITY/LEARNING PRECINCT

Urban Elements

Guiding Principles

Community Focus

DEVELOPMENT CONTROL

Development Objectives

Development Standards

DESIGN GUIDELINES

Objectives

Building Design

Access

Landscape & Open Space

COMMUNITY PLANNING

ENVIRONMENT

Environmental Management

Environmental Studies

Drainage & Nutrient Management Programme

TRAFFIC

ENGINEERING SERVICES

Siteworks

Roads

Drainage

Water & Sewerage

Other Public Utility Services

APPENDIX A

TRAFFIC REPORT

APPENDIX B

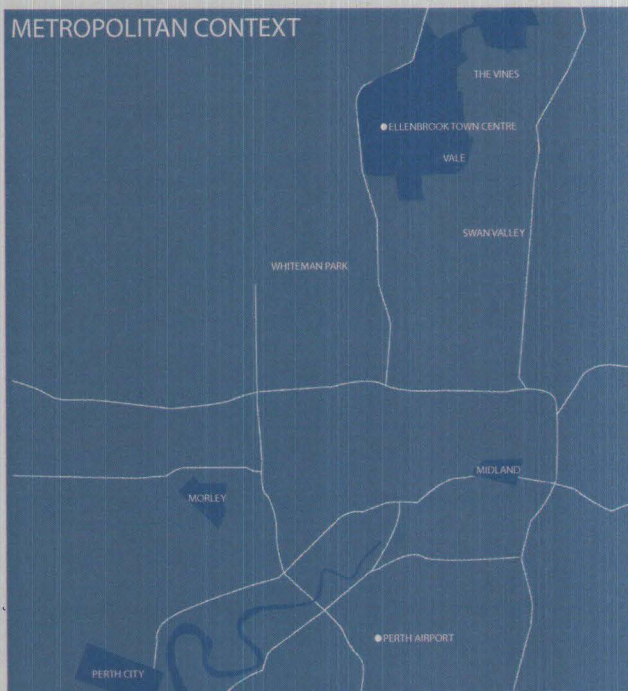
REPORT ON ENGINEERING ASPECTS

OVERVIEW

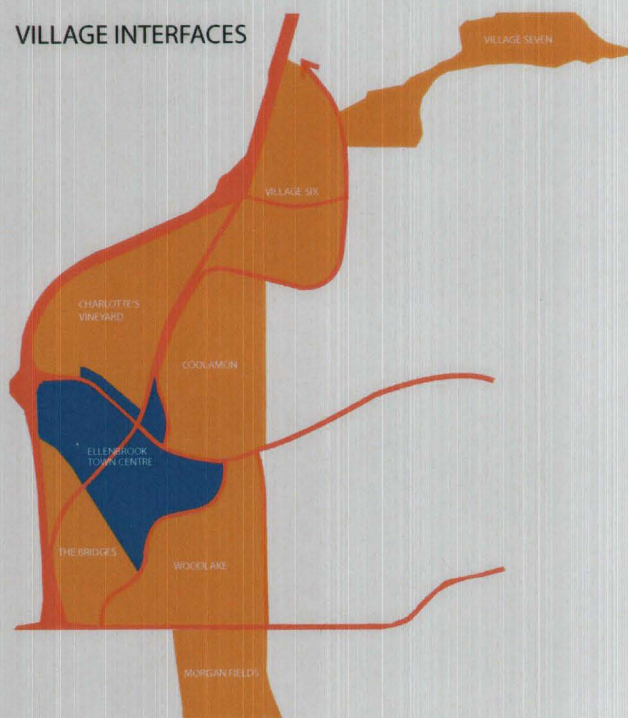
The Ellenbrook Community/Learning Precinct will grow over the next 15 years to become a key education, cultural and community node for the Ellenbrook New Town.

The Development Plan provides a flexible urban planning framework to guide the future development and use of the area as it continues to mature well into the future. It satisfies the requirements of the City of Swan Town Planning Scheme No. 9 (TPS 9) for the preparation of development plans.





VILLAGE INTERFACES



LOCATION

The Ellenbrook Town Centre is located within the City of Swan, approximately 20 kilometres north-east of the Perth Central Business District and within 10 kilometres of the Midland Town Centre. The Town Centre's immediate context comprises Charlottes Vineyard to the north, Coolamon to the east, Woodlake Village to the south east and The Bridges to the south west. Each village has access to local neighbourhood level facilities and will be integrated with the Town Centre via a comprehensive network of access connections. The Community/Learning Precinct is located within the south western portion of the Town Centre proper. It anchors the western end of the Town Centre's Main Street and abuts the high pressure gas pipeline on its south western boundary and the transit corridor on its north western boundary.

STATUTORY PLANNING STRUCTURE

Zoning

The Ellenbrook New Town, including the Town Centre, and more specifically, the Community/Learning Precinct, is zoned 'Special Purpose Zone – Ellenbrook' in the City of Swan Town Planning Scheme No. 9 (TPS 9). This zoning establishes the following three-tiered planning framework for the implementation of urban development within Ellenbrook:

- Structure Plan – broad planning framework covering all of Ellenbrook;
- Development Plan – prepared for each village and the Ellenbrook Town Centre to refine the Structure Plan and provide a framework for subsequent subdivision and development;
- Detailed Site Plan – guidelines for development sites that require specific planning direction.

This Development Plan satisfies the requirements set out in TPS No.9 for the second tier of the planning framework.

Existing Town Centre Development Plans

The existing Ellenbrook Town Centre Development Plan (2000) provides a broad planning framework for the future development of the Town Centre. It was intended that this overarching plan would be supplemented by more detailed Development Plans prepared for individual precincts within the Town Centre. These plans were to be consistent with the overarching Town Centre Development Plan and be in place as a precondition to subdivision and/or development approval.

In accordance with this arrangement, detailed Development Plans were prepared and endorsed for the Main Street and Commercial Enterprise Precincts of the Town Centre to facilitate subdivision and development. The Community/Learning Precinct Development Plan will be the final individual precinct Development Plan prepared, in order to facilitate subdivision and development of the secondary college. A consolidated Development Plan will be prepared for the remaining Town Centre precincts.

THE SITE

The Town Centre site comprises approximately 145 hectares and is bordered by Pinaster Parade on its south-eastern boundary, by the pipeline corridor parkway (Forrestview Parkway) on its south-western boundary and by the Perth-Darwin Highway on its north-western boundary.

The site is owned by the Ellenbrook Joint Venture, which allows a large degree of control over the planning of the Town Centre to ensure a coordinated and high quality development outcome.

The land was previously used for pine plantation purposes, however has since been largely cleared for Town Centre development. The results from geotechnical investigations indicate the soils comprise Bassendean Dune Sand overlying Guildford Formation. The sands are generally free draining and highly suited to urban development.

The landform of the Town Centre is gently undulating (elevations ranging from RL43m to RL60m AHD), falling away slightly from Pinaster Parade and rising to a modest ridgeline that defines the northern area of the Town Centre. The landform pertaining to the Community/Learning Precinct is generally level with most of the site elevated at approximately 46m AHD..

There is an existing microwave communications tower (approximately 80m high), which forms part of Western Power's control network and communications for the Dampier to Bunbury Natural Gas Pipeline. Although the Development Plan allows for the staged development of the Town Centre around this facility, it is expected that it will ultimately be relocated to a more appropriate site.





COMMUNITY/LEARNING PRECINCT

Urban Elements

The Community/Learning Precinct will feature the following urban elements:

- Multi-purpose community/recreation facility
- Secondary College
- Senior College
- High level pedestrian activity
- Public spaces, including active recreation grounds and facilities
- Shared community/school library
- Lifestyle retail

Guiding Principles

The key principles guiding the future development and operation of the precinct include:

- Landmark buildings focused towards Main Street to create a defining visual link
- High standard of built form and eminent community buildings
- Pedestrian priority environment achieved through quality landscaping, street furniture, slow vehicle speeds and community art
- Shared facilities for school and community use
- Sustainable building designs and landscaping

Community Focus

The collocation of a secondary college, senior college and community/civic activities within the Community/Learning Precinct will create a vitality that will anchor the western end of Main Street and result in a high-energy pedestrian environment.

To generate street life, active uses will be encouraged to occupy the ground floor of buildings.

Buildings will be focused toward Main Street, allowing the sporting ovals to be located within the buffer area to the existing high pressure gas pipeline. A landmark community building will provide a visual cue enclosing the western end of Main Street.

The Ellenbrook Joint Venture is working closely with the Department of Education and Training and the City of Swan to facilitate innovative school and community building designs that are expressive of Ellenbrook, address adjacent streets and embrace sustainability principles, to become the centrepiece for community.

Roads within the Community/Learning Precinct will be designed to efficiently transport vehicle movement but within a slow speed environment that gives priority to pedestrian and cyclist access.

"The educational and community heart of Ellenbrook, accommodating a 'next generation' high school and contemporary multi-purpose community buildings, together creating identity and injecting activity into the Town Centre"



DEVELOPMENT CONTROL

Land Use

The permissibility of land use within the Town Centre is contained in the City of Swan Town Planning Scheme No. 9 – Appendix 5 (Special Purpose Zone - Ellenbrook). An extract from the land use table for the relevant precincts is provided adjacent. The land use table is to be read in conjunction with the Zoning Classification Plan.

Development Objectives

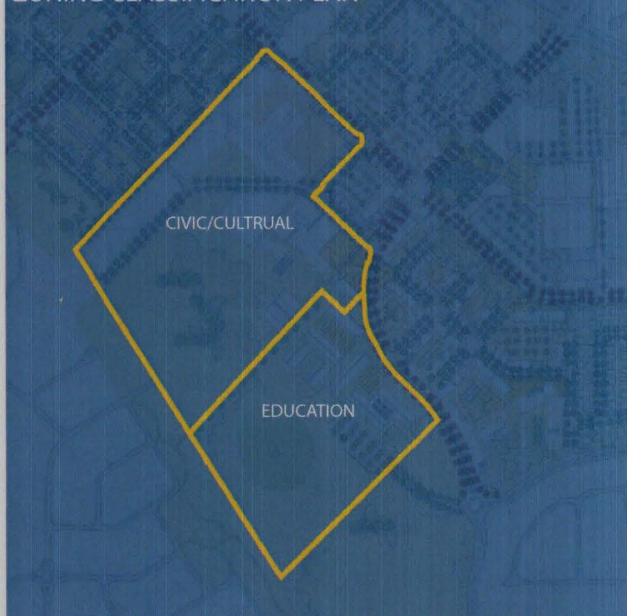
In considering an application for town planning approval in the Community/Learning Precinct the Council, in addition to any other aim or objective of the Scheme and to any other matter it is required or permitted to consider, shall have regard to the following objectives:

- promotion of a high standard of building development, landscaping and learning environment;
- protection of the amenities of the adjacent residential areas;
- safe movement of vehicular and pedestrian traffic in the area;
- promotion of the shared use of buildings/facilities for school and community use.

Development Standards

Development/site requirements for permissible land uses shall be in accordance with the relevant planning policies/standards contained in the City of Swan Town Planning Scheme No. 9 Section 9.3 (Table 9(A) & 9(B)) unless otherwise depicted on an endorsed Detailed Site Plan.

ZONING CLASSIFICATION PLAN



PRECINCTS DESCRIBED IN THE DEVELOPMENT PLAN

LAND USE	CULTURAL/ CIVIC	EDUCATION
Car Park	AA	AA
Car Sales Lot		
Car Sales Showroom		
Car Wash Station		
Cinema / Theatre	P	
Civic Building	P	
Consulting Rooms	AA	
Consulting Rooms: Group	AA	
Convenience Store	AA	
Cultural Use	P	AA
Dwelling: Aged or Dependent Persons		
Dwelling: Attached House Grouped (2 only) multiple		
Dwelling: Attached House (more than 2)		
Dwelling: Grouped (more than 2)		
Dwelling: Multiple	AA	
Dwelling: Single House		
Education Establishment	AA	P
Factory Tenement Building		
Fast Food Outlet	AA	
Funeral Parlour		
Hire Services – Industrial		
Hire Services – Non Industrial		
Hospital	P	
Industry Cottage		
Industry Light		
Industry Service		
Medical Centre		
Motor Repair Station		
Motor Vehicle Assembly		
Museum	P	
Nursery		
Office: General		
Office: Professional		
Restaurant	AA	
Service Station		
Shop	IP	
Shopping Centre		
Showroom		
Tavern – less than 200sqm GLA	AA	
Tavern – greater than 200 sqm GLA	AA	
Vehicle Sales & Service		
Veterinary Hospital		
Warehouse		
Any other use not listed above	AA	AA

DESIGN GUIDELINES

Development Potential

This lot has the potential to create a landmark building at the termination of Main Street and to provide a quality community, recreation and learning environment that is closely integrated with Main Street.

Building Envelope

The minimum floor to ceiling height at ground floor is 3.6m. The minimum floor to ceiling height of the upper floors is 3.0m.

The base development shall be a minimum of single storey with two storey facing Main Street and surrounding the town square.

Setbacks

The ground floor will be setback 0m unless otherwise dimensioned.

To upper floors, balconies and terraces may be built within the 3.0m setback zone.

Access

Vehicular access may be from any the location nominated on the adjacent plan.

Parking must be sleeved behind built form.

Provide for pedestrian access through the site as shown.

Miscellaneous










Built form framing the Town Square must have active frontages at ground level.

School building materials and design should express contemporary architecture reflective of 'urban' (not sub-urban) location (i.e. use of steel, glass, mini-orb, saw-tooth roof light or skillion roof)

Balconies or small terraces should be incorporated into the facade.

Minimum spacing between balconies is 2.0m.
Maximum width of balconies is 5.0m.



-  BUILDING ENVELOPE
-  GRADE CAR PARKING
-  BASEMENT CAR PARKING
-  COMMUNAL COURTYARD
-  SETBACKS
-  PUBLIC PEDESTRIAN ACCESS
-  FEATURE FACADE/ACTIVE FRONTAGE
-  VEHICULAR ACCESS POINTS
-  NODES

COMMUNITY PLANNING

Whilst community facilities and services will be scattered throughout the Town Centre, the focus for community infrastructure will be the Community/Learning Precinct that anchors the western end of Main Street. Facilities accommodated within this precinct will need to reflect Ellenbrook's status as a regional centre and incorporate in-built flexibility to respond to growth and changing community needs.

It is envisaged the Community/Learning Precinct will accommodate educational facilities, a regional library and indoor and outdoor recreational facilities. A collaborative approach to the planning for this precinct involving the Department of Education and Training, City of Swan, Ellenbrook Management and other stakeholders is in progress that is being driven by the mutual desire to form partnerships in the innovative delivery of required community facilities and services. Through these partnerships it should be possible to achieve servicing efficiencies and a higher standard of facility provision for the benefit of the Ellenbrook and wider community.

The provision of community facilities and services will be staged over the next fifteen or so years, with the timing of their provision being largely contingent on the catchment population reaching the required critical mass and funding availability. Funding for these facilities and services will be partly sourced from the community plan fund which procures a financial contribution from the Ellenbrook Joint Venture and City of Swan for every residential lot created at Ellenbrook.



ENVIRONMENT

Environmental Management

In support of the Ellenbrook project, comprehensive environmental assessment studies have been undertaken by RPS Bowman Bishaw Gorham – Environmental Management Consultants. These studies are related to protection of the Lexia Wetlands and the associated conservation area. The Department of Environment will oversee implementation of the recommendations contained within the drainage and nutrient strategy.

The objective of the work is to ensure that the wetlands and vegetation are not adversely affected by groundwater fluctuation following urbanisation. The water pollution control pond which is sited in the Henley Brook Precinct south of Gngara Road as part of the overall drainage strategy is a major component in achieving this objective.

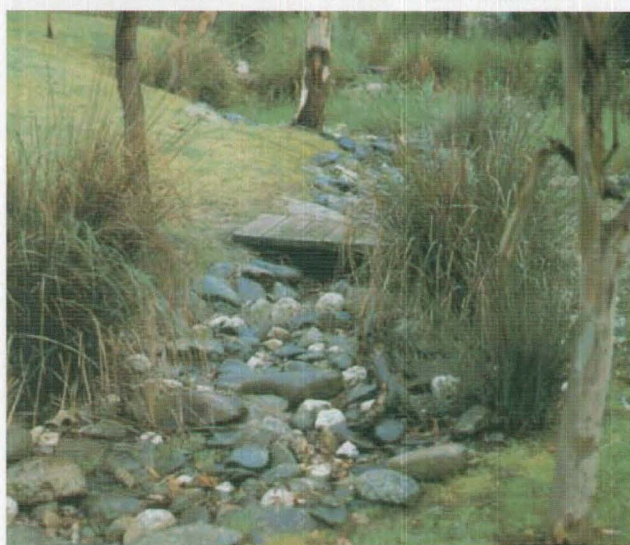
Environmental Studies

A number of detailed environmental studies have been conducted over the Ellenbrook project area including the Public Environmental Review (PER) assessed by the Environmental Protection Authority in 1992. A Drainage and Nutrient Management Programme prepared by RPS Bowman Bishaw Gorham, Cossill & Webley and Jim Davies & Associates was approved in August 1994 for the southern catchment and 2004 for the northern catchment. On-going environmental studies include protection of the Lexia Wetlands and associated conservation areas, and involve:

- Routine monitoring of shallow groundwater levels in the vicinity of the wetlands, and water levels in the wetlands, predominately during the winter – spring period of groundwater recharge;
- Evaluation of the monitoring data, including comparative evaluation of data from nearby Water Corporation bores, in order to revise and update the interim water level criteria for the Lexia Wetlands (established as a condition of environmental approval for the Ellenbrook project).

Drainage & Nutrient Management Programme

Following approval of the PER, a number of conditions were set by the Environmental Protection Authority. One condition required more detailed drainage and nutrient management work to be undertaken. A 'Drainage and Nutrient Management Programme' was prepared for the southern catchment of Ellenbrook and is being implemented with the oversight of the Technical Review Committee. The southern catchment wholly contains the land comprising the Town Centre.



TRAFFIC

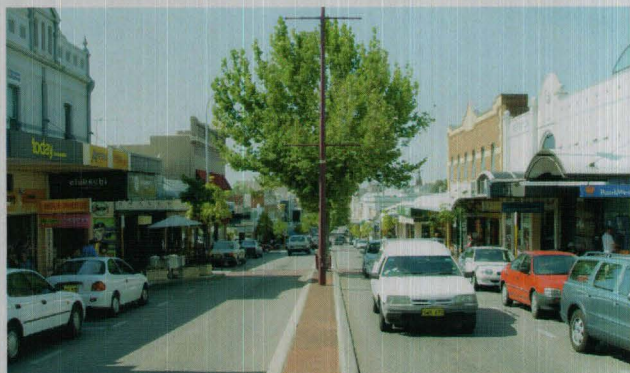
Sinclair Knight Merz has prepared a traffic report (refer Appendix A) which examines the following elements of the Town Centre movement framework:

- Traffic movement projections
- Network analysis
- Pedestrians and cyclist network
- Public transport

The traffic report prepared by Sinclair Knight Merz confirms that the proposed street network has capacity to accommodate projected traffic volumes without compromising local amenity and community safety.

The traffic projections identified through the modelling were applied to establish a street hierarchy for the Centre and to develop appropriate intersection controls. The traffic projection data, together with the nominated street hierarchy and intersection treatments, are fully documented in the Sinclair Knight Merz report.

With respect to pedestrians and cyclists, the report recommends that all roads within the Town Centre have a footpath on at least one side and both sides where traffic volumes are expected to exceed 1,000vpd. Roads with higher projected traffic volumes and/or high vehicle/bicycle speed differentials (greater than 20km/hr) are nominated as requiring special provision for cyclists.



ENGINEERING SERVICES

Cossill and Webley Pty Ltd, Consulting Engineers, has reviewed the engineering and servicing aspect of the Ellenbrook Town Centre and all necessary services are able to be made available to the Centre (refer Appendix B). The key points are summarised below.

Siteworks

It is expected that Town Centre earthworks will be designed to result in a balanced cut to fill from within the Ellenbrook landholding. Earthworks will entail removal of peaty sand and, where necessary, the general re-contouring of the site to meet desirable maximum grades applicable to each land use/development and that are required for drainage and sewerage.

Roads

The roads servicing the Town Centre will be designed in accordance with Department for Planning and Infrastructure (DPI) policies and City of Swan requirements. This will entail traffic calming to reduce vehicle speeds and landscaping treatments aimed at enhancing streetscapes and safety. Road reserve sizes will suit land uses and be designed in close consultation with the City and DPI. Nominated reserve widths are set out on page 6 of the Cossill and Webley report.

Drainage

Drainage will be designed in accordance with the Drainage and Nutrient Management Programme approved in August 1994 for the southern catchment and 2004 for the northern catchment. It will comprise the incorporation of retention basins (designed as landscape depressions where possible), regional subsoil cut off drain and water pollution control ponds that control both run-off quantity and quality prior to downstream discharge to Ellen and Henley Brooks.

Water And Sewerage

The Water Corporation has made provision for water supply and sewerage of the Town Centre Development.

The planning for water supply is based on a local supply from the Gngara groundwater mound beneath the State Forest, west of Ellenbrook, supplemented by a connection to the metropolitan system that services the north-east and north-west corridors.

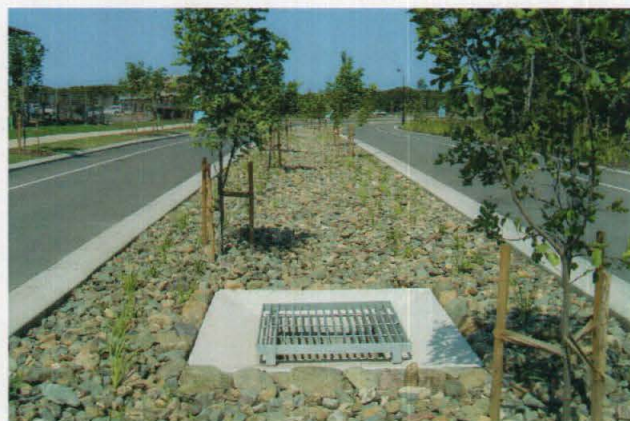
Sewerage will be pumped via a major pumping station located to the south of Gngara Road and adjacent to the PDNH corridor to the Beenyp Waste Water Treatment Plant (WWTP). Sewerage will ultimately be pumped to the Alkimos WWTP.

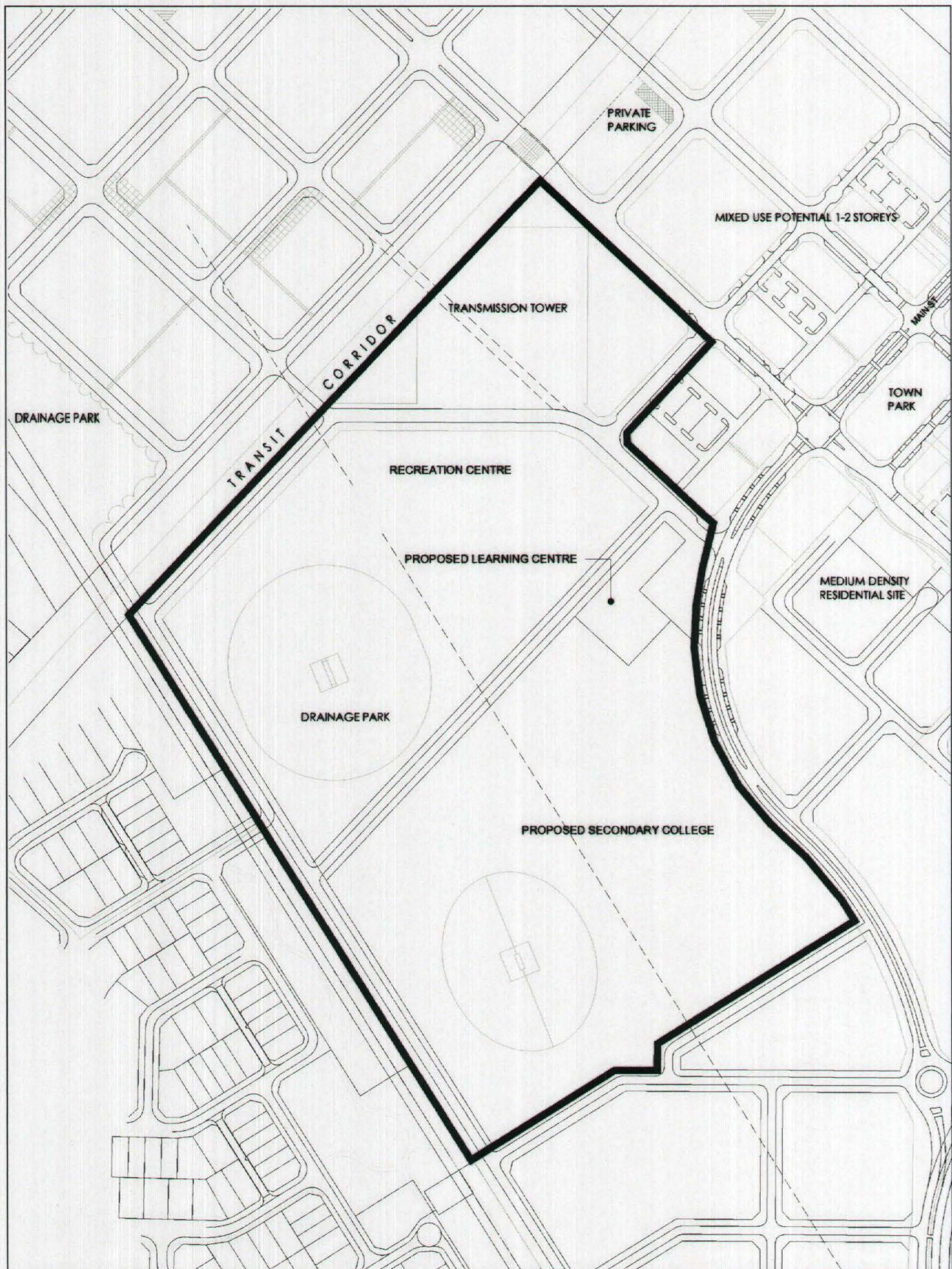
Other Public Utility Services

Underground electricity supply for the Town Centre will be sourced from the existing high voltage feeds from The Bridges Village and the feed located parallel to the gas pipeline.

Telecommunication can be provided by extension of the reticulation system from Woodlake Village.

Reticulated natural gas is to be supplied by a connection to the existing Dampier-Bunbury pipeline at a "gate station" located within the old state forest 65 section of Ellenbrook adjacent to the Town Centre.





APPENDIX A
TRAFFIC REPORT

Ellenbrook Town Centre

TRAFFIC REPORT

- FINAL
- September 2004



Ellenbrook Town Centre

TRAFFIC REPORT

- DRAFT
- September 2004

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Contents

1.	Introduction	1
1.1	Purpose of This Report	1
1.2	Structure of This Report	1
2.	Estimation of Future Traffic Movements	2
2.1	General	2
2.2	EMME/2	2
2.3	Road Network	2
2.4	Land Use Data	2
2.5	Model Structure	3
2.6	Trip Generation	4
2.6.1	Trip Productions (Trips Originating in the Modelled Area)	4
2.6.2	Trip Attractions (Trips Terminating in the Study Area)	5
2.6.3	Trip Generation Summary	6
2.6.4	Through Trips	6
2.7	Assignment	6
3.	Network Analysis	6
3.1	Overview of the Transport Network	6
3.2	Modelled Traffic Volumes and Road Hierarchy	6
3.3	Intersection Treatments	6
3.3.1	External Intersections	6
3.3.2	Intersections within the Town Centre	6
3.3.2.1	Four-way Intersections	6
3.3.2.2	Three-way Intersections	6



4. Pedestrians and Cyclists	6
4.1 Objective	6
4.2 Pedestrian and Cyclist Provision	6
4.2.1 Pedestrians	6
4.2.2 Cyclists	6
5. Public Transport	6



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2	26/02/2003	CAS	RJD	26/02/2003	Final
3	21/03/2003	FPC	CAS	21/03/2003	Final – Amendments to road network
4	18/03/2003	CAS	RJD	18/03/2003	Final – Changes to Main Street
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SINCLAIR KNIGHT MERZ



1. Introduction

1.1 Purpose of This Report

Sinclair Knight Merz has been commissioned by Ellenbrook Management Pty Ltd to update the Town Centre Traffic Modelling Report originally prepared in July 1999. The updated traffic model reflects the revised Town Centre Development Plan.

The main objectives of this analysis are:

- To determine the traffic volumes in the Town Centre;
- To make recommendations regarding the major road network and required road reserves;
- To determine the requirements for pedestrians, cyclists and public transport.

1.2 Structure of This Report

This report is divided into a further four section, as follows:

- Estimation of Future Traffic Movements;
- Network analysis;
- Pedestrians and Cyclists; and
- Public Transport.



2. Estimation of Future Traffic Movements

2.1 General

Traffic movements on the road network were estimated using the EMME/2 transport modelling package. The model was run as a refinement of the Ellenbrook District Model, which has been used to predict traffic volumes for all Ellenbrook Villages and for the Town Centre interim development plan in 1999. Use of the district model has allowed for a detailed analysis of the Ellenbrook Town Centre while maintaining consistency with the district road network and external traffic movements, estimated as part of the overall Ellenbrook Structure Planning.

2.2 EMME/2

EMME/2 represents a road network as a series of links (roads) and nodes (intersections). The traffic generating land uses are represented as a number of zones connected to the network.

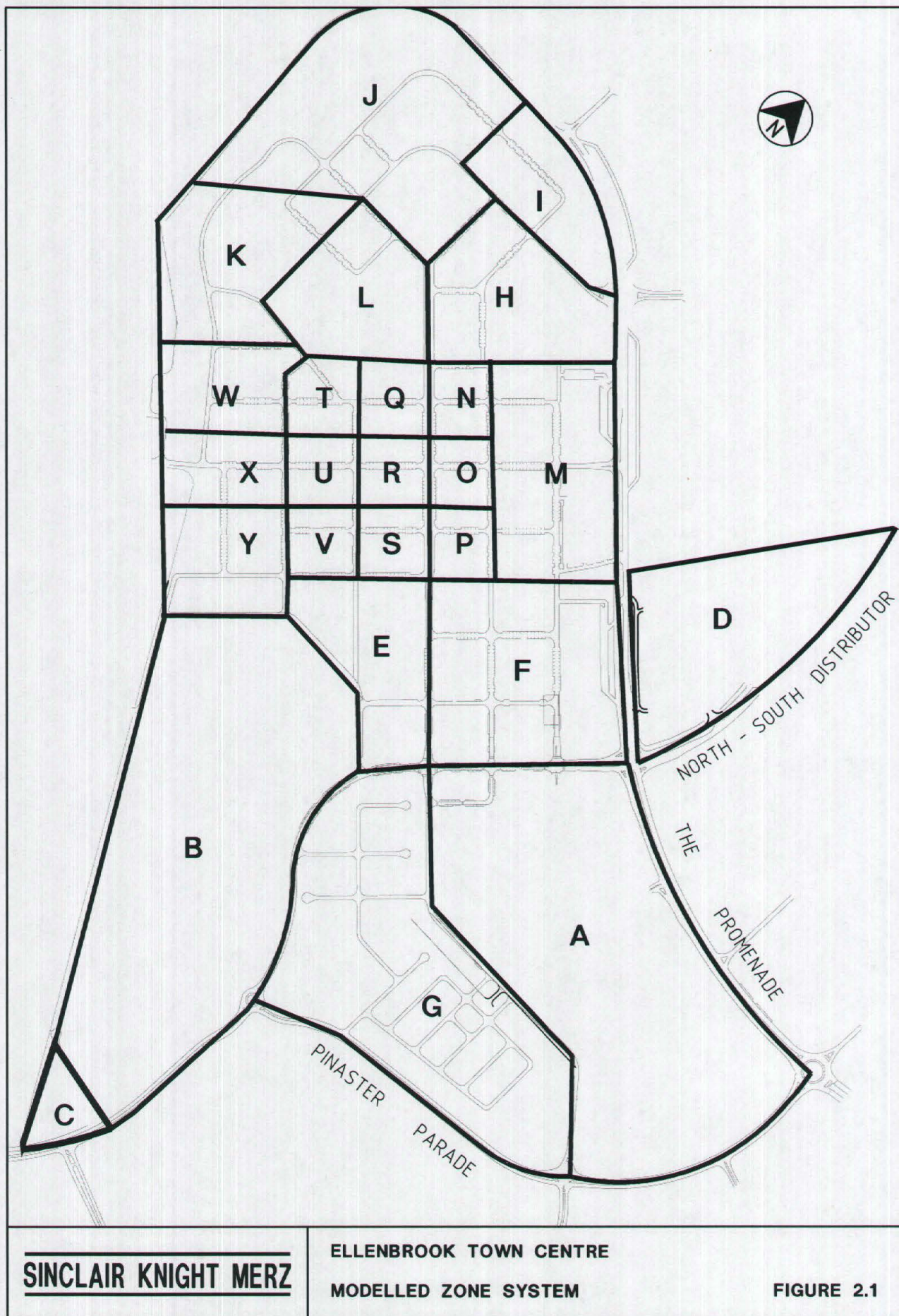
For this application, a 24-hour average weekday model was developed. The average weekday represents typical activity on a road network, and is a base for determining appropriate road hierarchy and road reserve widths.

2.3 Road Network

The study area including the modelled road network and zoning system is shown in **Figure 2.1**. The modelled road network comprises all the key routes within the Town Centre. Some minor local roads have not been included as they have little influence on the traffic operation of the network.

2.4 Land Use Data

Up to date land use data for the ultimate development of all Ellenbrook villages and the Town Centre has been obtained from Roberts Day. The Town Centre land uses are summarised in **Table 1**.





■ Table 1 Ellenbrook Town Centre Zoning System

Zone	EMME/2 Zone	Land Use
A	3	Shopping centre, tavern/bottleshop, fast foods
B	86	Public High school, district oval
C	132	Mixed use
D	133	Service commercial
E	88	Town Centre, library, offices, residential
F	87	Recreation/aquatic centre, residential/office, retail, showroom
G	85	Medium density residential/mixed use, aged care/independent living units
H-L	89-148	Residential
M-Y	149-161	Mixed use/residential

2.5 Model Structure

The traditional four-step model includes the following processes:

- Trip generation;
- Modal split
- Trip distribution; and
- Trip assignment.

In this instance the trip generation step has only considered private vehicle trips therefore the mode split process was not required.



2.6 Trip Generation

The purpose of the trip generation model is to produce 24-hour trip productions and attractions for input into the trip distribution procedure. These trips include:

- Trips originating in the study area to any destination;
- Trips terminating in the study area from any destination; and
- Through trips originating and terminating outside the study area but using roads within and around the study area.

2.6.1 Trip Productions (Trips Originating in the Modelled Area)

Trip productions are the trips associated with each household within the study area.

The daily trip production rates are based on combined trip rates dating back to the 1986 travel survey and the Road Reserves Review. A trip production rate of 7.8 trips per household was used, as shown in **Table 2**.

■ **Table 2 Household Daily Motorised Trip Rates - Ellenbrook**

Trip Purpose	Average Trips per Person	Average Trips per Household
Work	0.75	2.2
Education	0.2	0.6
Other	1.72	5.0
Total	2.66	7.8

Note: Population per household was assumed to be 2.9

Trips produced within the study area are destined for attractions both within and outside the study area.



2.6.2 Trip Attractions (Trips Terminating in the Study Area)

While trip productions represent the number of trips associated with each household, trip attractions represent the destination side of the traffic model, ie the destinations within the study area.

Trips are attracted to work places, education facilities, shopping facilities, community facilities and residential areas. The trip attractions have been based on the 1986 Travel Survey, adapted for local travel:

Work Attractions	=	1.365 trips per job
Education Attractions	=	0.8 trips per primary/secondary enrolment
	+	0.897 trips per tertiary enrolment
Other Attractions	=	1.138 trips per dwelling units
	+	0.8 trips per m ² retail floor area
	+	0.711 trips per school enrolment
	+	1.006 trips per job

These rates include trips to the modelled area originating within and outside the model area.



2.6.3 Trip Generation Summary

The total number of trip productions and attractions for each trip purpose for the Ellenbrook Town Centre are summarised in **Table 3**.

■ **Table 3 Trip Generation Summary – Ellenbrook Town Centre Only**

Trip Purpose		Total All Day Trips
Work	Productions	2,735
	Attractions	3,705
Education	Productions	729
	Attractions	960
Other	Productions	6,235
	Attractions	58,887

The trip productions and attractions arising from the Ellenbrook Town Centre are only a partial component of the total trip productions and attractions for the entire Ellenbrook development.

2.6.4 Through Trips

Through trips are trips which travel through the modelled road network with origins and destination outside of the modelled area. The Ellenbrook district model incorporates through trips from two sources:

- Trips on the regional network; and
- Trips generated by the future extension of the corridor north of Ellenbrook.



2.7 Assignment

The EMME/2 assignment model uses a linear approximation algorithm to solve the capacity restrained highway assignment.

The trips are distributed around the network by EMME/2 in such a way that their total travel time is minimised. The shortest travel time calculations are based on the road network and take into consideration the road type, average speed and number of lanes along each route. This is done in several iterations to allow the congestion to be included in the travel time calculations.



3. Network Analysis

3.1 Overview of the Transport Network

Liveable Neighbourhoods, released for testing and review in 1997 and then revised in 2000 by the Western Australian Planning Commission, sets out guidelines for the establishment of road hierarchies for new developments as well as for other areas of subdivision planning.

Liveable Neighbourhoods classifies roads according to purpose and traffic volumes. Roads are grouped into two broad classifications, Arterial routes and Local Streets. Arterial routes are intended to provide “efficient and safe regional and local traffic movement while integrating community through development frontage, wherever possible”. Local Streets are intended to be community oriented with better provision for pedestrians. They should encourage local traffic while discouraging long distance through traffic.

The road network classifications applying to this development and indicative 24 hour traffic volumes are shown on **Table 4**.

■ **Table 4 Classification of Arterial Routes and Local Streets**

Road Classification		Target Maximum Speed (km/hr)	Indicative Maximum Traffic Volume (vpd)
Primary Distributor	6 lane divided carriageway	80	50,000 vpd
	4 lane divided carriageway	80	35,000 vpd
District Distributor Integrator A		70	15,000 – 30,000 vpd
District Distributor Integrator B		60	7,000 – 20,000 vpd
Neighbourhood Connector		60	3,000 – 7,000 vpd
Access Street	Road Width 7 – 7.5m	50	3,000 vpd
	Road Width 5 – 5.5m	40	1,000 vpd
Lane way		15	300 vpd



3.2 Modelled Traffic Volumes and Road Hierarchy

The traffic volumes predicted by the EMME/2 model are shown in **Figure 3.1**. Based on these forecast traffic volumes, the road hierarchy as shown in **Figure 3.2** was developed.

The recommended road reserve requirements for the major roads within the Town Centre are discussed in the following section.

Entry 1

Entry 1 (as shown in **Figure 3.2**) is proposed as a minor access between the residential section of the Town Centre and the Promenade. Traffic volumes up to 3,000 vehicles per day (vpd) are forecast for this link. A Neighbourhood Connector classification is considered appropriate, with a road reserve of 20m.

Entry 2

Entry 2 provides a direct connection between the Town Centre and Village 5, forming a four-way intersection with the Promenade and a Village 5 access road. Traffic volumes up to 5,000 vpd are forecast for this link. A Neighbourhood Connector classification is considered appropriate, with a road reserve of 20m.

Entry 3

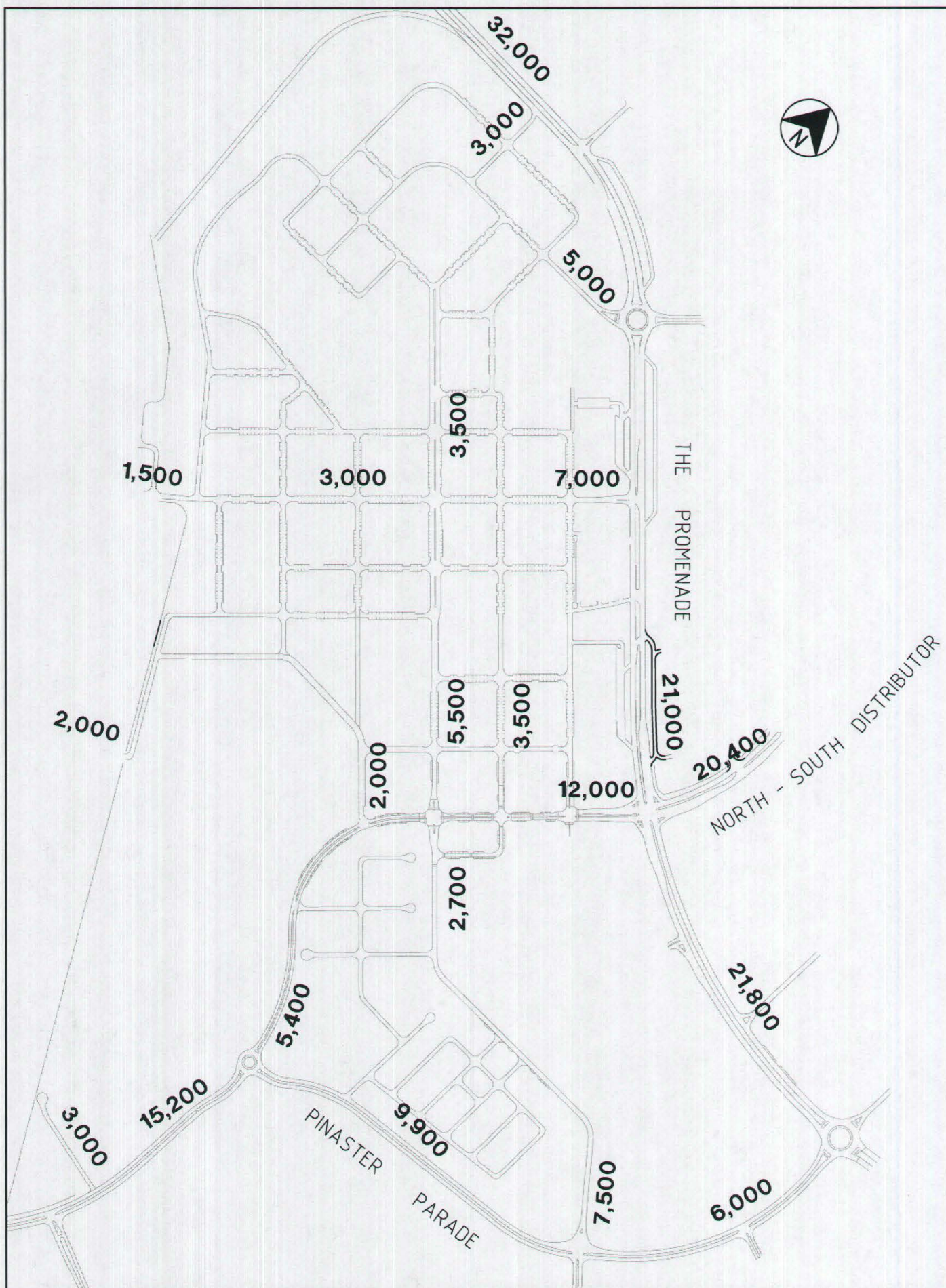
Entry 3 is one of only two links to the commercial heart of the Town Centre from the Promenade. It is forecast to carry approximately 7,000 vpd south of the intersection with the Promenade, reducing to 1,400vpd where the road enters The Bridges.

This link could be used as a bus route between the Town Centre and Village 5.

The recommended classification for the northern section of this road is a Neighbourhood Connector, with a road reserve of between 20 and 25m, depending on whether a median is required (for aesthetic purposes). This road reserve is sufficient to provided parking embayments and on-road cycling lanes.

Entry 4

SINCLAIR KNIGHT MERZ



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**ELLENBROOK TOWN CENTRE
FORECAST TRAFFIC VOLUMES**

FIGURE 3.1



Entry 4 (Main Street) is the primary access to the Town Centre from the residential areas to the north, forming a four-way intersection with the Promenade and the North-South Distributor. Entry 4 continues past the Town Centre, providing a direct connection to Pinaster Parade.

This road is forecast to carry approximately 12,000 vpd south of the Promenade, decreasing to 5,400 vpd to the north of the intersection with Pinaster Parade.

The northern section of this road is likely to be used as a bus route for travel between the Town Centre and Coolamon, and the southern section may be used for the route between the Town Centre and Woodlake Village.

The forecast traffic volumes could be accommodated within a two-lane road (ie one lane in each direction), however depending on the intersection control for the four-way intersection with the shopping centre access, turning lanes may be required.

High pedestrian movements would be expected along this road as it forms part of the pedestrian desire lines between Coolamon, Woodlake Village and the Town Centre. Given the forecast traffic volumes, some form of median to provide pedestrian refuge is recommended.

A District Distributor Integrator B classification is considered appropriate. A road reserve of between 20m and 25m will be sufficient to accommodate the required traffic lanes and median.

Entry 5

Entry 5 provides an important access between Woodlake Village and the Town Centre, forming a four way intersection with Pinaster Parade and Highpoint Boulevard. This road forms the southern boundary of the shopping centre site and is forecast to carry 7,500 vpd east of Pinaster Parade, with traffic volumes reducing further to the east.

Entry 5 may be used as a public transport route for buses from Woodlake Village.

The recommended classification is District Distributor Integrator B, with a road reserve of 20 to 25m, depending on whether a median is required.

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Entry 6

Entry 6 forms the south western boundary of the Town Centre, potentially providing direct access to the education precinct. Forecast volumes could reach 3,000vpd immediately to the west of Pinaster Parade.

Sections of the road could be used by buses travelling between the Town Centre and The Bridges.

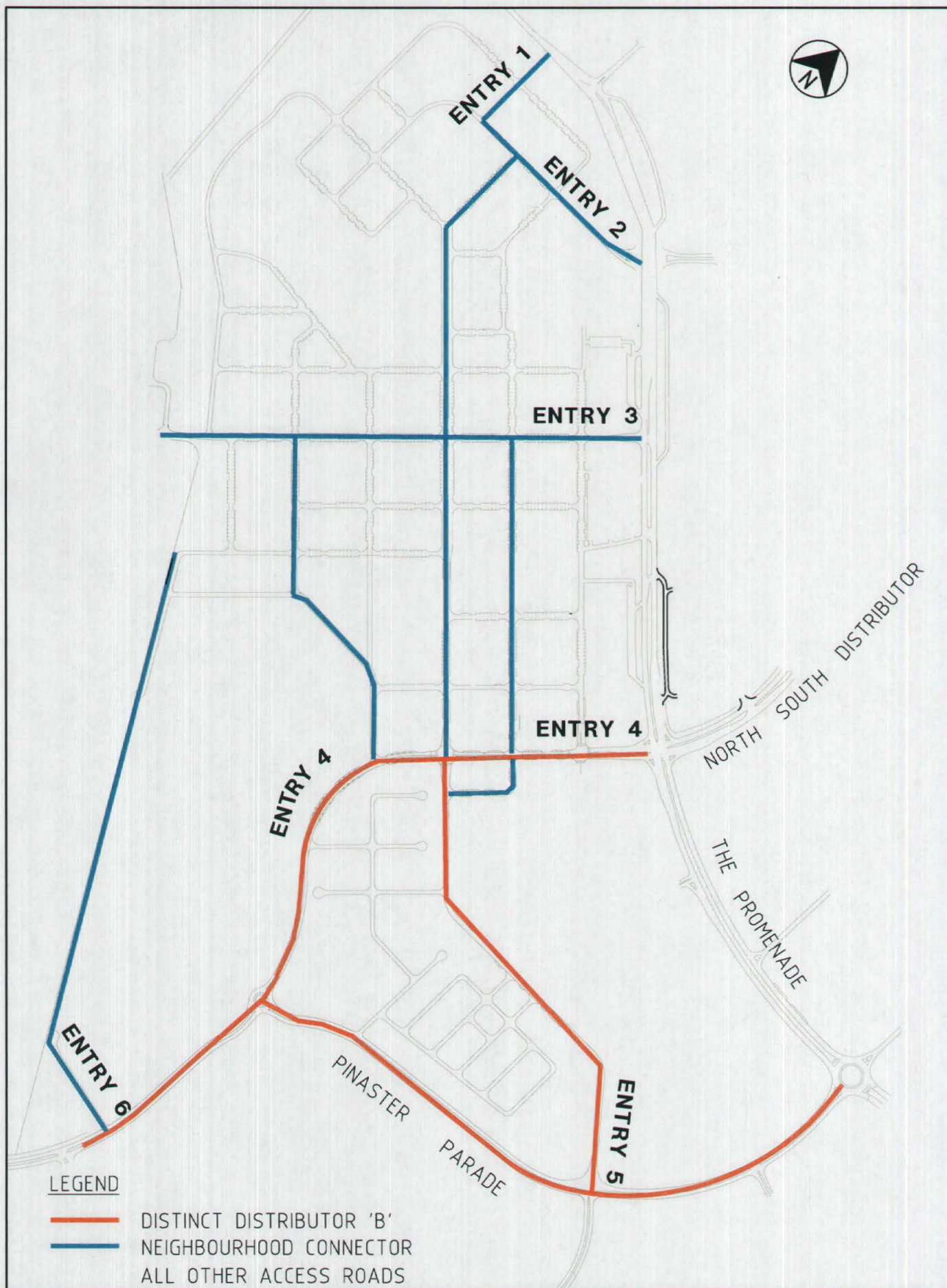
A Neighbourhood Connector road classification is considered appropriate, with a road reserve of 20m. This is sufficient for a 7.4m carriageway, and parking lanes in the vicinity of the High School and district oval.

Other roads

A number of internal roads within the Town Centre have been classified as Neighbourhood Connectors, as shown in **Figure 3.2**, with the remaining roads classified as Access Streets.

Road reserve widths of 20m are recommended for the roads forming the grid pattern in the mixed use/residential portion of the Town Centre, to allow for future flexibility and the potential for bus routes.

Road reserve widths of 14-16m are recommended for the roads within the residential area of the Town Centre, dependent upon whether there is a requirement for on-street parking.



SINCLAIR KNIGHT MERZ

**ELLENBROOK TOWN CENTRE
RECOMMENDED ROAD HIERARCHY**

FIGURE 3.2



3.3 Intersection Treatments

3.3.1 External Intersections

The appropriate intersection treatments between intersections of the east west distributor the major roads into the Town Centre were determined in the *Pinaster Parade and Future Junction Layouts Supplementary Report* (September 1998). The modelling of the Town Centre has not changed these intersection control requirements. These remain:

- The Promenade / North-south distributor / Entry 4 Traffic signals
- The Promenade / Pinaster Parade Roundabout

There are other external intersections that require discussion:

The Promenade / Entry 1

This T-intersection is proposed to operate under priority control as a left in left out.

The Promenade / Entry 2 / Village 5 Access

Roundabout control is considered the most appropriate treatment for this four-way intersection.

The Promenade / Entry 3

This T-intersection could ultimately require traffic signal control given the forecast traffic volumes for Entry 3. The requirement for traffic signals will be determined from the crash rate and the delays experienced by vehicles turning at this intersection. In the interim, it will operate as priority controlled T-junction with a right turn pocket.



Pinaster Parade / Entry 5 / Highpoint Boulevard

This four-way intersection requires either roundabout or traffic signal control. Given that most of the existing major intersections along Pinaster Parade are roundabout controlled, this may be the most appropriate device, however, it provides little protection for pedestrians who may be wishing to access the Town Centre from Woodlake Village.

Pinaster Parade / Entry 4 (south)

Given the forecast traffic volumes, this intersection could probably operate with priority control, with appropriate turning lanes. Roundabout control would also work at this intersection.

Pinaster Parade / Entry 6

This intersection would operate under priority control, either with full movement (with appropriate right turning lanes) or as a left in left out only.

3.3.2 Intersections within the Town Centre

3.3.2.1 Four-way Intersections

A large number of four-way intersections have been proposed within the Town Centre. The choice of intersection control between priority, roundabout and traffic signals is dependent upon:

- Traffic volumes and the direction of turning traffic;
- Pedestrian crossing demands in the immediate area;
- Sight distances;
- Urban design and landscaping; and
- Road network legibility.



Within the residential area in the north of the Town Centre, forecast traffic volumes are low enough for priority control.

Within the mixed use/residential portion of the Town Centre with the grid road pattern, forecast traffic volumes and predicted turning movements may require roundabout or signal control at some locations.

3.3.2.2 Three-way Intersections

The majority of three-way intersection proposed within the Town Centre could be priority controlled.



4. Pedestrians and Cyclists

4.1 Objective

Walking and cycling have an important role within the overall transportation infrastructure of an urban area. When integrated with major land uses, a strong walk/cycle network can:

- Reduce private car dependency for residents;
- Increase accessibility to employment and other urban activities for residents;
- Reduce adverse environmental impacts of transport;
- Increase resource efficiency in a multi-modal transport system;
- Reduce transport-related accidents.

The objective of a pedestrian and cycle network is to provide for the convenient and safe movement of pedestrians and cyclists through and between urban cells in the study area, having regard for the need to service schools, shops, recreation and other land uses as well as public transport access points.

4.2 Pedestrian and Cyclist Provision

4.2.1 Pedestrians

Pedestrians will enjoy a high degree of accessibility within the Town Centre, with a number of pedestrianised “malls” proposed.

It is recommended that all roads within the Town Centre have a footpath on at least one side, and on both sides where the traffic volumes are of 1,000 vpd or greater are forecast. Footpaths should be a minimum of 1.5m wide, increasing to 2m in the vicinity of schools, shops or other activity areas within the Town Centre.



4.2.2 Cyclists

There are several different kinds of bicycle facility, on-road and off-road, which are appropriate for different road environments and different classes of cyclists.

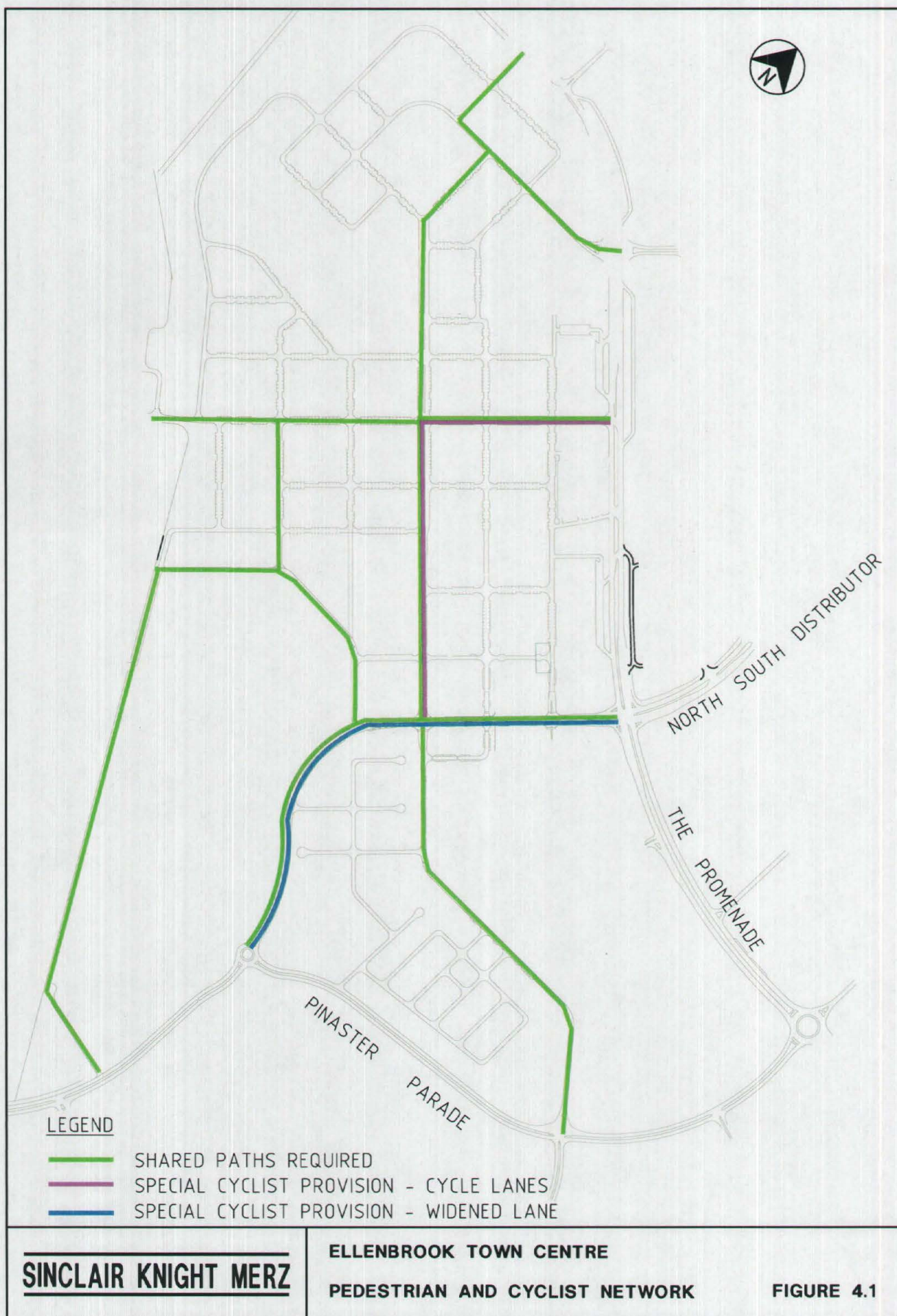
On roads where low traffic volumes are expected (less than 3,000 vpd), and where the differential in vehicle and bicycle speeds is less than 20kph, cyclists and cars can safely share the road with no specific cyclist provision. The introduction of the 50kph speed limit in built up areas should see most of the roads within the Town Centre fall into this category.

Certain roads have been identified as requiring provision for cyclists, due to the high forecast traffic volumes, or high vehicle-bicycle speed differential as shown in **Figure 4.1**.

Roads where high traffic volumes are combined with low vehicle speeds are suitable for widened kerbside lanes (acceptable range 3.7 – 4.2m). Widened lanes will allow slow moving vehicles to safely pass cyclists, or for cyclists to ride alongside vehicles at a similar speed. At this width it is not appropriate to delineate a separate cycle lane, as this would result in both narrow traffic and cycle lanes. Main Street is an example of where this treatment is appropriate, as the street treatments will result in a low speed environment.

On-road cycle lanes (acceptable range 1.2-1.5m) are appropriate for roads with high forecast traffic volumes where the differential in vehicle and bicycle speeds is expected to be greater than 20kph.

Shared paths have also been recommended, as shown in **Figure 4.1**, to maintain consistency with the existing shared path network within the development, and to provide for those cyclists who feel uncomfortable riding on-street.



K:\DEVN\02300\De02338\FIGURE4_1

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5. Public Transport

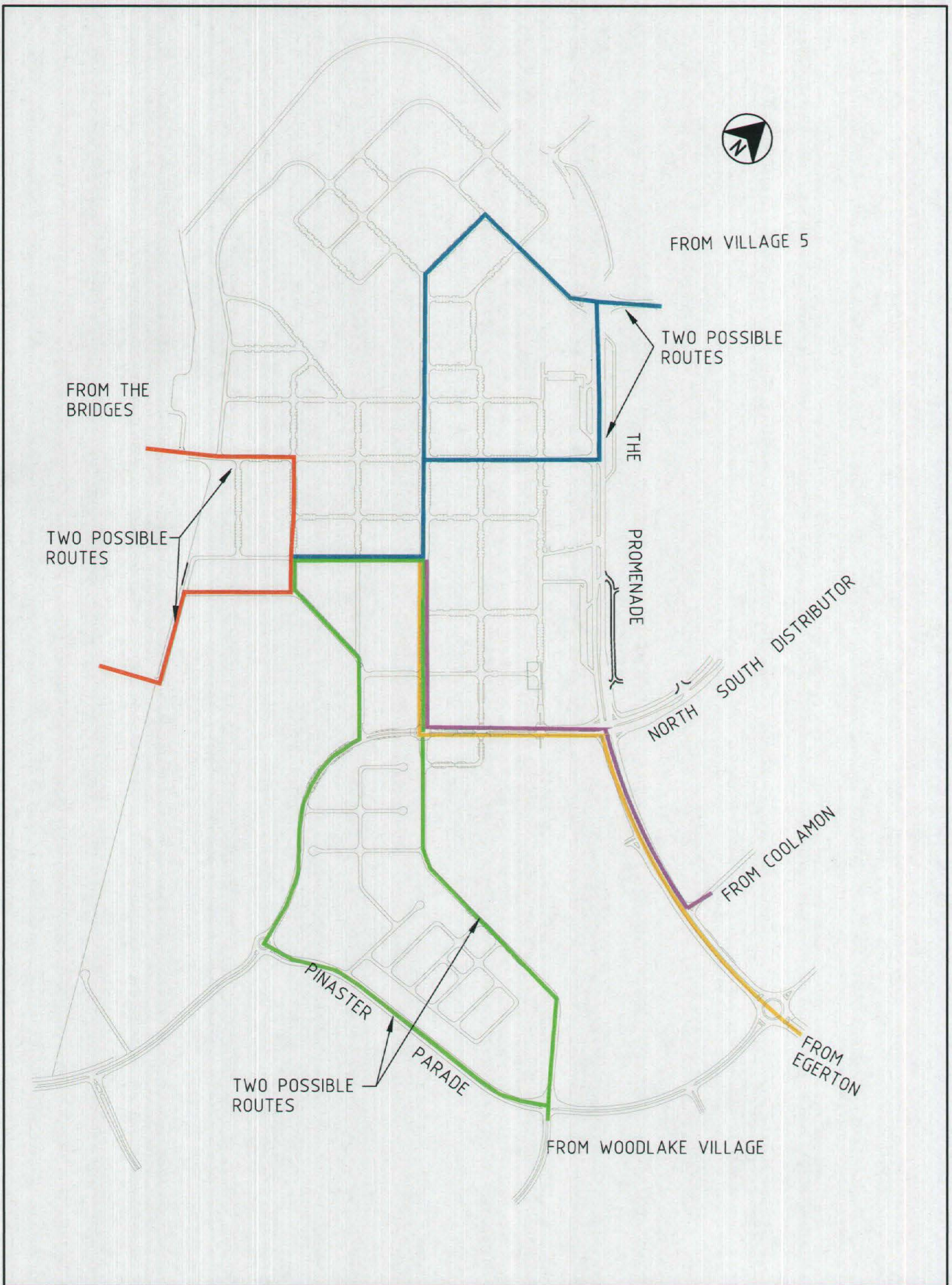
Discussions were held with public transport planners from the Department of Transport to determine the potential bus routes within the Town Centre.

It is likely that at ultimate development of the Ellenbrook precinct there will be between 5 and 7 bus routes connecting the Ellenbrook Villages with the Town Centre.

One route will come from the Bridges to the south, another route from Woodlake Village to the south-east. Another route is expected to connect Egerton with the Ellenbrook Town Centre. Two routes are expected from the north through Coolamon, and a further route is expected from the north to the west of the transit corridor.

The exact routes for these bus services have not been determined and will depend on the residential catchment at ultimate development. However the many connections of the Town Centre road network to the district distributors provide flexibility for public transport routes.

Although there is no certainty at this stage, likely routes through the Town Centre can be nominated to ensure that the relevant carriageways and intersections are constructed to a standard that will allow effective bus movement. These are identified in **Figure 5.1**.



SINCLAIR KNIGHT MERZ

**ELLENBROOK TOWN CENTRE
POTENTIAL BUS ROUTES**

FIGURE 5.1

APPENDIX B
REPORT ON ENGINEERING ASPECTS

ELLENBROOK MANAGEMENT PTY LTD

**ELLENBROOK DEVELOPMENT
TOWN CENTRE DEVELOPMENT PLAN**

REPORT ON ENGINEERING ASPECTS

REPORT NO. 5683-R3

SEPTEMBER 2004

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TABLE OF CONTENTS

	Page No.
1. INTRODUCTION.....	2
2. SITE DESCRIPTION.....	3
3. SITEWORKS	4
4. ACCESS AND ROADS	5
5. DRAINAGE	7
6. SEWERAGE	8
7. WATER SUPPLY	9
8. OTHER PUBLIC UTILITY SERVICES.....	10

1. INTRODUCTION

This report has been prepared by Cossill and Webley Pty Ltd, Consulting Engineers. It summarises the assessment undertaken by the firm, to date, on the engineering aspects of the proposed Ellenbrook Town Centre. The Town Centre is within the Ellenbrook landholding north of Gnangara Road and abuts the residential villages of The Bridges, Woodlake, Coolamon and Charlotte's Vineyard.

The report has been prepared for Ellenbrook Management Pty Ltd as supporting documentation for the Development Plan prepared by Roberts Day.

Requirements covering siteworks, roads, drainage, sewerage, water supply and public utility services have been assessed as they relate to the Development Plan proposal.

The engineering assessment has been based on the Development Plan dated September 2004 and shown as Figure 1, which yields some 145 hectares in total. Components of the Town Centre will include bulk retail, regional retail complex, civic community and commercial facilities (mixed and service industrial), education facilities, residential and recreation/open space.

2. SITE DESCRIPTION

The site of the proposed Town Centre is undulating and has a range in elevation of approximately 17 metres. The land varies in elevation from RL 43m to RL 60m AHD.

It comprises an area previously used for forest purposes and is generally found to have mature and juvenile pine trees with some pockets of native vegetation. The north-eastern sector of the site has been earthworked and is currently under construction as part of the development of the Retail Site including roadworks and servicing.

There is an existing microwave communications tower (80 metres high constructed in steel truss and stayed) which forms part of Western Power's control network for the Western Australian south west power grid. It is understood that the site on which the tower is constructed is now owned by Epic Energy. The tower is strategic and has other uses including communications for the Epic Energy (formerly AlintaGas) Dampier to Bunbury Natural Gas Pipeline and Telstra communication uses. It is positioned within the development plan in such a way, that staged development can occur around the site. Ultimately the tower may be relocated or as technology advances an alternative method of service delivery may evolve.

In connection with the Epic Energy Gas Pipeline there is a cathodic protection facility that traverses within the Site. A series of underground cables and a deep well "groundbed" are contained within an easement. These facilities have recently been relocated in accordance with the current development works on the site.

The results of geotechnical investigations carried out by Coffey Geosciences and available geological and topographical data indicate that the ground conditions within the Town Centre most likely comprise Bassendean Dune Sand overlying Guildford Formation. This is consistent with the conditions experienced to date within the site and for works completed within the adjoining Villages. The sands which make up the majority of the area are free draining and very suitable for urban development of the nature proposed in the Development Plan. Within low areas of the site localised pockets of peaty sand may exist.

Post development average annual maximum ground water levels, as predicted by Jim Davies and Associates as part of the Drainage Management Programme for the Ellenbrook Development Southern and Northern Catchment, are generally within one to two metres of the existing ground surface within the central lower portions of the Town Centre site. These levels will be used to determine finished surface levels and for sizing drainage facilities. The future design and construction of any underground or "sunken" transit facility would need to take into account near surface ground water.

3. SITEWORKS

Siteworks comprising bulk earthworks for the proposed Town Centre development will include the removal of the peaty sand, if necessary and the general re-contouring of the site to meet desirable maximum grades applicable to each land use. Bulk earthworks will also be used to ensure adequate grades for drainage and sewerage and to provide acceptable slopes for building in accordance with marketing and maximum allowable engineering grades.

In general it is expected that the Town Centre bulk earthworks will be designed to result in a balanced cut to fill from within the Ellenbrook land holding.

The natural surface levels across the Town Centre site lends it self to a central low spine in a north east – south west direction linking the land to the north and south (Bridges Village). This is reflected in the general road layout. This will allow a central spine for gravity flow of both sewer and stormwater runoff.

4. ACCESS AND ROADS

Existing road access to this precinct of the Ellenbrook landholding, and the north-east corridor area, generally, is via Gnangara Road which is linked to the Perth and Midland central areas and other metropolitan areas by Lord Street, Reid Highway, Alexander Drive, Tonkin Highway, Beechboro Road and West Swan Road.

Expansions of the regional road network completed with financial assistance from Ellenbrook Management include the extension of Reid Highway between Tonkin Highway and Midland, the construction of Lord Street between Reid Highway and Gnangara Road. These links now form an important network for all residents and road users in the Perth north east corridor.

In the longer term there are proposed extensions of Lord Street, as a controlled access highway (Perth Darwin National Highway – PDNH), north of Gnangara Road and the construction of Henley Brook Avenue between Reid Highway and the Ellenbrook/Egerton developments. Henley Brook Avenue will terminate at The Promenade, which fronts the northern boundary of the Town Centre.

Under a tripartite funding arrangement (State Government, City of Swan and EMPL) a second access road (Local Road) is proposed to be constructed along the alignment of the PDNH. Design works are currently underway and the road should be completed by mid 2005. In addition it is proposed to extend The Broadway north of the Town Centre such that it will link to The Vines development.

Initially the Town Centre will be served from the south by road connection from the existing Pinaster Parade. Access from the north and east will be via The Broadway and The Promenade Roads respectively. Upon completion of the Local Road a second “regional” access to Gnangara Road will be available via The Promenade link. In the longer term access to and from the Town Centre from growth to the east via extension of The Promenade and Henley Brook Avenue (from the south). Together these roads will provide a high level of road access for the area to and from the above regional road network.

Internally the Town Centre development would be serviced by a system of local distributor roads and local access roads the traffic planning of which has been separately assessed by Sinclair Knight Merz, (Traffic Modelling Report June 1999 and December 2002 – refer Traffic section). Currently the Main Street and The Parkway roads are under construction and these will provide the main internal links to the initial Retail Site and surrounding development. Roundabouts will be constructed at the intersection of these roads and Pinaster Parade junctions. Within the central part of the Main Street a “town square intersection” is being developed that will be a key feature of the Town Centre (refer details in the Landscaping section).

The roads have and will be designed in line with current Department of Planning and Infrastructure (DPI) policies for more innovative and varied approaches to commercial and residential street development. This may include the incorporation of traffic calming measures, to reduce vehicle speeds, road pavement and landscaping treatments aimed at creating a higher quality commercial and residential environment and improved traffic safety, as well as a high standard of access and permeability.

The road reserve and pavement widths will be varied to suit land use and local activities through out the Town Centre. Road narrowing and reduced building set backs will be used selectively to highlight areas of increased activity and speed control.

4. ACCESS AND ROADS - continued

The detailed design of roads in the Town Centre will be carried out in close consultation with the City of Swan and DPI with initial proposals for reserve and carriageway widths as follows:

Road Classification	Width (Metres)	
	Road Reserve	Carriageway
i) Local Distributor – entry roads . Boulevard . Other	<i>22 – 30</i> <i>16 – 20</i>	<i>2 x 3.7 + parking</i> <i>6 – 7.4</i>
ii) Accessway – street (up to 3000 vehicles per day)	14 – 16	5.5 – 6
iii) Access Lanes (up to 3 dwellings served)	10.5 – 12.5	3.5 – 4.5
iv) Rear Lanes (Access to lots)	6	6

Road reserves widths will be locally reduced adjacent to public open space and where service or access streets are adjacent to district distributor roads.

On street parking embayments will be used where land uses and planning determine street access is required. Parking and access from localised off street bulk parking areas have also been identified.

The Sinclair Knight Merz report has suggested proposed bus routes through the Town Centre which will link the adjacent Ellenbrook residential villages with the Town Centre. The provision in the plan for a dedicated public transit route suggests in the long term either a metro rail or express bus route from the “station square” to either Perth or another major regional centre, ie. Morley or Midland. What ever the long term regional public transport it is expected the Town Centre will be well served with the major higher speed or less frequent stopping link.

The Town Centre has strong pedestrian links with the adjoining residential villages. A pedestrian underpass has been installed under Pinaster Parade linking Woodlake to the Town Centre. Provision for a pedestrian crossing point on The Promenade from Coolamon has been made at a proposed traffic controlled intersection. The Bridges Village has access across the gas pipe reserve, which has been developed as a linear public open space facility.

5. DRAINAGE

Drainage within the Ellenbrook Town Centre development will be designed in accordance with the approved strategy detailed within the Ellenbrook Southern Catchment Drainage and Nutrient Management Programme (DNMP) August 1994 prepared for the project by Bowman Bishaw and Gorham, Cossill and Webley and Jim Davies and Associates. Further direction and guidance would be taken from the Drainage Technical Review Committee for the Perth North-East Corridor chaired by the Water and Rivers Commission.

In general this comprises the incorporation of retention basins, regional subsoil cut off drain and water pollution control ponds within the system to control both run-off quantities and quality prior to downstream discharge to Ellen and Henley Brooks. This system would be designed to meet various environmental criteria, as established by Bowman Bishaw and Gorham, covering flood levels within the adjacent existing rural areas, protection of groundwater resources, protection of existing wetlands, etc.

Where ever possible the retention basins will be designed as landscaped depressions either within the existing low lying areas or wetlands or within public open space areas. Four major basins are proposed in this area and two of these basins will act as stand alone infiltration basins. There is potential to provide an overland flow path for extreme storm event overflows, however, the need for such links will be examined in detail when the available storage is examined.

The other two infiltration basins, located either side of the Transit Corridor, will compensate flows and discharge water via a piped system to the wet detention basin in the Bridges Village. A pipe system has been installed in Santana Boulevard up to the gas pipe reserve for this purpose. Compensated flow from the basins will flow via the Gngangara Road branch drain to the regional water pollution control pond south of Gngangara Road. Both of these facilities were constructed by the Water Corporation as headworks funded infrastructure in 1999.

Surface drainage within the subdivision areas would be via a conventional system of road gullies and underground pipes draining to the retention / infiltration basins where recharge into the ground water will be possible. The pipe system would be designed to cater for run-off from storms with a frequency of up to 1 in 5 years in local streets and 1 in 10 years for district roads with flows from less frequent events, up to 1 in 100 years, provided for in overland floodways comprising road reserves, drainage channels and swales, linear open space, etc. Where possible and with the support of the City of Swan, drainage facilities will be designed to incorporate best management practices and water sensitive design principles.

In areas of high post-development groundwater, sub-soil drainage and earthworks filling would be carried out to provide adequate clearance between the groundwater and building levels. Sub-soil drains would be constructed at or above the pre-development average annual maximum groundwater levels, in line with the environmental criteria for the project.

The performance of the drainage management facilities, outlined above, would be monitored against the established criteria as part of an ongoing Environmental Management Programme (EMP). The management of the monitoring program is the responsibility of the North-East Corridor Technical Review Committee.

6. SEWERAGE

The Water Corporation has made provision for the sewerage of the Ellenbrook development in its planning for servicing the overall north-east corridor.

Sewage from the area is pumped via a major pumping station located south of Gnangara Road, at the western boundary of Ellenbrook adjacent to the Perth to Darwin National Highway Reserve, to the Beenyp Waste Water Treatment Plant (WWTP). Ultimately sewage will be pumped to the proposed Alkimos WWTP. Sewage within the Town Centre will be conveyed via conventional gravity system of reticulated and trunk sewers to the major pumping station.

The Ellenbrook Main Sewer which conveys gravity flows from the Town Centre and villages north of this site has been installed through developer constructed works agreement with the Water Corporation. The section through the Town Centre and linking Ellenbrook's third village, Coolamon and a proposed pressure main from the Vines Resort was constructed in 1999. Recently gravity reticulation sewers were extended from this Main Sewer to service the first stages of development within the Town Centre.

7. WATER SUPPLY

As with sewerage, the Water Corporation has made provision for water supply to the Ellenbrook development in its planning for servicing the overall north-east corridor.

This planning is based on a local supply, from the Gngangara groundwater mound beneath the State Forest, west of Ellenbrook, supplemented by connection to the metropolitan system within the north-east and north-west corridors.

Groundwater bores within the Water Corporation's Lexia system pump to a treatment plant and reservoir located on the higher ground along the State Forest boundaries and Lexia conservation area, west of Ellenbrook. Supply to the development areas will be via a network of trunk and distribution water mains linking the reservoir to a conventional system of reticulation.

Initially water supply was being sourced from the existing Water Corporation water supply system servicing the Vines development to the north. This was used to supply water to a temporary reservoir located within Ellenbrook and connected to permanent water mains constructed within the development areas on future road/public open space alignments.

The Water Corporation completed a trunk water main link from the Wanneroo system in January 1999. This main operates as a transfer main in both directions from the Wanneroo and Lexia systems depending on ground water production and local demand at any point in time. The first stage of the Lexia ground water treatment plant has recently been completed.

Special water headworks have been agreed with the Water Corporation for the Ellenbrook project. The Water Corporation has agreed to provide the necessary trunk infrastructure to service the development based on an agreed rate and orderly pattern of development. To date trunk mains have been installed within The Promenade and the adjoining linear open space that service the Town Centre.