

Hillcroft Estate

Outline Development Plan

Prepared for

Australand Pty. Ltd.

October 2000

Version 5
13th February 2001

Hillcroft Estate Development Plan

Development Plan approved by the City of Whittlesea on
19 December, 2000, in accordance with Clause 43-04
Schedule 6 of the Whittlesea Planning Scheme

27/02/2001


.....
Signature for the Responsible Authority



1.0	INTRODUCTION.....	4
1.1	OVERVIEW.....	4
1.2	ODP PURPOSE.....	4
1.3	ODP CONTENT.....	5
2.0	STRATEGIC CONTEXT.....	6
2.1	REGIONAL.....	6
2.2	SOUTH MORANG LOCAL STRUCTURE PLAN.....	7
2.3	SUMMARY.....	8
3.0	SITE ANALYSIS.....	8
3.1	SITE DESCRIPTION.....	8
3.1.1	Location.....	8
3.1.2	Zoning and encumbrances.....	9
3.2	LANDFORM.....	9
3.3	ACCESS.....	10
3.4	VIEWS.....	10
4.0	THE PLAN.....	10
4.1	VISION.....	10
4.2	PRINCIPAL ELEMENTS.....	11
4.3	LAND BUDGET.....	12
4.4	HOUSING.....	13
4.5	LANDSCAPE DESIGN.....	14
5.0	ECOLOGICAL ASSESSMENT	14
5.1	OBJECTIVE.....	14
5.2	FLORA.....	15
5.3	FAUNA.....	16
5.4	HABITAT CORRIDORS.....	16
6.0	ARCHAEOLOGICAL/HERITAGE.....	16
6.1	OBJECTIVE.....	16
6.2	ABORIGINAL ARCHAEOLOGICAL SITES.....	17
6.3	NON- ABORIGINAL HISTORICAL SITES.....	18
7.0	OPEN SPACE AND RECREATION.....	19
7.1	OBJECTIVE.....	19
7.2	OPEN SPACE ALLOCATION.....	19
7.3	DESCRIPTION OF OPEN SPACE AREAS.....	20
8.0	ACTIVITY CENTRES.....	21
9.0	TRANSPORT AND TRAFFIC	22
9.1	OBJECTIVE.....	22
9.2	ROAD NETWORK	23
9.2.1	The Boulevard.....	23
9.2.2	Gordons Road.....	25
9.2.3	McArthurs Lane.....	26
9.2.4	Plenty Road.....	27
9.2.5	Local Roads	27
9.2.6	Non Access Roads.....	28

9.3	BUS ROUTES.....	28
9.4	BICYCLE AND PEDESTRIAN LINKAGES.....	29
10.0	PHYSICAL INFRASTRUCTURE.....	29
10.1	STORMWATER.....	29
10.2	SEWER.....	29
10.3	WATER SUPPLY.....	30
10.4	POWER, GAS, TELECOMMUNICATIONS.....	30
11.0	DEVELOPMENT CONTRIBUTIONS.....	30
11.1	POLICY FRAMEWORK.....	30
11.2	HILLCROFT: CONTRIBUTION ASSESSMENT.....	31
11.3	OPEN SPACE CONTRIBUTION.....	31
11.4	WORKS IN KIND.....	32
12.0	SITE STAGING	32

6 December 2000

Chris De Silva
Manager Strategic Planning
City of Whittlesea
Locked Bag 1
BUNDOORA MDC 3083

Please Quote : SY/WHI/GEN/G81

Dear Mr De Silva

Re: Whittlesea Planning Scheme
Hillcroft Estate Development Plan

I refer to your Council's letter dated 31 October 2000 and received on 2 November 2000 forwarding to VicRoads a Development Plan for land owned by Australand Pty Ltd west of Plenty Road and north of Gordons Road, South Morang, now known as "Hillcroft".

Further to the meeting between VicRoads and Council on 28 November 2000 and previous meetings between VicRoads, Council and the developer VicRoads submits the following comments in relation to the Development Plan dated October 2000.

1. Prior to the approval of the Development Plan Council must ensure that the Plan is compatible with a future realignment of Gordons Road to the north which will be required as part of grade separation of Plenty Road and a future extension of the heavy rail line beyond the South Morang Activity Centre. The proponent of the development must demonstrate that the realignment can be achieved to the satisfaction of VicRoads and the Responsible Authority with or without changes to the layout of the subdivision prior to the approval of the of the Development Plan. In any case appropriate measures will need to be put in place to ensure the future purchase of allotments is in full cognisance of this future realignment. These measures should include, but not necessarily limited, to the following.

- (a) Incorporation of the future realignment in the approved Development Plan.
- (b) Appropriate planning permit conditions.
- (c) Execution of a Section 173 Agreement pursuant to the Planning and Environment Act and noting of such on titles of affected lots.
- (d) Notice in the Contract of Sales of affected lots.

All allotments between The Boulevard and Gordons Road shall be deemed to be affected.

2. Even though it is desirable to provide greater separation between The Boulevard and a future realigned Gordons Road VicRoads accepts the proposed location of The Boulevard / Plenty Road intersection subject to the above.

3. The layout of the subdivision must be compatible with the ultimate upgrade of Plenty Road and ultimate configuration of The Boulevard / Plenty Road intersection based on ultimate traffic volumes on The Boulevard. A functional layout plan of the ultimate access arrangements along Plenty Road and the intersection with The Boulevard will need to be prepared which will dictate the subdivision layout in the vicinity. This functional layout must make provision for the following ultimate design features.
- (a) Signalisation of The Boulevard / Plenty Road intersection.
 - (b) A left turn deceleration lane into The Boulevard in addition to three northbound lanes.
 - (c) Two lanes turning right and one lane turning left out of The Boulevard onto Plenty Road.
 - (d) One way service roads which connect directly onto Plenty Road.
 - (e) No connectivity between the service road south of The Boulevard and subdivision roads to avoid rat running to bypass the intersection of The Boulevard with Plenty Road, wrong way movement along the service road and the incidence of U-turns on Plenty Road to travel south rather than right turns through the intersection.
 - (f) A left in left out T intersection between the service road north of The Boulevard and any connection to the internal subdivision road. This arrangement would allow lots abutting the service road to access local internal facilities without accessing Plenty Road and is not expected to result in a rat running problem given the low demand for northbound travel.
 - (g) Minimum 5 metre splays on the allotments at the corners of Plenty Road and The Boulevard.
 - (h) The removal or relocation west of The Boulevard median opening and the design of any local road intersection with The Boulevard that will not adversely affect the operation of The Boulevard / Plenty Road intersection.
 - (i) Any access to the two lots on the corner of The Boulevard and the service roads to be off The Boulevard from at the western extremity.
 - (j) Access to the two lots adjacent to these corner lots to be at the extreme ends of the lots away from The Boulevard.
4. Until Plenty Road is duplicated the service road shall operate under a temporary arrangement which is compatible with the ultimate design and which concentrates access to the service road via The Boulevard / Plenty Road intersection. The service roads shall not connection directly to Plenty Road and shall operate as two way. VicRoads will construct the service road modifications as part of the Plenty Road duplication. Appropriate measures as per item 1 above will be needed to advise prospective purchasers of the temporary service road arrangements.
5. Temporary connections between the two way service road and internal subdivision loop roads and the median opening on The Boulevard may be acceptable as part of an initial stage of development only and subject to similar measures outlined in item 1 above.

6. The Boulevard / Plenty Road intersection could initially be unsignalised as part of the initial development stage but will require a Type C right turn treatment and left turn deceleration lane on Plenty Road. The timing of the signalisation of this intersection will depend on the rate of development of the Estate and the traffic growth on Plenty Road. Prior to the approval of any stage and at least every 12 months an analysis of the operation of the intersection will be required and signals installed if warranted at the full cost of the developer.
7. The impact on the intersections of Plenty Road with Gordons Road and McArthurs Lane of any development stage which will load traffic onto the intersection will need to be assessed and mitigating roadworks provided at the full cost of the developer prior to the issuing of a Statement of Compliance for that stage. The scope of the mitigating works will depend on the prevailing traffic conditions.
8. Analyses of intersections shall include documentation of all assumptions and presentation of SIDRA inputs and outputs in a pictorial manner.

The Development Plan should not be approved until the above requirements have been satisfied and the Plan amended accordingly. Any references contrary to the above points should be removed.

Should you have any queries or wish to discuss these matters further please contact me on 9313 1156.

Yours sincerely



BILL HRONOPOULOS
TEAM LEADER STATUTORY PLANNING

LIST OF FIGURES

- FIGURE 1 – SOUTH MORANG LSP AREA
- FIGURE 2 – SITE LOCATION PLAN
- FIGURE 3 – EXISTING CONDITIONS AND SITE ANALYSIS
- FIGURE 4 – HILLCROFT: OUTLINE DEVELOPMENT PLAN
- FIGURE 5 – STREET TREE AND LANDSCAPE MASTER PLAN
- FIGURE 6 – FENCING DESIGN TO QUARRY HILLS
- FIGURE 7 – ROAD HIERARCHY AND TRAFFIC VOLUMES
- FIGURE 8 – CROSS SECTIONS: MCARTHURS LANE; THE BOULEVARD AND GORDONS ROAD
- FIGURE 9 – PLENTY ROAD/THE BOULEVARD: CONCEPTUAL LAYOUT
- FIGURE 10 – CROSS SECTIONS: COLLECTOR ROAD, LOCAL ROAD AND LANEWAY
- FIGURE 11 – STAGE ONE: HILLCROFT

TABLES

- TABLE 1 – LAND DEVELOPMENT ANALYSIS
- TABLE 2 – OPEN SPACE PROVISION
- TABLE 3 – HILLCROFT: DEVELOPMENT CONTRIBUTION ASSESSMENT

APPENDICES

- APPENDIX 1A – THE BOULEVARD/PLENTY ROAD INTERSECTION (INTERIM UNSIGNALISED): SIDRA ANALYSIS
- APPENDIX 1B – THE BOULEVARD/PLENTY ROAD INTERSECTION (INTERIM SIGNALISED): SIDRA ANALYSIS
- APPENDIX 2 – THE BOULEVARD/PLENTY ROAD INTERSECTION (ULTIMATE): SIDRA ANALYSIS

1.0 Introduction

1.1 Overview

Australand is one of Australia's leading developers and has been operating nationally for over seventy years. A commitment to an increased level of investment in Melbourne has been made since 1997. Within Victoria Australand has developed successful urban living developments in areas such as Camberwell, Croydon, Glen Waverley, Templestowe, Blackburn and Oakleigh. Australand is dedicated to 'creating exceptional communities where a complete quality of life can be enjoyed.'

Australand is the owner of land comprising 79.65 hectares located within the South Morang urban growth area of Whittlesea City. It is Australand's intention to develop this land as a new residential estate, to be known as 'Hillcroft'.

The majority of the land is zoned Residential 1 in the Whittlesea Planning Scheme and is subject to a Development Plan Overlay (DP06). Accordingly, an outline development plan (ODP) which indicates the manner in which the proposed residential estate, Hillcroft, is to be developed is required to be prepared for approval by the Council.

1.2 ODP Purpose

The site is located within South Morang, being an identified growth area in the Plenty Valley. The planning framework within which the development of this land is envisaged to take place is set out in the South Morang Local Structure Plan (SMLSP). The purpose of the ODP is to provide the detailed structure of the proposed design of Hillcroft having regard to the broader principles and objectives of the LSP and with reference to site specific studies.

The role of the ODP is as the master plan for the ongoing development of Hillcroft against which the issue of planning permits (or permit) for subdivision are considered. To this end, the Planning Scheme requires that the Development Plan (DP06) include sufficient information to demonstrate that subdivision of the land may proceed in an integrated manner with the immediately surrounding area. The ODP is required to indicate:

- General consistency with the South Morang Local Structure Plan.
- The local road, pedestrian and bicycle network, including links to adjoining land and networks and provision for access to proposed public transport routes.

- Concept design of the proposed subdivision including proposed landscape treatments.
- Location and layout of the proposed non-residential uses, including activity centres and open space.
- Relevant topographical and landscape details, including identification of significant environmental and cultural features and measures to preserve and enhance these features.
- Opportunities for a diverse range of allotment sizes and dwelling types.

(Clause 43.04, Schedule 6, Whittlesea Planning Scheme)

In the preparation of the Hillcroft ODP a comprehensive site analysis has been undertaken which has identified site features, site attributes, constraints and opportunities. This information, together with an ecological assessment and an archaeological/heritage survey have formed the basis of the 'vision' for the residential estate and the associated design philosophy. The urban design principles, as expressed in the SMLSP, have been fully considered in establishing the detailed urban form for the subdivision and development of this land. The development of this residential estate has been undertaken mindful of the relevant land use planning objective (Clause 21.04-2) which states:

"To plan for a diverse series of residential communities that have a unique identity and sense of place, cater to all segments of the housing market and respect and incorporate local environmental and cultural features."

1.3 ODP Content

This report together with accompanying plans comprise the Hillcroft Outline Development Plan. This report details the background information and site assessments from which this ODP has been prepared. Matters addressed in this report include:

- Description of site characteristics and site analysis
- Identify relationship with surrounding neighbourhood and areas of potential integration
- Summary of statutory context
- Detail of the design philosophy of Hillcroft Estate and description of the urban form of the proposed residential estate
- Review of the open space, recreation and community services available and to be provided
- Analysis of the traffic network and identification of the likely impact from Hillcroft Estate on the surrounding road network

- Assessment of the site's environmental and heritage characteristics
- Summary of infrastructure services and the manner in which they are to be provided
- Description of the implementation and staging of the Hillcroft ODP
- Discussion of the application of development levies and contributions

Associated plans, forming part of the Hillcroft ODP include:

- Outline Development Plan (Subdivision Layout Plan)
- Street Tree and Landscape Master Plan
- Existing Conditions and Site Analysis Plan

2.0 Strategic context

2.1 Regional

The City of Whittlesea's location on the urban rural fringe of Melbourne has necessitated considerable planning and management of the city's growth. The Whittlesea Municipal Strategic Statement (MSS) acknowledges the city as being *'traditionally characterised by its rapidly expanding residential areas and its continuing focus as a residential growth area'* (Clause 21.02-2).

The Plenty Corridor (within which Hillcroft Estate is located), was identified in the 1980's as one of Melbourne's priority growth areas. The general form and strategic direction of urban development within the Plenty Corridor has been established by the Plenty Valley Strategic Plan.

A key land use planning objective of the MSS, clearly summarises the City's intention for such residential growth areas;

"To plan for a diverse series of residential communities that have a unique identity and sense of place, cater to all segments of the housing market and respect and incorporate local environment and cultural features."
(21.04-2, Vision)

There is long established policy support for the Plenty Valley area as a focus for future residential growth within the Melbourne regional context and more specifically, within the local Whittlesea City context. The manner in which such growth is sought to occur is set out in local structure plans. These documents provide a detailed framework for future development within the individual growth nodes of each growth area. The South Morang Local Structure Plan (SMLSP) applies to Hillcroft.

2.2 South Morang Local Structure Plan

The SMLSP provides the guiding framework against which the Hillcroft ODP is required to be designed and developed. The location of major land uses and development criteria have been established in the SMLSP on the basis of the principles of the Plenty Valley Strategic Plan. These principles relate to aspects of residential development, local employment, roads and public transport, recreation and open space, urban design and staging and infrastructure provision. The function of the Outline Development Plan (ODP), as the next stage in the growth area framework, is to detail the subdivision design of Hillcroft and to provide a 'master plan' for the issue of planning permits for subdivision.

Hillcroft ODP is one of two 'planning units', located within the 'western precinct' of the SMLSP. The total SMLSP area can generally be described as being bordered to the east by Plenty Road, with Findon Road to the south and the Quarry Hills to the north and west, as shown in Figure 1.

The goals of the SMLSP are stated as being, to:

- balance social, economic, environmental and community interests
- facilitate the creation of an interesting and diverse urban environment
- conserve, enhance and manage areas and features of environmental and heritage significance
- accommodate future development at a rate related to demand and the ability to service the area
- facilitate the creation of a sense of community identity and provide opportunities for the physical and social fulfilment of future residents
- provide a flexible structure that can readily adapt to changes in people's lifestyle and aspirations
- ensure that development is energy efficient in terms of subdivision/housing design and transportation
- provide a framework for the co-ordinated and timely provision of infrastructure
- provide a structure, which allows equitable accessibility of all residents to public facilities, services and open space.

The main features of the SMLSP of particular relevance to the Hillcroft ODP include:

- a modified grid main road network with a central arterial road providing the potential for a future light rail connection (The Boulevard)
- a range of residential densities and lot sizes, seeking to achieve an average gross residential density of 15 dwellings per hectare

- the utilisation of Quarry Hills area as district passive open space
- existing SECV easement to provide linear linkages between the main open space areas by means of pedestrian/bicycle paths
- neighbourhood parks to provide the focus for the linear open space system, as both active and passive recreational facilities.

2.3 Summary

The Hillcroft ODP has been prepared with reference to the overall planning framework which comprises the principles of the Plenty Valley Strategic Plan; the specific features of the SMLSP; the objectives of the MSS; the provisions of the Whittlesea Planning Scheme; and the specific policies of the following reference documents:

- Subdivision Design Requirements and Site Analysis Procedures Guidelines
- River Redgum Protection Policy and Guidelines
- City of Whittlesea Development Contributions Policy

3.0 Site analysis

3.1 Site description

3.1.1 Location

Hillcroft Estate has a total site area of 79.65 hectares which is held in one ownership in four titles. The land is owned by Australand and is located to the south of McArthurs Lane; to the west of Plenty Road; to the north of Gordons Road; with a western boundary to the Environmental Rural Zone of the Quarry Hills. The site is irregular in shape with limited road frontage to Plenty Road and Gordons Road. The location of the site is shown on Figure 2.

The residential estate of Mill Park Lakes is developing to the west and will, in the future, be accessible to Hillcroft via The Boulevard. A number of other recently developed residential estates are located in close proximity, to the south on Plenty Road. Existing community facilities include Hawkestone regional park which is located to the east, opposite Hillcroft on Plenty Road; and the Council's municipal offices (including the arts and cultural centre) to the south-west. The proposed South Morang retail centre is to be developed on land to the south in McDonalds Road. Existing schools are located to the south in Mill Park and Epping. New school sites are designated within the adjacent Mill Park Lakes residential estate.

3.1.2 Zoning and encumbrances

While most of the land within the Hillcroft ODP is zoned Residential 1 (Whittlesea Planning Scheme), a significant area within the north eastern section of the site is zoned Environmental Rural. The estate adjoins the eastern edge of the Quarry Hills, similarly zoned Environmental Rural.

The land is traversed by a 150 metre wide power easement and three Melbourne Water Corporation pipetracks, one of which is now abandoned. Three high tension power transmission towers occupy the power easement.

The Hillcroft estate is setback from Plenty Road by a 20 metre wide road widening reserve, required for the future duplication of Plenty Road.

A 3394 square metre lot located near the estate's Plenty Road frontage, remains in the ownership of the land's former owners, the Clements family. The farm homestead is located on this lot and is intended to be fully serviced to the same standard as the proposed new residential lots during construction of the first stage of Hillcroft.

Figure 3, Existing Conditions and Site Analysis Plan, clearly details the site's existing characteristics and features.

3.2 Landform

While the land form of the majority of the site is generally gently undulating, the adjoining Quarry Hills to the west (zoned Environmental Rural) provide a distinctive backdrop. The land steepens along the base of this ERZ zone which forms the western boundary to the site.

North of the transmission line easement the land rises from the southeast to the highest point, being within the northwestern section of the site. Plenty Road is elevated above the site as are parts of the site's McArthurs Lane frontage. South of the transmission line the land generally falls from the Plenty Road frontage towards the eastern most pipetrack which traverses the site in a north-south direction, and continues to fall to the west. The elevation of the site is approximately 135 metres to 185 metres above sea level.

The site geology is predominantly Quaternary (Pleistocene) aged olivine basalt of fine to medium grain. No major faults are shown to exist across the site.

3.3 Access

The only vehicular access to the site is currently from Plenty Road which provides entry to the existing farm homestead. It is intended that this access will remain in the short term but will be replaced with access via the internal road network upon construction of the surrounding Hillcroft estate.

The proposed road network and access points provide for primary access to the site from Plenty Road via the proposed arterial road, The Boulevard. In accordance with the principles of the SMLSP the alignment of this road will link through to Mill Park Lakes to the west. Secondary entry points to the estate are from Gordons Road (to the south) and McArthurs Lane (to the north).

Provision is made for local road access to adjacent land at appropriate locations along the site's western boundary. No vehicular access is proposed to the Quarry Hills ERZ land to the west. No roads are located within the ERZ land within the north eastern corner of the site.

3.4 Views

Views both within the site and from the site to the neighbouring area are identified on the 'Existing Conditions & Site Analysis Plan' (Figure 3). Long panoramic views are enjoyed from the site, particularly from elevated locations. These views include Kinglake National Park to the east; the surrounding rural areas of Mernda Doreen to the north; and the Melbourne CBD to the south. Immediate, short views of trees within the site are also pleasant.

The presence of the power lines and associated towers on the site result in negative views from a number of locations, both within and outside the site. These features are particularly evident when travelling south along Plenty Road and from the centre of the site.

4.0 The Plan

4.1 Vision

In developing a vision for the proposed Hillcroft residential estate, the directives of the Whittlesea MSS have provided valuable reference. This northern area of the City is acknowledged as containing features of environmental importance, the retention and maintenance of which has the opportunity to add to the area's character and identity. This ODP has therefore sought to identify the land's key

environmental features from which the estate's sense of place and community is developed.

The MSS identifies the need for urban design principles to ensure that new development is responsive toward incorporating local environmental features and an integrated urban and landscape design. The following features are identified as forming the basis of the vision for the Hillcroft ODP:

- Retention of River Red Gum trees by incorporating them where practical in the subdivision design (being appropriate in terms of scale; tree condition and location), and "where feasible, that the redgums that are to be removed should be considered for recycling within the estate or the municipality. In addition, where feasible any stages that exist within the site that could be considered for retention as habitat."
- Respect for the value of the adjoining Quarry Hills
- The site's location as a link between Quarry Hills/Hawkestone Park/Plenty Gorge Park is acknowledged
- Need to minimise the visual impact of the transmission easement on residential development
- Potential to utilise pipetrack easements as pedestrian and environmental links through the estate
- Desire to conserve heritage features of identified significance (such as the scar tree and house ruins) in the most appropriate manner
- To respect and complement the existing Clements homestead allotment
- Any existing stone walls to be retained where possible especially within the land zoned Environmental Rural.

The resulting 'vision' for Hillcroft is the creation of a high quality residential estate, principally designed for the first and second home buyer market, where a natural setting will complement the existing natural features of the area including local fauna (particularly birdlife), significant trees, cultural elements and topography.

4.2 Principal Elements

It is intended that this vision be implemented in accordance with subdivision design policies, as expressed in the MSS and which include:

- Diversity of lot size and type
- Incorporation of features of cultural, natural and heritage significance
- Integration with the surrounding environment

- A high level of accessibility and connectivity to enhance the effectiveness of the transportation network, both within and beyond Hillcroft ODP.

Accordingly, the urban concept design for Hillcroft, presented as the Hillcroft Outline Development Plan (ODP), shown Figure 4, incorporates the following principal elements:

- A grid pattern road network to enable permeability throughout the estate and to promote positive views/vista opportunities
- The Boulevard as an arterial road which, as a result of its size and landscape character, is a positive and distinguishing feature of the estate
- Linear linkages (both east-west and north-south) to provide habitat corridor and open space links (pedestrian/cycle links)
- A significant water feature located within the power transmission easement to provide a dual function of servicing and visual amenity. This area is intended to act as a visual focus to distract views from the powerline
- Precincts within the ODP which delineate areas of different character
- Use of the pipe track easements for pedestrian links and linear open space
- Provision of a significant pedestrian link and wildlife corridor between the Quarry Hills and the regional park within which identified trees are to be retained
- A modified grid pattern of subdivision that responds to and is respectful of the topography of the site; the location of existing significant trees; view lines; and cultural and ecological features.

4.3 Land Budget

The Hillcroft ODP covers an area of 90ha, which includes the titles held by Australand and the pipetracks bounded by Hillcroft and the section of ERZ land between Hillcroft and Plenty Road. Land within the transmission power easement; the MWC pipe tracks; road widening on the site's Plenty Road and Gordons Road frontages; the 'Regional Park' land (as identified in the SMLSP), together with the habitat link which forms an integral part of the regional park network reduce the developable ODP area to 63.91 ha, as detailed in Table 1.

Table 1: Land Development Analysis

GROSS ODP AREA	90ha
Less undevelopable land:	
- Regional Park (as indicated in the SMLSP), comprising: - ERZ (unencumbered) 5.80 ha - ERZ (encumbered – power easement) 2.39 ha - ERZ (pipe tracks) 3.70 ha - ERZ (other ownerships) 3.00 ha - Balance of power easement 4.70 ha - Balance of pipe tracks 0.42 ha - Habitat link 1.80 ha - Pocket parks 0.97 ha	22.78 ha
- Balance of pipe tracks 2.89 ha - Jim Clements Property, 1065 Plenty Road (Lot 1 PS 437325J) 0.34 ha - Plenty Road widening 1.08 ha	
TOTAL	27.09 ha
GROSS DEVELOPABLE AREA	62.91 ha

A lot yield of approximately 700 lots is proposed to be provided within Hillcroft. On the basis of an average household size of 3.3 persons, a population in the order of 2,300 persons is projected to be accommodated.

4.4 Housing

Housing provision in the newer estates of Whittlesea City are identified as 'increasingly becoming more varied to meet the needs of a diverse and changing population' (Clause 21.02-4, MSS). Diversity of housing is considered essential to both cater for these various demands and to create 'interest and identity' within the urban environment.

The Hillcroft ODP provides the opportunity for housing diversity by highlighting areas which are potentially suitable for medium density housing and by proposing a mix of lot sizes (ranging from approximately 450 square metres to 1000 square metres) within the overall subdivision layout.

The Hillcroft display village, proposed to be located in proximity to the site's Plenty Road frontage, is to accommodate in the order of twenty display homes of a variety of size and style.

4.5 Landscape design

The landscape design (as shown in Figure 5, Street Tree and Landscape Master Plan) is complementary to and forms part of the wider urban design of the Hillcroft ODP. The planting proposed seeks to provide a natural setting which has as its focus, the wildlife aspects of the estate's location. In doing so the landscape design is respectful of the site's particular heritage, topographical and locational elements.

Planting

A mix of native, indigenous and exotic trees together with heritage plantings (peppercorns, poplars, oaks and plane trees) as street trees are proposed. This selection of trees is intended to strengthen the significance of existing trees and to provide a variety of colour, leaf texture and form while coordinating with the landscape theme of the nearby Mill Park Lakes estate. Flowering trees, shrubs and ground covers which are known to attract local bird life are to be provided, particularly within the wildlife corridor, to endorse the habitat value of this area.

Formal planting is to be utilised to emphasise view lines and linear links within the ODP area. However, care will be taken to ensure that planting proposals complement and emphasise the character of the River Red Gums on site. In addition to River Red Gums, identified trees of significance will be retained where possible to provide scale and interest to Hillcroft.

Furniture

As an integral and highly visual component of the landscape, the estate's furniture will similarly reflect the natural setting of Hillcroft using various elements such as timber, concrete, and steel detailing. It is intended that estate furniture be designed and constructed as part of the overall estate theme, linking the different elements together through the use of consistent and complementary materials and forms. The landscape proposals are detailed in the accompanying Street Tree and Landscape Master Plan.

5.0 Ecological Assessment

5.1 Objective

The MSS expresses the principal objective in respect of the City's environmental assets as:

"To identify, permanently preserve and promote opportunities for the enhancement of local

environmental assets which are vital to the maintenance of ecological processes."

(Clause 21.06.10)

Associated policies of particular relevance to the Hillcroft ODP include:

- In recognition of important environmental assets the Eden Hills, Quarry Hills, Redgum Protection Area, northern areas of the Plenty River, the Plenty Valley, the Humevale/Kinglake Area and the Craigieburn Grasslands will be zoned Environmental Rural Zone.
- To consider the cumulative effect of the removal of native vegetation when assessing applications and where appropriate pursue replacement strategies.
- In recognition of existing River Redgums in future urban areas of Mernda/Doreen and South Morang the Vegetation Protection Overlay will be applied.

In an area such as Hillcroft, a greenfield development site, the proposed urban design has acknowledged the importance of ensuring that the existing natural environment is reflected in and appropriately influences the shape and form of the urban development. A significant aspect of the natural environment at Hillcroft is the remnant vegetation communities and the need to conserve identified areas of significance during the transition from rural to urban in order to ensure the conservation and ongoing survival of these areas.

5.2 Flora

An ecological assessment of the site (exclusive of the land zoned Environmental Rural in the northeast) has been undertaken. This study, together with a detailed arborist's tree survey, provide valuable information on the site's natural environmental attributes. Generally the site is identified as being severely altered from its original condition, being dominated by pasture and weeds. The observation is made in the ecological assessment that "*A long history of dairy farming and in more recent times, the invasion of noxious, environmental weeds throughout the study site has dramatically altered the floristic composition of the site.*"

The main notable feature of the site is the existence of scattered mature eucalypts, particularly River Red Gums. These are considered to dominate the landscape and to be of Local to High Local conservation significance. Apart from this tree cover and a small modified area of Plains Grassy Woodland, little remaining native vegetation was identified. The vegetation of most of the site is considered to be in very poor condition and therefore of little conservation value.

5.3 Fauna

Five habitat types are described for the site. These are rocky rises; artificial wetlands; scattered trees; rock walls/piles; and pasture. Collectively the habitat value of these habitat types on the site is identified as 'low to moderate'.

- Little vegetation remains on the rocky rises which are mostly submerged thus reducing the fauna habitat value.
- The dams on site are small and none had any fringing aquatic vegetation making regular use by waterbirds unlikely.
- The greater concentration of trees was observed to be within the north central part of the site. These scattered trees (although little regeneration is noted) are considered to provide the only semblance of remnant woodland habitat within the site. They are noted as being habitat for common birds (including Galahs, Magpies and Sulphur Crested Cockatoos) and possibly roosting habitat for bats.
- The rock walls on site, constructed from on-site rock to delineate property boundaries, occur in several places and are identified as potential shelter for reptiles and mammals.
- Pasture occurs across the majority of the site and is considered to provide habitat for relatively few species of native fauna, possibly open country birds such as Richard's Pipit and the Welcome Swallow, and grazing habitat for the Eastern Grey kangaroo.

5.4 Habitat Corridors

While much reduced from their former value, several discernible corridors are identified within the site. A corridor of scattered trees extends north south within the site, potentially providing habitat corridor values both within the site itself and between adjacent areas.

It is observed that the value of the habitat corridors on site would be enhanced by incorporating the identified River Red Gums within public open space reserves and by providing for such spaces to be contiguous. Priority should be given to the natural regeneration of native flora species, specifically the River Red Gums.

The habitat link provided, at the request of Council, is not shown as a required component of the open space network in the SMLSP. Accordingly this area is considered to qualify as part of the ODP's open space contribution.

6.0 Archaeological/Heritage

6.1 Objective

The principal objective for the consideration of the City's heritage and cultural matters is stated in the MSS as "To

increase the level of protection for and opportunities for incorporation of the City's European and Aboriginal heritage."
(Clause 21.06-12)

The importance of the retention and inclusion of heritage features within the urban environment is described in the MSS as contributing to the identity, interest and diversity of the City.

Accordingly, in the process of developing the urban design for Hillcroft a site analysis of archaeological and heritage features was undertaken.

6.2 Aboriginal Archaeological Sites

Two aboriginal archaeological sites were located during the survey of the site. One site, a scar tree, had previously been recorded (Ellender, 1993). The location of this is shown on the Hillcroft ODP, in the vicinity of the site's western boundary near the abandoned MWC pipe track. The other is an isolated artefact, a single quartz flake.

The study notes that the *Wurundjeri balug* clan of the *Woi wurrung* language group would have occupied the region containing the study area. The *Wurundjeri willam* group of this clan occupied the land between the Darebin Creek and the Maribyrnong River. This area would have provided Aboriginal people with "*an ample supply of raw stone material suitable for stone tool production.*" With the onset of European settlement in the area, traditional food sources were quickly exhausted. The numbers of *Wurundjeri willam* people soon dwindled with few being noted as living in Plenty Valley in 1854.

The archaeological survey of the site involved inspection of all mature native trees for Aboriginal cultural scars, together with a visual investigation of exposed ground. The quartz flake was located in the vicinity of the non- Aboriginal historical site (house ruins), 50 metres NNW of the power transmission easement. The flake measured 21 mm in length; 11mm wide; and 6mm thick. The scar tree is located approximately 250 metres north of a small dam in the vicinity of the site's western boundary.

The scar is readily identifiable with a small basalt rock located at the base of the scar. It is believed that the scar is the result of extraction of bark to construct a shield or container. The scar overgrowth of the tree averages 40 cm. The girth of the tree at chest height is 5.5 metres. The tree is a River Red Gum and is considered to be in reasonable health.

It is recommended that the scar tree be preserved and incorporated into the proposed development. Consultation with both the City of Whittlesea and the Wurundjeri Tribe has been

undertaken. Protection and acknowledgment of the tree is proposed with its inclusion within a dedicated area of open space. The artefact was located within a non-Aboriginal historical site which is proposed to be covered and preserved (house ruins). The Wurundjeri Tribe has confirmed that this is acceptable and that no permit would therefore be required.

6.3 Non- Aboriginal Historical Sites

Two historical archaeological sites were recorded. Both sites are of house ruins and are in poor condition. The less visible of the two is located on a stony rise adjacent to a fence which runs parallel to McArthurs Lane. The other (referred to as the Plenty Road house ruins) is located approximately 50 metres north west of the power transmission easement and is marked at the eastern end by two exotic trees.

The Plenty Road house ruins site contains a variety of historical artefacts, mostly comprising glass and ceramic fragments. The types of glass and bottles found indicate a probable date of the site as being from the mid to late nineteenth century. The presence of bluestone indicates that there may be foundations present.

The McArthurs Lane house ruins site similarly contains a variety of historical artefacts. Ceramic fragments include blue and white transfer painted underglaze, plain creamware and stone ware bottle fragments. An inspection of the site failed to reveal any archaeological deposits although the site is covered with pasture grasses.

It is concluded that both of these historical sites are likely to be the remains of houses or huts as the artefacts present were predominantly domestic in nature. The McArthurs Lane site appears to have been disturbed at its northern end by the construction of McArthurs Lane. Both sites indicate that there was some form of earlier settlement present, although it is not known for how long these sites were used.

Heritage Victoria has advised that covering the Plenty Road ruins and being within a dedicated open space area is acceptable and that no permit is required to be obtained for this work. A permit to disturb/destroy is however required for the McArthurs Lane ruins. Given the location of these ruins within the frontage to McArthurs Lane and being part of the proposed residential development, there is no proposal to retain this ruins site. It is anticipated that this consent would include a condition for monitoring of the site to be undertaken prior to development works commencing.

7.0 Open Space and Recreation

7.1 Objective

Guidance as to the manner in which the City's open spaces are to be developed is provided in the policy framework of the MSS and the guidelines of the City of Whittlesea's Open Space Strategy (1997).

Open space areas are identified as offering

"opportunity to develop interest and identify and (to) contribute significantly to the development of a sense of community through the provision of a focus for a wide range of active and passive activities."

(Clause 21.06-11)

Specific actions of relevance to Hillcroft ODP include:

- Providing a regional open space network in South Morang by progressively developing the Quarry Hills as a regional open space area in association with the Plenty Gorge Parklands.

The local open space policy (Clause 22.01) identifies specific matters to be considered when planning open space, with the principle objective being to develop 'an integrated open space system which meets the wide ranging needs of the community'. Those matters considered to be of particular relevance to Hillcroft include:

- the protection and enhancement of natural and cultural features
- the provision, where applicable, of local and regional linear open space linkages, walking and cycling trails
- achieve a balance between local, district and regional open space.

The River Red Gum Protection Policy (Clause 22.10) seeks the inclusion of those trees identified for retention within public open space reserves and/or road reserves.

7.2 Open space allocation

The extent and location of open space within the wider South Morang area is detailed in the SMLSP. The ERZ zoned land located within the north eastern sector of the Hillcroft ODP together with the power easement extending to the land's southern boundary, are described in the SMLSP as 'neighbourhood park', being part of the wider open space link sought to be achieved within South Morang. The ERZ land to the west (Quarry Hills) borders the Hillcroft ODP but does not

form part of it. It is proposed to provide appropriate fencing along the boundary, the design of which is shown in Figure 6.

The Hillcroft ODP also provides for a habitat link as an east-west link between Quarry Hills and the ERZ land; and local parks. The respective sizes of these open space areas provided by Australand are detailed in Table 2 below.

Table 2: Open Space Provision

Regional Park (ERZ land and power easement)	12.89 ha
Habitat Link	0.895 ha
Habitat Link tree protection	0.900 ha
Pocket Parks	0.975 ha
TOTAL	15.66 HA

The total open space area provided by Australand represents 19.7% of the title area of the Hillcroft Estate

The location of the open space network within Hillcroft is shown on the Street Tree and Landscape Master Plan (Figure 5). A diversity in the form, use and location of open space areas is achieved within Hillcroft, while maintaining a 'natural' theme that complements the setting and character of the site.

7.3 Description of open space areas

Main Reserve (under powerlines)

The design of this open space would provide/incorporate:

- a natural setting with the informal wetland as a visual focal point
- an island in the wetland acts as a haven for birds
- sculptures on land and in the water to distract from the view to the powerlines
- incorporate walking trails and information boards that explain the significance of the local flora and fauna and provide a map of the open space network and trails
- picnic facilities
- boardwalks to the waters edge

Regional Park (where most of the existing Red Gums are located)

The design of this open space would:

- retain the open woodland character created by the established Red Gums
- allow for natural revegetation of Red Gums
- incorporate planting from local seed (if possible)
- incorporate interpretive signage explaining the species of trees and their age

- provide informal walking trails
- include timber sculptures (represent local fauna)
- make use of curved rock walls as a sculptural feature
- incorporate the existing ruins (covered) within a formal landscaped area

It is noted that overall a very low order of enhancement is envisaged as necessary to retain the natural woodland values of the regional park area.

Habitat Link & old ruins

The design of this open space would:

- provide a linear link between the Quarry Hills and the Regional Park
- be planted with trees, shrubs and understorey plants that will provide habitat and food for local fauna
- provide amenity for local residents with the provision of paths, seating areas and spaces for passive recreation

Scar Tree Reserve

The design of this open space would:

- highlight the significance of the tree
- use coloured uplights to provide a feature at night

Pocket park surrounded by medium density

The design of this open space would:

- create a common courtyard for the residences
- formalise access around the edge
- provide a sculptural feature centrally in the space
- potentially incorporate use of coloured uplights to provide a feature at night (as per scar tree)

Other Pocket parks

The design of these open spaces would:

- preserve the character of the Red Gums
- provide for passive recreation (ie seats, garden beds etc)

8.0 Activity centres

The location of commercial and community activity centres has been determined at the local structure plan stage. One neighbourhood and two local activity centres are proposed within the SMLSP area. Given the proximity of this area to the

newly developing South Morang regional centre, the activity centre proposed within the SMLSP is to serve a neighbourhood function. The two community centres are described as being “multi-purpose”, each to serve the western and eastern precinct of the SMLSP area respectively. It is envisaged that the types of facilities provided at the community centre would include meeting rooms; child care activities; senior citizens facilities and local health services.

In accordance with the SMLSP no activity centre sites are identified within the Hillcroft ODP area. The principle arterial link provided via The Boulevard will eventually enable access from Hillcroft to Mill Park Lakes where these facilities may be utilised.

9.0 Transport and traffic

9.1 Objective

Within residential developments the road network should facilitate the movement of traffic in an efficient and safe manner. The design of the transport network within the Hillcroft ODP and beyond is recognised as an important aspect of the livability of the development as it directly impacts on accessibility to services and movement efficiency. The road network of the Hillcroft ODP area has been defined in the SMLSP. Three road functions are identified, relative to traffic volumes and location. The SMLSP defines the network as comprising:

Arterial Road

Forms the main grid of traffic routes, being connective and continuous.

Sub-Arterial Road

Provide the finer grain of traffic routes and have more frequent connections to lower level roads; will generally form the basis for bus routes.

Collector Road

These roads collect traffic from the access streets and have a reasonable level of residential amenity by restricting traffic volumes and speeds.

Local Roads, Access Streets and Places

Contain a high level of residential frontage and living space with low traffic volumes. Speeds are therefore to be minimised

by restricting road lengths and incorporating traffic calming treatments.

9.2 Road Network

The Hillcroft ODP area abuts Plenty Road which is a Primary Arterial Road, under the control of VicRoads. The construction of a new arterial road, extending from Plenty Road west through the Hillcroft ODP area to the eastern boundary of the adjacent Mill Park Lakes Estate, has been identified as part of the SMLSP. This road, referred to as The Boulevard, will incorporate a median width sufficient to incorporate the future extension of light rail into this area.

VicRoads approval of the intersection treatments of the Hillcroft internal roads with Plenty Road will be sought in order to confirm detailed design. The proposed road designs and intersection treatments for the Hillcroft ODP are based on traffic volume estimates. These volumes, together with the proposed road hierarchy, are shown in Figure 7. Traffic volume estimates utilise a trip generation rate of 10 trips per day which is the recognised average value for an outer suburban residential area. The ultimate predicted traffic volumes throughout the area are taken from the SMLSP (also shown on Figure 7).

The internal road network comprises the arterial; sub-arterial and collector roads; access streets and places. This road network provides an efficient and workable layout within the proposed grid pattern of the subdivision.

9.2.1 The Boulevard

The Boulevard is the main arterial road and runs through the Hillcroft ODP area and is to be constructed as a four lane divided road within a 40 m wide road reserve (shown in Figure 8). The median is to be 15.0m wide to cater for future light rail options. Within Hillcroft the Boulevard will cater for moderate traffic volumes of 8,000 vpd. While some lots front The Boulevard no direct access to The Boulevard is provided for. Rear laneways will enable vehicular access from these lots to The Boulevard.

The predicted volumes on all intersecting streets are of an acceptable level for give way or stop sign controlled intersections to be appropriate. The intersection of the north-south collector and The Boulevard will be treated with a roundabout. This intersection will require signalisation when the light rail is installed and The Boulevard is connected to the wider South Morang LSP area. It is anticipated that this will be at least 10 to 15 years away. This intersection can operate satisfactorily until that time. The Plenty Road/ The Boulevard intersection is to be a signalised intersection. It is understood that the proposed configuration of Plenty Road is a 6 lane

divided road. The estimated future traffic volumes in The Boulevard is 8,000.

Initially, it is proposed that the intersection operate as an unsignalised "T" intersection and is to be constructed as part of the initial development works within the Hillcroft ODP. A SIDRA analysis using the predicted volumes from the Hillcroft estate and the projected volumes in Plenty Road has been undertaken. This indicates that the unsignalised intersection operation will be satisfactory in the interim when volumes of up to 120vph in the AM peak period turning right from The Boulevard are experienced. A summary of these results is shown in Appendix 1. The intersection will therefore require signalisation prior to Hillcroft estate's completion. Based on the above analysis the signalisation of the intersection will need to occur at about the time when the number of occupied lots north of The Boulevard reaches 200. However, Australand recognise that the signals may be required at an earlier, or later, time and therefor undertake to install the signals when requested by council or Vic Roads.

The Boulevard leg of the intersection will be provided with two lanes. The left lane will be for a left turn movement and the right lane will be a right turn movement. A SIDRA analysis shows that this configuration is acceptable for the ultimate traffic volumes. A summary of the results is shown in Appendix 2.

The interim intersection will be provided with a deceleration and right turn lane for the southbound traffic on Plenty Road. A deceleration and left turn lane for northbound traffic on Plenty Road will also be provided. A conceptual layout for the interim treatment of the Plenty Road / The Boulevard intersection is shown in Figure 9. It is noted that the likely future ultimate treatment of this intersection should be considered in light of the future Plenty Road Transport Study.

The unsignalised "T" intersection will be controlled by either a "stop or give way" sign depending upon sight distances. Initial investigations indicate that sight distances achieved at this proposed intersection will warrant a "give way" sign to be installed.

Australand recognise that the residences in Stage 1 and Stage 2 of Hillcroft will be affected by a change in road configuration from the interim treatment to ultimate treatment as described above. In order to ensure that potential purchasers are fully aware of the proposal interim and ultimate road works, appropriate plans will be included in the sale documentation and in addition, a 173 agreement will be attached to the title for each allotment. The wording of the 173 agreement will be to the satisfaction of VicRoads and Council.

9.2.2 Gordons Road

Gordons Road is an existing rural unsealed road. There will be no direct residential access to Gordons Road and all vehicular access will be via rear laneways. The proposed road cross section is shown in Figure 8 indicating pavement widened to provide for two through lanes with parking lanes either side. The ultimate volume on Gordons Road will be 6,000 vpd while the volume from the Hillcroft development is expected to be 900 vpd.

As access to Hillcroft does not depend on Gordons Road it is proposed that no works will be constructed in Gordons Road by Australand. As traffic volumes increase on this road as a result of other developments, it is envisaged that staged construction will occur through funding from the SMLSP development contributions fund.

When Gordons Road is connected to the wider SMLSP the predicted volume of 6000 vpd will most likely require traffic signals, at the intersection of Plenty Road. It is expected that the installation of the signals will be considered at this time by VicRoads.

Australand will not allow access to the development from Gordons Road until such time that Gordons road and it's intersection with Plenty Road have been upgraded to an acceptance standard as agreed between the developer and Council.

9.2.2.1 Realignment of Gordons Road

A proposal to extend the Epping heavy rail to service the South Morang area is being considered and will be investigated during the Traffic and Transport study.

Even though it is not yet known if the heavy rail extension is to proceed, VicRoads have considered the possibility and in particular the affect it will have where the heavy rail crosses Plenty Road.

The proposed alignment of the heavy rail will most likely follow the existing dismantled railway tracks and its current vertical alignment. The current alignment crosses Plenty Road at the intersection of Gordons Road and Plenty Road.

Ove Arup on behalf of Vic Roads, have prepared a preliminary grading for Plenty Road which is proposed to pass over the railway tracks. This will require the realignment of Gordons Road.

According to the Ove Arup design the location of the realigned Gordons Road and Plenty Road intersection as proposed by Vicroads would be located within the Hillcroft Estate approximately 50m north of the southern boundary.

A review of the proposed preliminary grading has revealed that it is feasible to locate the intersection of the realigned Gordons Road and Plenty Road approximately 50m south of the southern boundary of the Hillcroft Estate.

Further investigation regarding the possible realignment of Gordons Road will be undertaken by Council in association with Vicroads and the Department of Infrastructure.

Vic Roads have confirmed that the alternative design, as described above, is acceptable.

It is reasonable to expect that all potential purchasers within the Hillcroft development, that are likely to be effected by these works, be properly advised of the possible realignment of Gordons Road. Australand proposes to advise all purchases within Stage 2 of the development of the possible future works by way of a 173 agreement attached to the title of each allotment. The wording of the 173 agreement will be to the satisfaction of VicRoads.

9.2.3 McArthurs Lane

McArthurs Lane is an existing sealed road, which will be upgraded along the frontage of Hillcroft OPD area.

Residential lots will directly front McArthurs Lane. The road cross section is to be that of a Collector Road ultimately with two 3.75m through lanes (Figure 8).

McArthurs Lane is located between two areas identified for future urban development. To the north, land fronting Plenty Road is zoned to be developed for residential purposes. It is expected that the main access to this estate will be from Plenty Road and therefore future development abutting McArthurs Lane will produce similar volumes to that anticipated to be generated from the Hillcroft ODP area. The land to the west of Hillcroft is zoned Environmental Rural and will not therefore be developed in such a manner as to generate significant traffic volumes.

The anticipated volume on McArthurs Lane for Hillcroft is calculated to be 1700vpd and the intersection will be a cross road with the continuation of McArthurs Lane to the east of Plenty Road.

A detailed analysis of the configuration of this intersection has been delayed pending the completion of the Plenty Road Transport Study. As the connection of the Hillcroft Estate to McArthurs Lane is within the final stages of the Hillcroft ODP (and not likely to be within the next five years), it is considered premature to confirm this intersection design at this stage.

Australand will be responsible for the upgrading of the intersection of McArthurs Lane and Plenty Road to a reasonable and acceptable standard to both VicRoads and Council.

9.2.4 *Plenty Road*

Plenty Road is a declared main road (under the control of VicRoads) along the frontage of the Hillcroft estate. Vic Roads is undertaking a strategic study of Plenty Road, the results of which will not be available for inclusion in this ODP. However, the intersections of Plenty Road with The Boulevard has been considered now as it will form the initial connections to the development. The development will have no access to Gordons Road. Therefore, the intersection of Gordons Road and Plenty Road has not been considered. The McArthurs Lane intersection proposal has been deferred pending completion of the transport study. VicRoads preliminary advice is that the ultimate Plenty Road cross section will be a 6 lane divided road and no direct access to any allotments from Hillcroft to Plenty Road will be permitted.

VicRoads has advised that the Plenty Road upgrade will involve widening on the west side and will contain a 7.6m median; 3 x 3.5m lanes and a 1.8m bicycle lane and deceleration lanes as required. Based on these parameters the service roads will be compatible with the proposed ultimate Plenty Road configuration. The service roads will be one way and will connect to Plenty Road. The conceptual ultimate intersection and service road layouts are shown in Figure 9.

The internal subdivision roads running parallel to Plenty Road will effectively be service roads for Plenty Road.

In the interim, the service road will have no direct access to Plenty Road and will be a two way road.

9.2.5 *Local Roads*

The remaining roads within Hillcroft will be local roads carrying low volumes. The major north/south road (north of The Boulevard and extending through to McArthurs Lane) will have volumes requiring the provision of a wider road cross section. The cross sections of the local roads (including laneways and courts) are shown in Figure 10.

Parking bays will be provided on the collector road north of The Boulevard where it abuts the pipe track.

Roundabouts will be provided at cross roads where volumes are anticipated to be significant and where there is a likelihood of straight through movements on the minor legs. The road network of Hillcroft has however been designed to minimise this occurrence.

9.2.6 Non Access Roads

Hillcroft will have a number of allotments developed on non access roads, namely The Boulevard and Gordons Road but in some other locations as well. In these locations vehicle access will be provided from a side road or rear lane. Australand will prepare a "House Sitting and Design Guidelines" brochure that will provide information to purchasers on the specific access requirements for these allotments. In further support of this a "Notice of Restriction" will be attached to the plan of subdivision.

9.3 Bus routes

Preliminary discussions have taken place with Dysons Bus Service who operate a route which runs along Plenty Road between Whittlesea and Greensborough. They have indicated that it is possible to divert the buses to run through Hillcroft along the collector roads between The Boulevard and McArthurs Lane. Bus stops will be provided at 400 to 500m intervals and can mostly be located adjacent to the side boundaries of lots or next to open space areas.

Until development occurs north of the regional park it is possible for the bus route to remain in Plenty Road. After development commences north of the regional park the bus route can be diverted into the collector road where provision will be made for a U turn movement back along the same route to The Boulevard.

It is possible that with the future western connection of The Boulevard, the bus service through the existing SMLSP area will be extended to cater for the Hillcroft estate. The final route within Hillcroft will depend on the road network at the time and on discussions with Dysons.

9.4 Bicycle and pedestrian linkages

The proposed bicycle and pedestrian linkages through Hillcroft are shown on both the ODP (Figure 4) and the Street Tree and Landscape Master Plan (Figure 5). The pipe track easements provide a valuable recreational cycle/pedestrian corridor between the regional park (ERZ land) and the proposed

wetland area (within the power easement). Footpaths within the residential road network complement this recreational cycle route.

Within The Boulevard a bicycle path is provided on the southern side, ultimately linking through to Mill Park Lakes. A variety of sealed and unsealed shared paths will be available within Hillcroft, within both the open space and local road networks. Pedestrian and cycle access to the nearby regional park, Hawkstowe, and to community and social activities to the south are therefore catered for. The location of Hillcroft is acknowledged as providing an integral link for pedestrian and cycle movements from the future urban area of Mernda to the north.

10.0 Physical Infrastructure

10.1 Stormwater

The southern portion of the Hillcroft ODP area is within the Melbourne Water Upper Henderson Creek Drainage Scheme (UHCDS) with the balance draining naturally east to the Plenty River.

Control of water quantity and quality will be the responsibility of the developer, with financial assistance from Melbourne Water, where appropriate. The land is at the top of the catchment and therefore, the extent of work involved is not anticipated to be significant.

Discussions have been held with Melbourne Water and agreement reached to redirect minor runoff, from the north west of the site, into the upper Henderson Creek catchment via the central lake/retarding basin.

The opportunity to create water features within the estate, to enhance the value and interest of the property, has been utilised. These works will also improve the quality of the storm water leaving the site. A water quality control feature is proposed as part of the Hillcroft ODP, to be located within the power easement and forming part of the area's open space network.

10.2 Sewer

The long term strategy for sewerage the Hillcroft ODP area is to extend the McDonalds Road Branch Sewer from the connection point marked 'D' shown on the Yarra Valley Water Local Sewerage Catchment Plan.

In the short term Hillcroft can be serviced by a temporary rising main which is to be designed and constructed as part of the first stage of the development.

A branch sewer will be constructed through the estate, which forms part of the permanent works. This sewer is expected to be approximately 1km long.

A temporary pump station and sewer outfall rising main to connect the gravity sewer to the existing Findon Road Branch Sewer is to be constructed. The works include a pump station and 2.2km of rising main.

10.3 Water supply

Yarra Valley Water Ltd has advised that the existing 225mm diameter water main on the east of Plenty Road, terminating 300m south of Gordons Road can be extended to service Hillcroft.

The Hillcroft ODP is within the Quarry Hills Zone area with a top water level of 202 metres. The maximum supply level for the Quarry Hill Zone is approximately RL 165 metres. Servicing the land above this contour will be provided by a variable speed pump system.

10.4 Power, Gas, Telecommunications

Electricity, gas and telephone services are readily available and can be provided by the appropriate service authorities.

11.0 Development contributions

11.1 Policy framework

The SMLSP identifies the range of infrastructure and facilities required to serve the future urban development of South Morang. Infrastructure items include land and construction costs for all major roads, community activity centres and the provision of equipment and landscaping for neighbourhood parks.

An infrastructure funding policy details the infrastructure levies which are to apply within the entire South Morang LSP area to achieve the level and form of infrastructure sought. The 'South Morang Local Structure Plan Infrastructure Funding Policy' (December 1995) includes a full break down of the costs attributable to each of these items.

Separate levies have been applied to the 'eastern' and 'western' precincts of the SMLSP area. The levy for the 'western' precinct, as it applies to Hillcroft is \$42,566 per

hectare of developable land. The SMLSP indicates that the levy is to paid at the time of subdivision (or stages thereof), with the option given for carrying out the works 'in-kind'. The provision of land and/ or the construction of buildings and works by the developer can therefore be offset against this levy payable.

11.2 Hillcroft: Contribution Assessment

The development levy due on the Hillcroft Development has been assessed at \$2,677,830 being the net residential area of 62.91ha multiplied by the infrastructure levy of \$42,566ha. The net residential area has been determined from the title area less open space and road widening (see details on page 14). The attached table 3 provides details of the works to be funded by the development contributions. Australand proposes to carry out the following works, as 'works in-kind', in the development of Hillcroft:

- Provision of land and construction of the full width of The Boulevard between Plenty Road and the pipe track (east of the power easement)
- Provision of land only for the balance length of The Boulevard
- Provision of park equipment and landscaping
- Provision of land only for Gordons Road.

11.3 Open Space Contribution

The SMLSP requires a total contribution of 8% open space for all developments. The open space can comprise 5% unencumbered and 3% encumbered land. Hillcroft provides a total unencumbered land area of 2.77 ha (4.21%), and an encumbered land area including the ERZ land of 12.89 ha (16.2%).

The open space provided consists of a main neighbourhood park, a habitat link and several smaller pocket parks provided specifically for the retention of significant vegetation.

Total Australand Open Space liability = 5.67Ha

Total Australand Actual Open Space Contribution = 15.66Ha

Open Space Type	Required Area (Ha)	Actual Provided Area (Ha)	Surplus/Deficit Area (ha)
5% Unencumbered (65.68Ha)	3.281Ha	0.895 (Habitat link) 0.900 (Habitat link tree protection)	Deficit of 0.51ha

		0.975 (Pocket parks)	
		2.77 Ha	
3% Encumbered (79.65Ha)	2.39	7.09	Surplus of 4.7ha
Environmental Rural Zone		5.80ha	Surplus of 5.80ha

11.4 Works in kind

Gordons Road

Hillcroft does not rely on Gordons Road as a primary point of access to the development. Because of the uncertainty of timing of the developments west of Hillcroft along Gordons Road, and the uncertainty of the ultimate form that it will take, it is proposed that Australand will not carry out any construction works in Gordons Road as part of the development of Hillcroft. It is proposed that construction of Gordons Road be carried out by others at some future time, to be determined by Council, and that the cost of these works be funded by the Development Contribution Fund.

The Boulevard

The main access to Hillcroft will be from Plenty Road via The Boulevard. It is therefore appropriate that The Boulevard be fully constructed as part of the stage 1 and stage 3 subdivision works. It will extend up to the western boundary of stage 3. No further construction of The Boulevard is proposed to be carried out by Australand.

The Development Contribution Plan allows for "works in kind" to be provided in lieu of a cash contribution. It is proposed that these works be constructed under this arrangement.

12.0 Site Staging

Development of Hillcroft is proposed to commence in early 2001. The first stage of the estate will be that area between the transmission lines and The Lakes Boulevard.

It is intended that construction of stages 2, 3, 4 and 5, anticipated to make approximately 125 additional lots available, will be commenced shortly after the start of Stage 1. Subsequent development of Hillcroft will occur over the next five years or more in line with market demand. Development will proceed from Stage one, progressively developing through to the McArthurs Lane frontage.

A staging plan has not yet been determined for the balance of the development north of the transmission line easement. However development will generally proceed in a north westerly direction to the base of the Quarry Hills and then west until the limit of the drainage and sewerage catchments are reached. Development will then proceed north along the collector road and then finally the most western portion of the site will be developed.

It is intended that a plan for the northern area of the Hillcroft ODP will be developed and forwarded to the Whittlesea City Council for information in the near future.

Table 3: Hillcroft: Development Contribution Assessment

ITEM NO.	ITEM	EXPENDITURE REQUIRED AFTER NATIONAL MUTUAL CONTRIBUTION (\$)	% OF TOTAL	AUSTRALAND (\$)
1 *	The Boulevard - Land - Construction	\$332,976.00 \$3,781,840.00	2.667% 30.292%	\$71,418.97 \$811,154.92
2	Findon Road - Land - Construction	\$501,165.00 \$1,354,500.00	4.014% 10.849%	\$107,493.30 \$290,522.43
3 *	Gordons Road (Sub-Arterial) - Land and Construction	\$1,795,438.00	14.381%	\$385,097.83
4	N-S 1 - Land and Construction	\$250,000.00	2.002%	\$53,621.71
5	N-S 2 - Land and Construction	\$2,403,521.00	19.252%	\$515,523.63
6	Lakeside CAC - Land and Construction	\$1,300,000.00	10.413%	\$278,832.90
7	Red Gum CAC - Land and Construction	\$600,000.00	4.806%	\$128,692.11
8 *	Equipping and Landscaping Neighbourhood Parks etc.	\$165,368.00	1.325%	\$35,469.26
TOTAL		\$12,484,808.00	100.001%	\$2,677,827.06

Note: Excludes intersection costs

* Infrastructure items for which in-kind contributions through direct works possible

Note: Developer contribution calculated, as per South Morang Local Structure Plan, at a rate of \$42,566 per hectare (developable area)

FIGURES

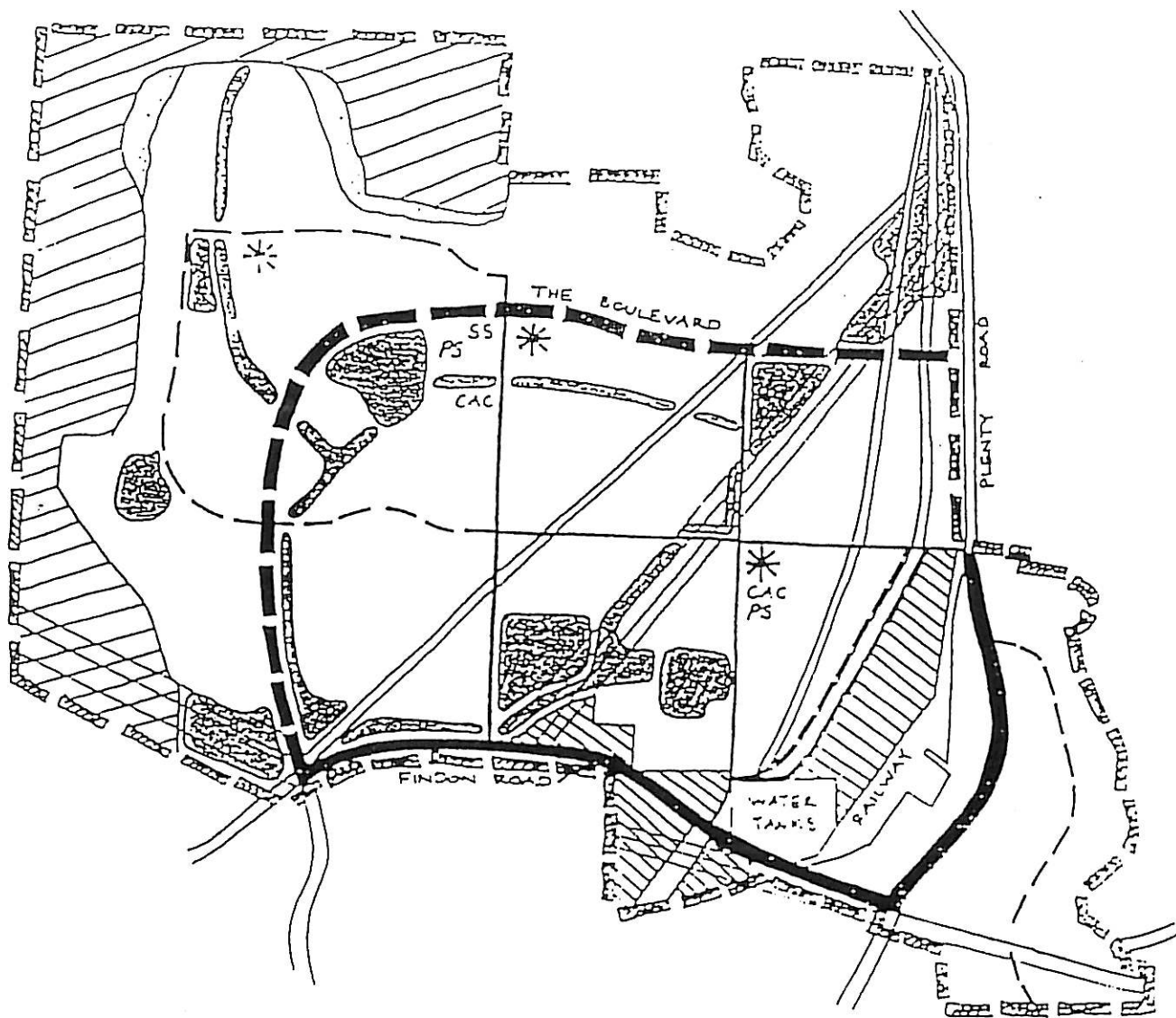


FIGURE 1

South Morang
Local Structure Plan Area

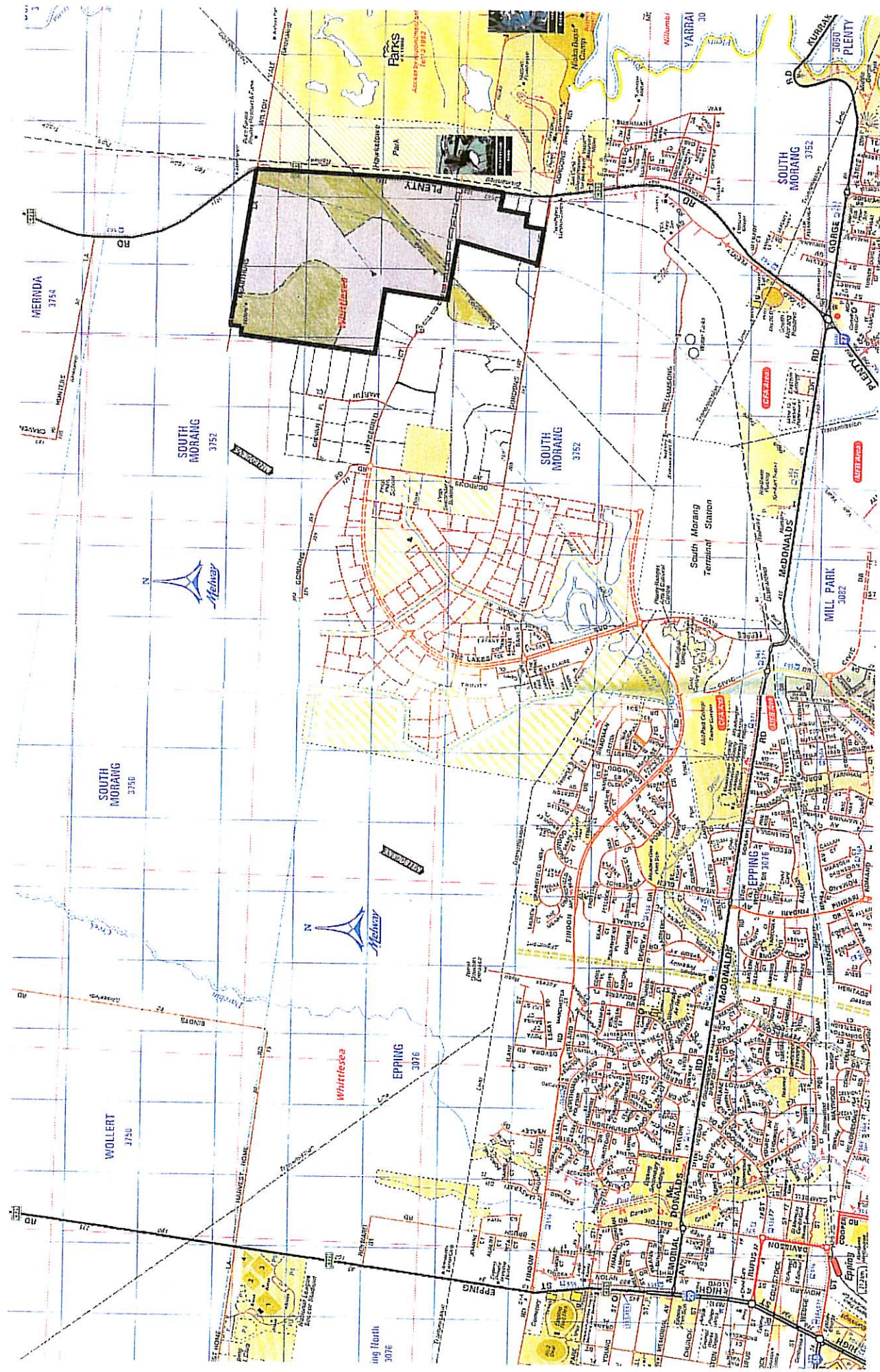


FIGURE 2

Site Location Plan
Hillcroft

OPPORTUNITIES AND CONSTRAINTS



Existing vegetation
The property is predominantly pasture grass on flood plain. Pasture grass and weed species dominate the site. However a small area of vegetation in the south east of the site contains some indigenous understory vegetation (Ecological Assessment March 2003).

Measure White Pelicans dominate the inventory. Other less common species of White Pelicans include Blackwood, Swamp Gum and Yellow Pine. These are found in the flood plain of the site. Some specimens of Swamp Gum and Red Sheoak are found on the lower slopes of the site. Opportunity exists to improve the quality of the vegetation in the flood plain by planting native species of trees and shrubs.



- Existing trees**
- Red Gum (Eucalyptus sp.)
- Other Indigenous Trees (including Acacia mangium and Eucalyptus sp.)
- Exotic Trees (including Pinus, Populus, Ginkgo, etc.)
- Cypress Trees (Cupressus sp.)
- Heritage Trees (Heritage trees are those trees that are considered to be of historical or cultural significance)



- Tree condition** (as per Arbor Report June 2003)
- V2 Good - very good (no decay, no structural damage)
- G Good (minor decay, minor structural damage)
- F Fair (moderate decay, moderate structural damage)
- D Dead or dying (no structural value)



Drainage reserve
A drainage reserve is proposed to accommodate a 1 in 100 year flood. The drainage reserve runs parallel to the site boundary. It is proposed to incorporate the drainage reserve into the site boundary.



High voltage transmission assessment
The power transmission assessment consists of three lines running parallel to the site boundary. The assessment is based on the proximity of the lines to the site boundary.



Melbourne Water Pipe Network
Three 1500mm diameter water pipes run parallel to the site boundary. The pipes are made of concrete and are in good condition.



Environmental Rural Zone
The Environmental Rural Zone is a designated area for rural use. It is located in the south east of the site.



Neighbourhood Parks
The South Murrumbidgee LSP is a designated area for rural use. It is located in the south east of the site.



Climate Change Assessment
The climate change assessment is based on the proximity of the site to the coast. It is located in the south east of the site.



Archaeological artefacts
Archaeological artefacts are located in the south east of the site. They include stone walls, stone foundations, and stone structures.



Potential vehicular entry points
Potential vehicular entry points are located in the south east of the site. They include the site boundary and the site access.



Vehicular circulation
Main vehicular traffic runs along the site boundary. It is located in the south east of the site.



Proposed light rail
The South Murrumbidgee LSP is a designated area for rural use. It is located in the south east of the site.



Interface
The site boundary is a designated area for rural use. It is located in the south east of the site.



Potential pedestrian links
The site boundary is a designated area for rural use. It is located in the south east of the site.



Positive views
Long panoramic views from the site, particularly from the elevated areas. Short views of the site are also possible.



Negative views
Potential views of the site from the elevated areas. Short views of the site are also possible.

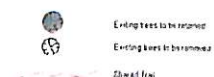


Elevated areas
Elevated areas are located in the south east of the site. They include the site boundary and the site access.

FIGURE 3
Existing Conditions and Site Analysis Plan
Hillcroft



LANDSCAPE MASTERPLAN KEY



PROPOSED STREET TREES

BOTANICAL NAME	COMMON NAME	APPLICATION
<i>Allocasuarina verticillata</i>	Drooping Sheoak	To be planted informally adjacent to wildlife corridor
<i>Angophora costata</i>	Apple Myrtle	To be planted on higher slopes to soften the visual prominence of houses
<i>Eucalyptus leucocorym</i>	Yellow Gum	To be planted along roads connecting to wildlife corridor and open space
<i>Eucalyptus mannifera</i> ssp. <i>maculosa</i>	Butter Gum	
<i>Eucalyptus melliodora</i>	Yellow Box	To be planted adjacent to open space areas
Alternative species to <i>Eucalyptus melliodora</i> include:		Note: Street trees on boundary adjacent to power easement are subject to Powernet approval
• <i>Allocasuarina verticillata</i>	Drooping Sheoak	
• <i>Eucalyptus torquata</i>	Coast Gum	
• <i>Eucalyptus cana</i>	Silver Wattle	
• <i>Lagerstroemia indica</i>	Crape Myrtle	
• <i>Melastomaceae</i> sp.	Ironbark	
<i>Cornus ficoides</i>	Red-flowering Gum	Trees used adjacent to car tree
<i>Lagerstroemia indica</i>	Crape Myrtle	To be used in cul-de-sac and local streets to provide contrast in colour and texture
<i>Malus floribunda</i>	Crab Apple	To be used in cul-de-sac and local streets to provide contrast in colour and texture
<i>Malus domestica</i>	White Crab	To be used at secondary entry points into development
<i>Platanus orientalis</i> 'Digitata' / 'Insularis'	Plane Tree	To be used in the nature strip of Boulevard and along Plenty Road (no Plane Trees planting under powerlines)
<i>Populus nigra</i> 'Italica'	Lombardy Poplar	To be used along edges of the boulevard central median in boulevard (no Poplar Tree planting under powerlines)
<i>Quercus rubra</i>	Red Oak	To be used along the collector road and to denote main vehicular circulation
<i>Schinus molle</i>	Peppercorn	To be used adjacent to the homestead

PROPOSED TREES IN OPEN SPACE

Additional trees to be used in open space:	Other Plant List:
• <i>Eucalyptus danielliana</i>	Wattle
• <i>Eucalyptus globulus</i>	Wattle
• <i>Eucalyptus saligna</i>	Wattle
• <i>Eucalyptus nitens</i>	Wattle
• <i>Banksia marginata</i>	Wattle
• <i>Arctostaphylos uva-ursi</i>	Wattle
• <i>Arctostaphylos uva-ursi</i>	Wattle
• <i>Callistemon viminalis</i>	Wattle
• <i>Callistemon viminalis</i>	Wattle
• <i>Callistemon viminalis</i>	Wattle
• <i>Callistemon viminalis</i>	Wattle

FIGURE 5

**Street Tree and Landscape Masterplan
Hillcroft**





DRAWING KEY:

-  Existing Trees to be retained
-  Existing trees to be removed
- Contours 1m Interval
-  Proposed shared paths
-  Proposed Water Body
-  Open Space
-  Residential

DEVELOPMENT LAYOUT PLAN: Hillcroft

0 50 100 150 200
SCALE IN METRES

DWG 5550 L&I
FEBRUARY 2001
PLAN EDITION: 11



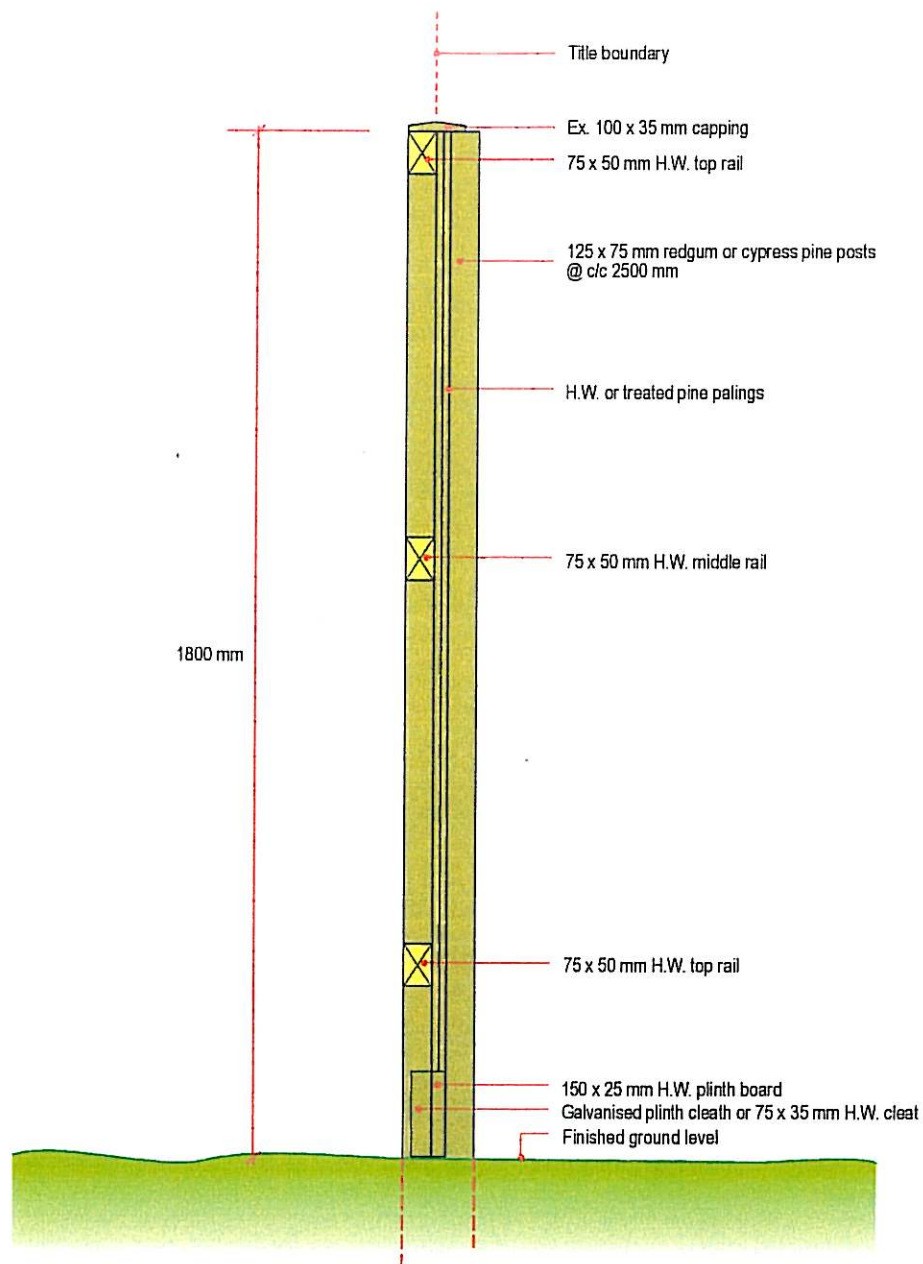


FIGURE 6

Fencing Design to Quarry Hills
Hillcroft

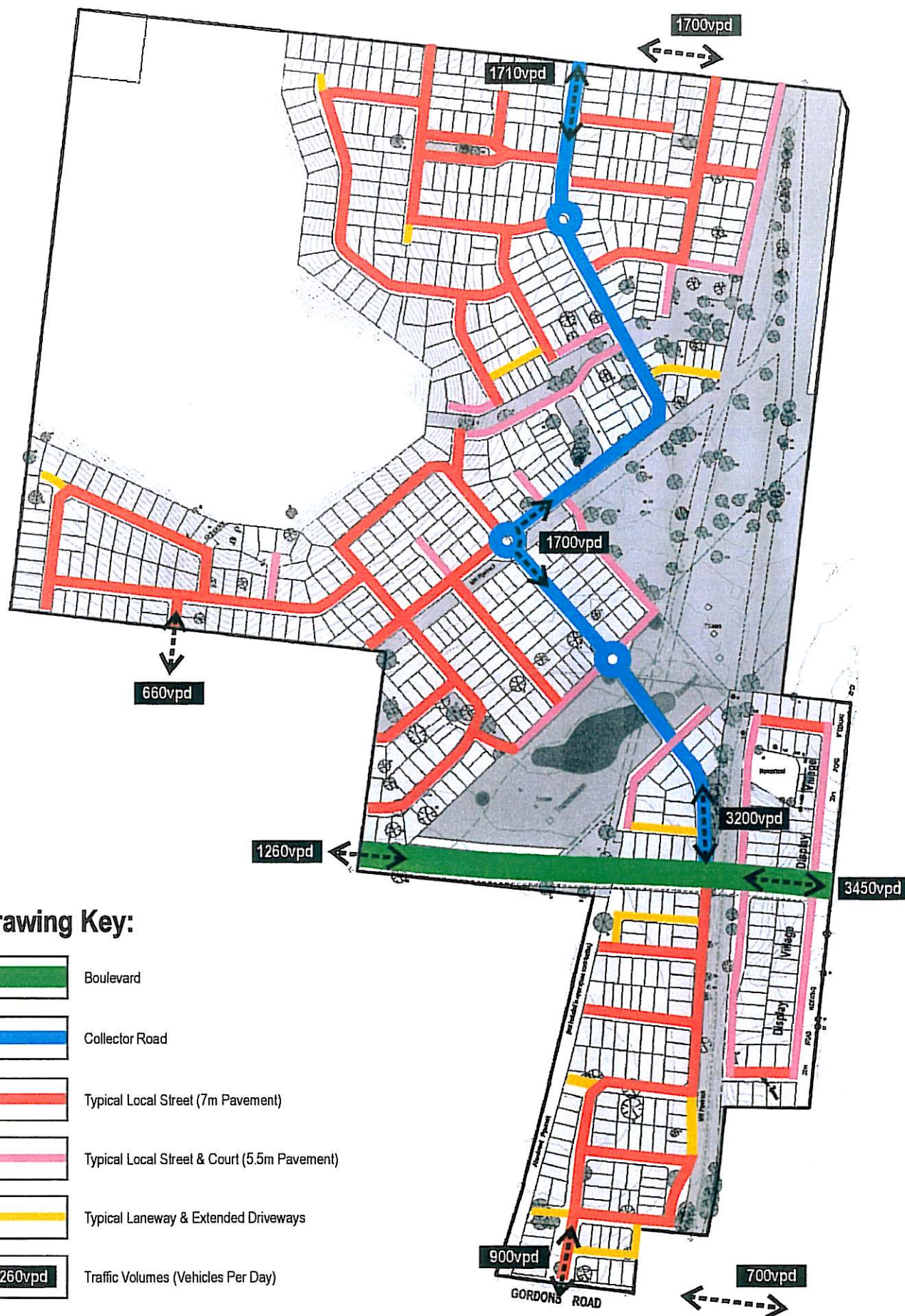
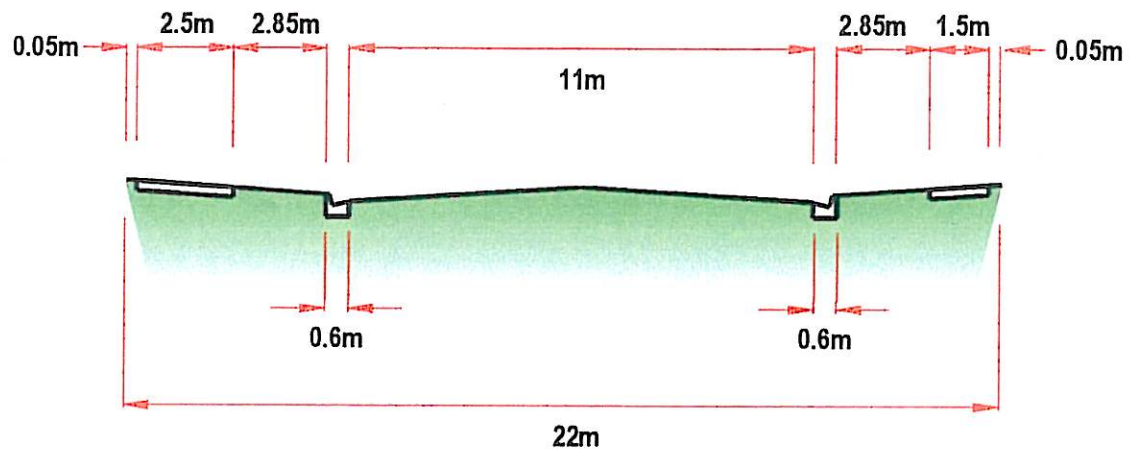
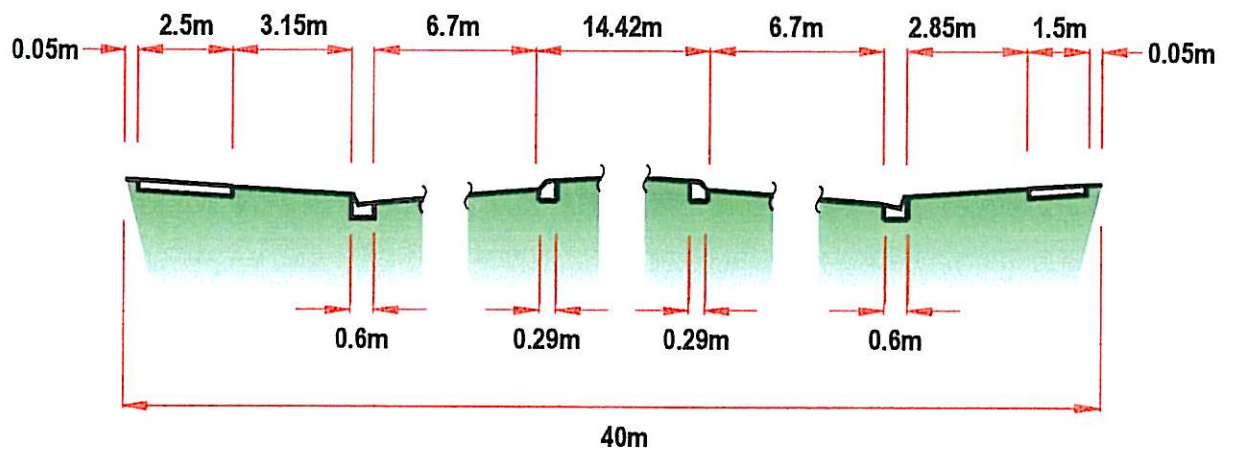


FIGURE 7

Road Hierarchy & Traffic Volumes Hillcroft



GORDONS ROAD



TYPICAL BOULEVARD SECTION

FIGURE 8

Cross Sections
The Boulevard and Gordons Road

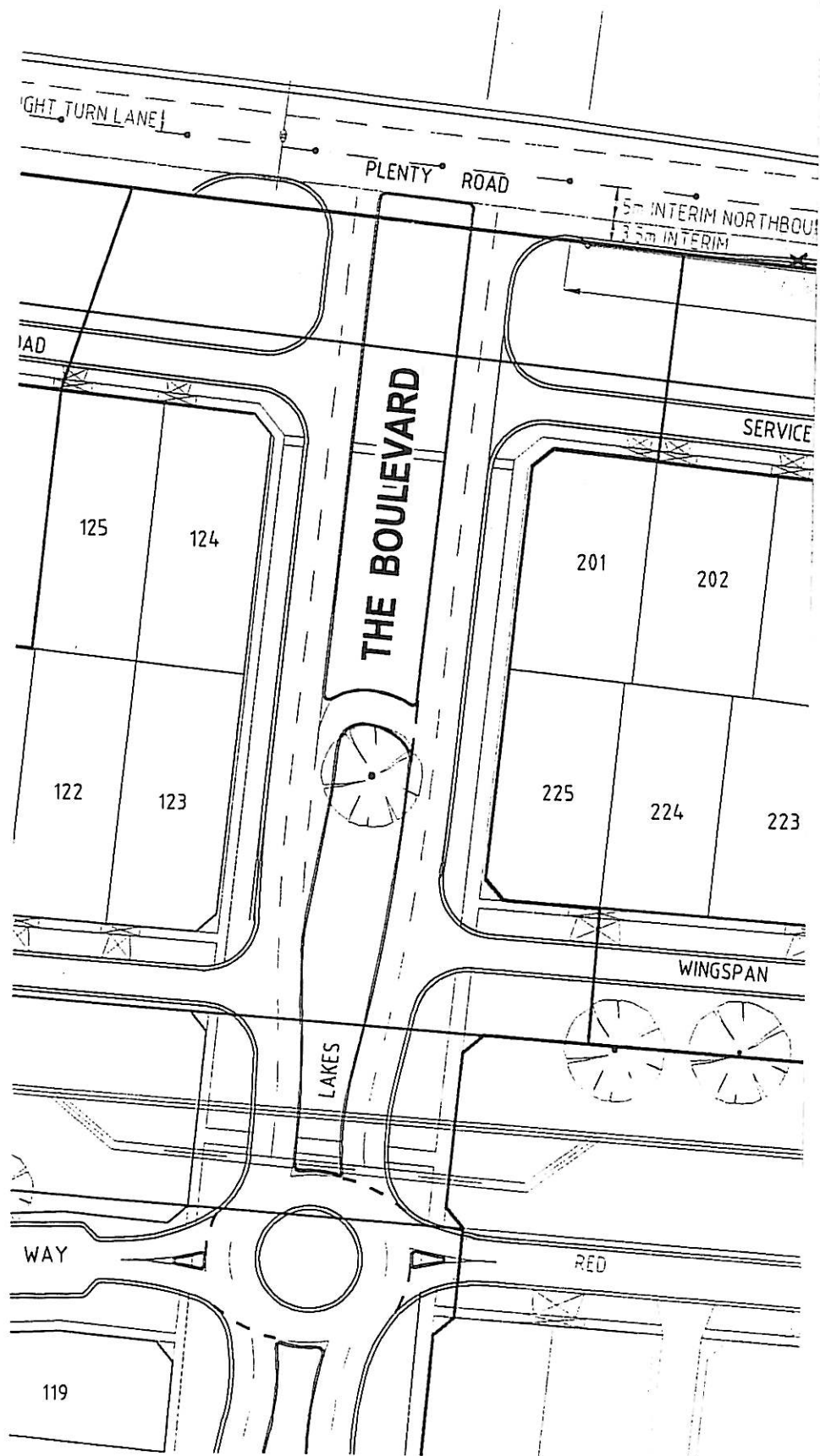
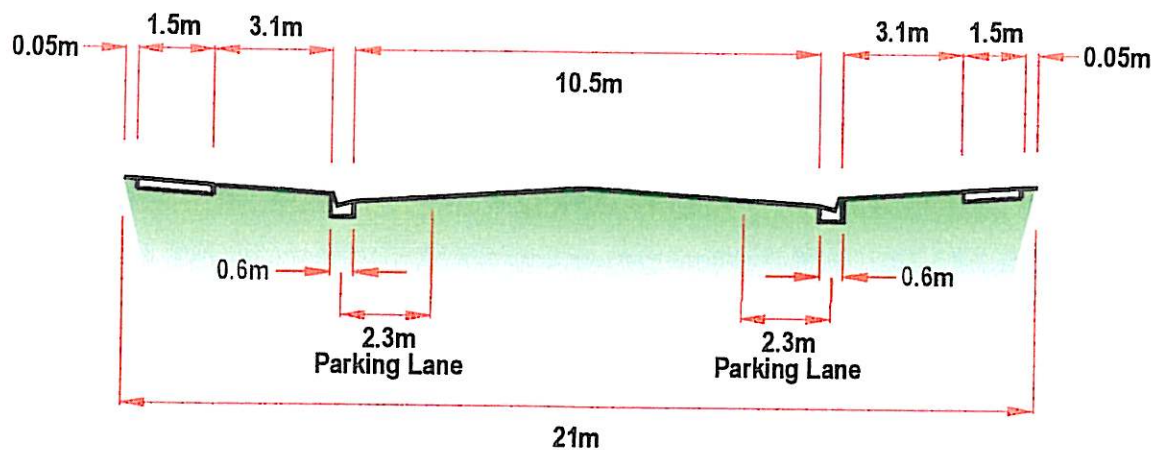
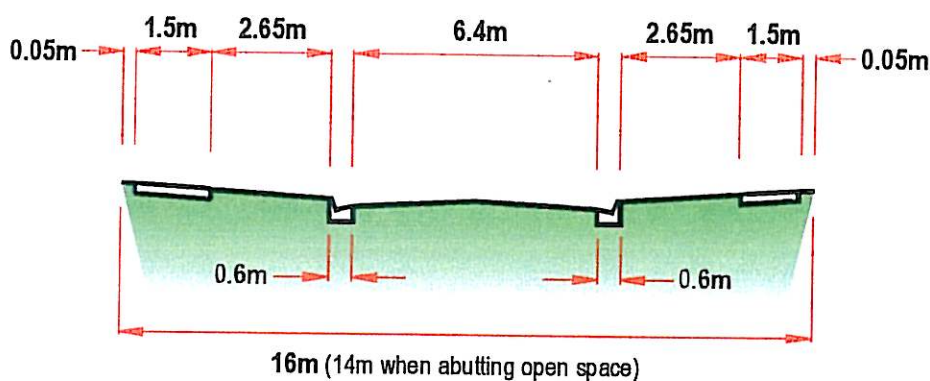


FIGURE 9

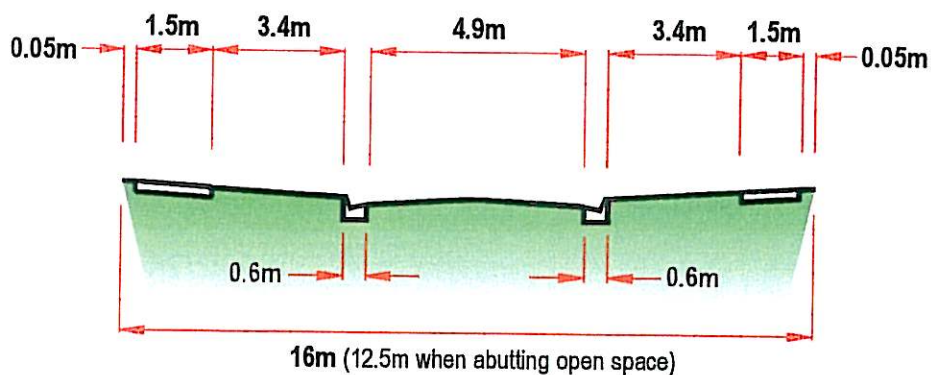
Plenty Road & The Boulevard Intersection
Conceptual Layout (Interim)



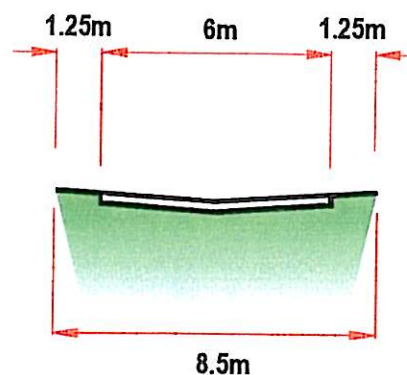
COLLECTOR ROAD
(With Parking)



TYPICAL LOCAL STREET
(7m Pavement)



TYPICAL LOCAL STREET & COURT



TYPICAL LANEWAY

FIGURE 10

Cross Sections
Collector and Local Roads

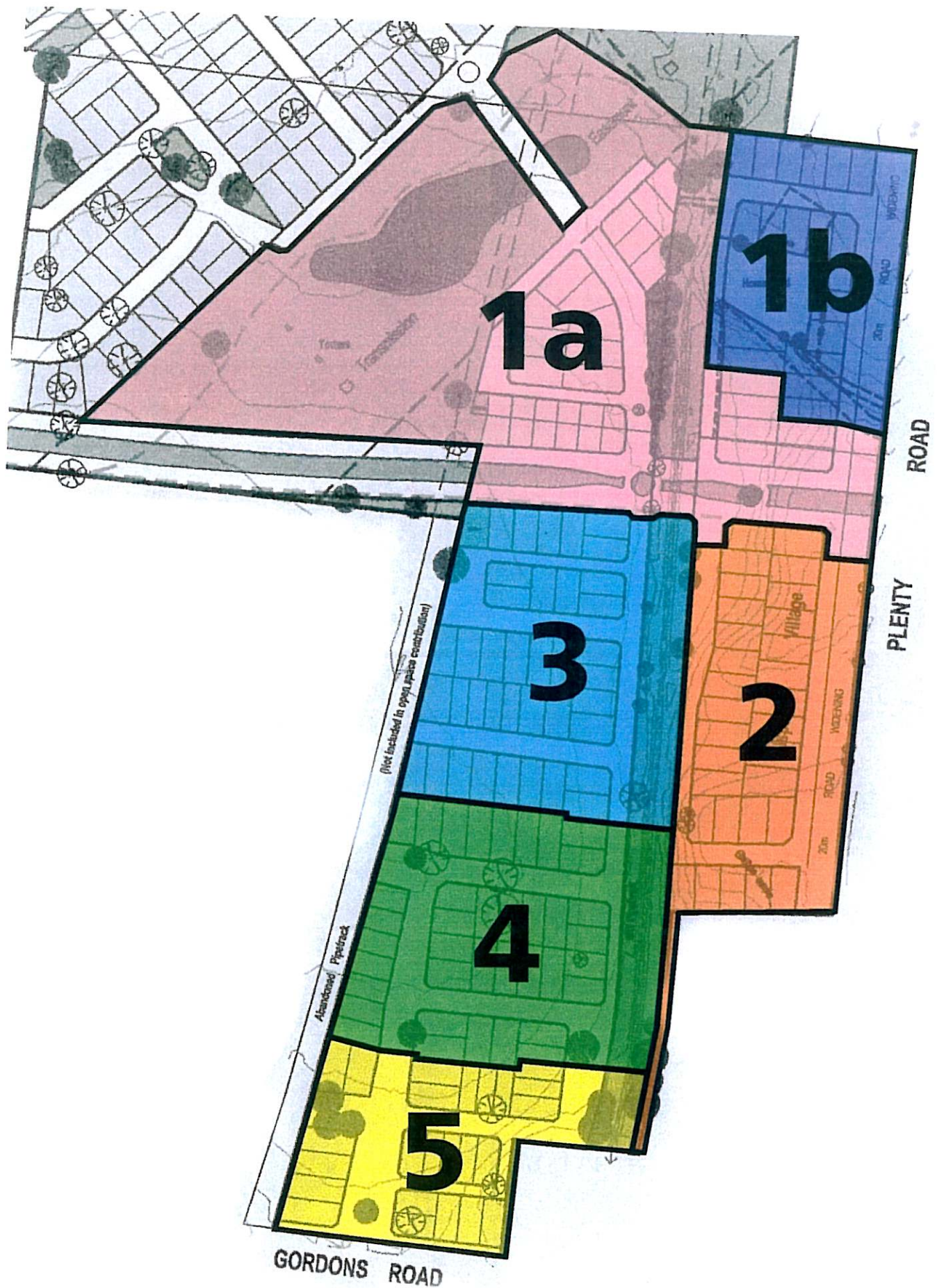


FIGURE 11

Stage One
Hillcroft

APPENDIX 1A

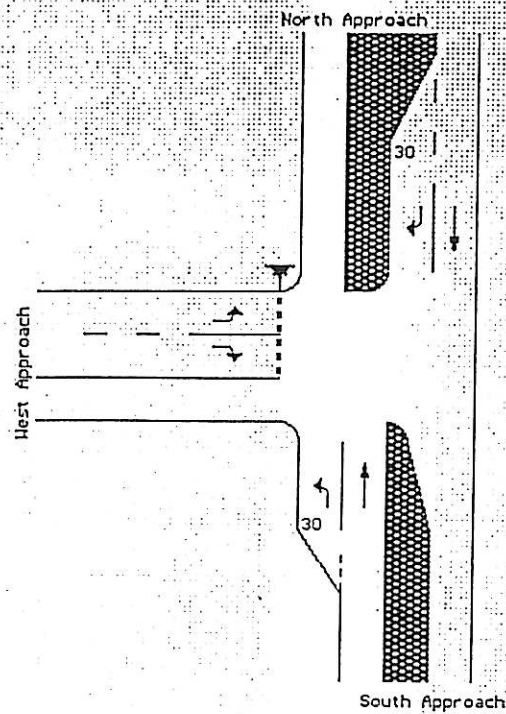
**THE BOULEVARD/PLENTY
ROAD INTERSECTION
(INTERIM INSIGNALISED):
SIDRA ANALYSIS**

User: A0603

Coomes Consulting Group

GEOMETRY

1^N



Legend

SO-Short
lane
length
(metres)

ARRB TR SIDGRA
File: BOULEV6
Esc-Close Window

Coomes Consulting Group

Level 2, 24 Albert R

Registered User No. A0605

Time and Date of Analysis 10:56 AM, 6 Oct 2000

LENTY ROAD / THE BOULEVARD INTERIM TRAFFIC ANALYSIS
AM PEAK HOUR ANALYSIS

* BOULEV6 *

Intersection ID: A

Give-Way Sign Controlled Intersection

UN INFORMATION

* Basic Parameters:

Intersection Type: Unsignalised - Give Way

Driving on the left-hand side of the road

Input data specified in Metric units

Default Values File No. 1

Peak flow period (for performance): 60 minutes

Unit time (for volumes): 60 minutes (Total Flow Period)

Delay definition: Control delay

Geometric delay included

Delay formula: SIDRA standard

Level of Service based on: Delay (HCM)

Queue definition: Back of queue, 95th_Percentile

LENTY ROAD / THE BOULEVARD INTERIM TRAFFIC ANALYSIS
AM PEAK HOUR ANALYSIS

* BOULEV6 *

Intersection ID: A

Give-Way Sign Controlled Intersection

Table S.3 - INTERSECTION PARAMETERS

Degree of saturation (highest)	=	0.678
Practical Spare Capacity (lowest)	=	18 %
Total vehicle flow (veh/h)	=	1152
Total vehicle capacity, all lanes (veh/h)	=	7628
Average intersection delay (s)	=	5.6
Largest average movement delay (s)	=	46.4
Total vehicle delay (veh-h/h)	=	1.78
Largest back of queue, 95% (m)	=	41
Performance Index	=	22.59
Total fuel (L/h)	=	177.5
Total cost (\$/h)	=	522.28
Intersection Level of Service	=	A
Worst movement Level of Service	=	E

LENTY ROAD / THE BOULEVARD INTERIM TRAFFIC ANALYSIS
AM PEAK HOUR ANALYSIS

* BOULEV6 *

Intersection ID: A

Give-Way Sign Controlled Intersection

Table S.6 - INTERSECTION PERFORMANCE

Total Flow (veh/h)	Total Delay (veh-h/h)	Aver. Delay (sec)	Prop. Queued	Eff. Stop Rate	Perf. Index	Aver. Speed (km/h)
--------------------	-----------------------	-------------------	--------------	----------------	-------------	--------------------

INTERSECTION:

1152 1.78 5.6 0.103 0.19 22.59 85.6

PLENTY ROAD / THE BOULEVARD INTERIM TRAFFIC ANALYSIS
AM PEAK HOUR ANALYSIS

* BOULEV6 *

Intersection ID: A
Give-Way Sign Controlled Intersection

Table S.7 - LANE PERFORMANCE

		Arv					Q u e u e		
Lane	Mov	Flow	Cap	Deg.	Aver.	Eff.	95% Back		Short
No.	No.	(veh/h)	(veh/h)	Satn x	Delay (sec)	Stop Rate	----- (vehs)	(m)	Lane (m)

South: South Approach									
1 L	1	45	1800	0.025	14.1	0.75	0.0	0	30
2 T	2	195	1887	0.103	0.0	0.00	0.0	0	

North: North Approach									
1 T	8	775	1888	0.410	0.0	0.00	0.0	0	
2 R	9	6	1120	0.005	14.9	0.67	0.0	0	30

West: West Approach									
1 L	10	11	756	0.015	11.9	0.63	0.1	1	
2 R	12	120	177	0.678	46.4	1.47	6.6	41	

PLENTY ROAD / THE BOULEVARD INTERIM TRAFFIC ANALYSIS
AM PEAK HOUR ANALYSIS

* BOULEV6 *

Intersection ID: A
Give-Way Sign Controlled Intersection

Table S.10 - MOVEMENT CAPACITY AND PERFORMANCE SUMMARY

Mov	Mov	Arv	Total	Lane	Deg.	Aver.	Eff.	95%	Perf.
No.	Typ	Flow	Cap.	Util	Satn	Delay	Stop	Back of	Index
		(veh	(veh				Rate	Queue	
		/h)	/h)	(%)	x	(sec)		(veh)	

South: South Approach									
1	L	45	1800	100	0.025	14.1	0.75	0.0	1.01
2	T	195	1887	100	0.103	0.0	0.00	0.0	2.72

North: North Approach									
8	T	775	1888	100	0.410	0.0	0.00	0.0	10.81
9	R	6	1120	100	0.005	14.9	0.67	0.0	0.14

West: West Approach									
10	L	11	756	100	0.015	11.9	0.63	0.1	0.36
12	R	120	177	100	0.678*	46.4	1.47	6.6	7.55

< Reduced capacity due to a short lane effect

* Maximum degree of saturation

PLENTY ROAD / THE BOULEVARD INTERIM TRAFFIC ANALYSIS
AM PEAK HOUR ANALYSIS

* BOULEV6 *

Intersection ID: A
Give-Way Sign Controlled Intersection

Table S.12A - FUEL CONSUMPTION, EMISSIONS AND COST - TOTAL

Mov No.	Fuel Total L/h	Cost Total \$/h	HC Total kg/h	CO Total kg/h	NOX Total kg/h	CO2 Total kg/h	Lead Total kg/h
INTERSECTION:	177.5	522.28	0.526	9.66	1.121	440.5	0.01420

PLENTY ROAD / THE BOULEVARD INTERIM TRAFFIC ANALYSIS
1 PEAK HOUR ANALYSIS

* BOULEV6 *

Intersection ID: A

Give-Way Sign Controlled Intersection

Table S.14 - SUMMARY OF INPUT AND OUTPUT DATA

Lane No.	Arrival Flow (veh/h)				%HV	Adj. Basic	Eff (secs)	Grn 1st 2nd	Deg Sat x	Aver. Delay (sec)	95% Queue (m)	Shrt Lane (m)
	L	T	R	Tot								
South: South Approach												
L	45	0	0	45	4				0.025	14.1	0	30
T	0	195	0	195	5				0.103	0.0	0	
	45	195	0	240	5				0.103	2.6	0	
North: North Approach												
T	0	775	0	775	5				0.410	0.0	0	
R	0	0	6	6	17				0.005	14.9	0	30
	0	775	6	781	5				0.410	0.1	0	
West: West Approach												
L	11	0	0	11	9				0.015	11.9	1	
R	0	0	120	120	5				0.678	46.4	41	
	11	0	120	131	5				0.678	43.5	41	
ALL VEHICLES												
	Tot				%				Max	Aver.	Max	
	Arv.				HV				X	Delay	Queue	
	1152				5				0.678	5.6	41	

Total flow period = 60 minutes. Peak flow period = 60 minutes.

Note: Basic Saturation Flows are not adjusted at roundabouts or sign-controlled intersections and apply only to continuous lanes.

Values printed in this table are back of queue.

PLENTY ROAD / THE BOULEVARD INTERIM TRAFFIC ANALYSIS
1 PEAK HOUR ANALYSIS

* BOULEV6 *

Intersection ID: A

Give-Way Sign Controlled Intersection

Table S.15 - CAPACITY AND LEVEL OF SERVICE (HCM STYLE)

Mov No.	Mov Typ	Total Flow (veh	Total Cap. (veh	Deg. of Satn	Aver. Delay	LOS
------------	------------	-----------------------	-----------------------	--------------------	----------------	-----

/h) /h) (v/c) (sec)

South: South Approach

1 L	45	1800	0.025	14.1	B
2 T	195	1887	0.103	0.0	A
	240	3687	0.103	2.6	A

North: North Approach

8 T	775	1888	0.410	0.0	A
9 R	6	1120<	0.005	14.9	B
	781	3008	0.410	0.1	A

West: West Approach

10 L	11	756	0.015	11.9	B
12 R	120	177	0.678*	46.4	E
	131	933	0.678	43.5	E

ALL VEHICLES:	1152	7628	0.678	5.6	A
---------------	------	------	-------	-----	---

INTERSECTION:	1152	7628	0.678	5.6	A
---------------	------	------	-------	-----	---

Level of Service calculations are based on average control delay including geometric delay (HCM criteria), independent of the current delay definition used. For the criteria, refer to the "Level of Service" topic in the SIDRA Output Guide or the Output section of the on-line help.

< Reduced capacity due to a short lane effect

* Maximum v/c ratio, or critical green periods

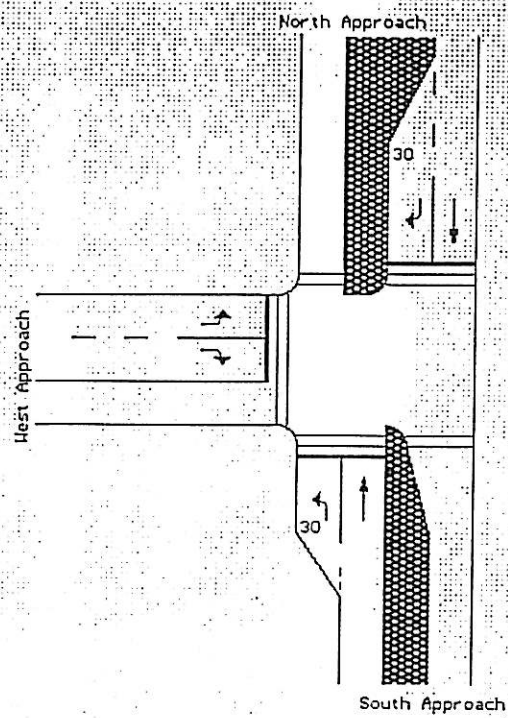
--- End of SIDRA Output ---

APPENDIX 1B

**THE BOULEVARD/PLENTY
ROAD INTERSECTION
(INTERIM SIGNALISED):
SIDRA ANALYSIS**

User: 1

GEOMETRY



Legend

30-Short
lane
length
(metres)

ARAB TR SIDGRA
File: BOULEV2
Esc-Close Window

Registered User No. .
Time and Date of Analysis 9:11 AM, 5 Oct 2000

LENTY ROAD / THE BOULEVARD INTERIM TRAFFIC ANALYSIS
AM PEAK HOUR ANALYSIS

* BOULEV2 *

Intersection ID: A

Fixed-Time Signals, Cycle Time = 50

IN INFORMATION

* Basic Parameters:

Intersection Type: Signalised - Fixed Time

Driving on the left-hand side of the road

Input data specified in Metric units

Default Values File No. 1

Peak flow period (for performance): 60 minutes

Unit time (for volumes): 60 minutes (Total Flow Period)

Delay definition: Control delay

Geometric delay included

Delay formula: SIDRA standard

Level of Service based on: Delay (HCM)

Queue definition: Back of queue, 95th_Percentile

* No. of Main (Timing-Capacity) Iterations = 1

Comparison of last two iterations:

Difference in intersection degree of satn = 0.0 %

Difference in total vehicle capacity = 0.0 %

Largest difference in eff. green times = 0 secs

(max. value for stopping = 0 secs)

LENTY ROAD / THE BOULEVARD INTERIM TRAFFIC ANALYSIS
AM PEAK HOUR ANALYSIS

* BOULEV2 *

Intersection ID: A

Fixed-Time Signals, Cycle Time = 50

Table S.3 - INTERSECTION PARAMETERS

Critical Movements: 8, 12

L= 23 Y= 0.410 U= 0.456 T= 45.8

Cycle Time:

Minimum	Maximum	Practical	Chosen
36	120	42	50

Degree of saturation (highest)	=	0.760
Practical Spare Capacity (lowest)	=	18 %
Total vehicle flow (veh/h)	=	1212
Total pedestrian flow (ped/h)	=	3
Total vehicle capacity, all lanes (veh/h)	=	3855
Average intersection delay (s)	=	13.7
Largest average movement delay (s)	=	27.3
Total vehicle delay (veh-h/h)	=	4.61
Total pedestrian delay (ped-h/h)	=	0.01
Largest back of queue, 95% (m)	=	110
Performance Index	=	42.80
Total fuel (L/h)	=	222.2
Total cost (\$/h)	=	676.73

Intersection Level of Service = B
Worst movement Level of Service = C

LENTY ROAD / THE BOULEVARD INTERIM TRAFFIC ANALYSIS
AM PEAK HOUR ANALYSIS

* BOULEV2 *

Intersection ID: A
Fixed-Time Signals, Cycle Time = 50

Table S.4 - PHASE INFORMATION

Phase Change Times: 0, 32
Phase Green Times: 27, 13

Current Phase Sequence No.: 1
Input phase sequence: A B
Output phase sequence: A B

LENTY ROAD / THE BOULEVARD INTERIM TRAFFIC ANALYSIS
AM PEAK HOUR ANALYSIS

* BOULEV2 *

Intersection ID: A
Fixed-Time Signals, Cycle Time = 50

Table S.6 - INTERSECTION PERFORMANCE

Total Flow (veh/h)	Total Delay (veh-h/h)	Aver. Delay (sec)	Prop. Queued	Eff. Stop Rate	Perf. Index	Aver. Speed (km/h)
--------------------	-----------------------	-------------------	--------------	----------------	-------------	--------------------

PEDESTRIANS:

3	0.01	14.4	0.747	0.75	0.10	3.4
---	------	------	-------	------	------	-----

ALL VEHICLES:

1212	4.61	13.7	0.781	0.73	42.70	73.9
------	------	------	-------	------	-------	------

INTERSECTION:

1215	4.62	13.7	0.781	0.73	42.80	73.6
------	------	------	-------	------	-------	------

LENTY ROAD / THE BOULEVARD INTERIM TRAFFIC ANALYSIS
AM PEAK HOUR ANALYSIS

* BOULEV2 *

Intersection ID: A
Fixed-Time Signals, Cycle Time = 50

Table S.7 - LANE PERFORMANCE

Lane No.	Mov No.	Effective Red and Green Times (sec)				Arr Flow Cap Deg.			Aver. Delay (sec)	Eff. Stop Rate	Queue		
		R1	G1	R2	G2	(veh/h)	(veh/h)	(x)			95% Back (vehs)	(m)	Shrt Lane (m)

South: South Approach

1 L	1	23	27	0	0	45	502	0.090	20.0	0.75	0.8	5	30
2 T	2	23	27	0	0	195	1019	0.191	6.4	0.45	3.5	22	

North: North Approach

1 T	8	23	27	0	0	775	1020	0.760	11.8	0.79	17.4	110	
2 R	9	25	25	0	0	6	394	0.015	21.0	0.72	0.1	1	30

West: West Approach

1 L	10	37	13	0	0	11	453	0.024	25.1	0.69	0.3	2
2 R	12	37	13	0	0	180	466	0.386	27.3	0.80	5.2	32

PLENTY ROAD / THE BOULEVARD INTERIM TRAFFIC ANALYSIS

* BOULEV2 *

M PEAK HOUR ANALYSIS

Intersection ID: A

Fixed-Time Signals, Cycle Time = 50

Table S.10 - MOVEMENT CAPACITY AND PERFORMANCE SUMMARY

Mov No.	Mov Typ	Arv Flow (veh/h)	Total Cap. (veh/h)	Lane Util (%)	Deg. Satn x	Eff. Grn 1st Grn	Eff. Grn 2nd Grn	Aver. Delay (sec)	Eff. Stop Rate	95% Back of Queue (veh)	Perf. Index
South: South Approach											
1 L		45	502<	100	0.090	27		20.0	0.75	0.8	1.40
2 T		195	1019	100	0.191	27		6.4	0.45	3.5	5.06
North: North Approach											
8 T		775	1020	100	0.760*	27*		11.8	0.79	17.4	26.78
9 R		6	394<	100	0.015	25		21.0	0.72	0.1	0.19
East: West Approach											
10 L		11	453	100	0.024	13		25.1	0.69	0.3	0.51
12 R		180	466	100	0.386	13*		27.3	0.80	5.2	8.76
Pedestrians											
51	(Ped)	1	3200	100	0.000	8		17.6	0.84	0.0	0.03
55	(Ped)	1	3200	100	0.000	8		17.6	0.84	0.0	0.03
57	(Ped)	1	8800	100	0.000	22		7.8	0.56	0.0	0.03

< Reduced capacity due to a short lane effect

* Maximum degree of saturation, or critical green periods

PLENTY ROAD / THE BOULEVARD INTERIM TRAFFIC ANALYSIS

* BOULEV2 *

M PEAK HOUR ANALYSIS

Intersection ID: A

Fixed-Time Signals, Cycle Time = 50

Table S.12A - FUEL CONSUMPTION, EMISSIONS AND COST - TOTAL

Mov No.	Fuel Total L/h	Cost Total \$/h	HC Total kg/h	CO Total kg/h	NOX Total kg/h	CO2 Total kg/h	Lead Total kg/h
INTERSECTION:	222.2	676.73	0.739	32.99	1.563	551.7	0.01778

PLENTY ROAD / THE BOULEVARD INTERIM TRAFFIC ANALYSIS

* BOULEV2 *

M PEAK HOUR ANALYSIS

Intersection ID: A

Fixed-Time Signals, Cycle Time = 50

Table S.14 - SUMMARY OF INPUT AND OUTPUT DATA

Lane No.	Arrival Flow (veh/h)	Adj. %HV	Eff Grn Basic (secs)	Deg Sat	Aver. Delay	95% Queue	Shrt Lane
----------	----------------------	----------	----------------------	---------	-------------	-----------	-----------

	L	T	R	Tot		Satf.	1st	2nd	x	(sec)	(m)	(m)

South:	South Approach											
L	45	0	0	45	4	1950	27		0.090	20.0	5	30
T	0	195	0	195	5	1950	27		0.191	6.4	22	

	45	195	0	240	5				0.191	8.9	22	

North:	North Approach											
T	0	775	0	775	5	1950	27		0.760	11.8	110	
R	0	0	6	6	17	1950	25		0.015	21.0	1	30

	0	775	6	781	5				0.760	11.9	110	

West:	West Approach											
L	11	0	0	11	9	1950	13		0.024	25.1	2	
R	0	0	180	180	5	1950	13		0.386	27.3	32	

	11	0	180	191	5				0.386	27.2	32	

Pedestrians												
Across S approach				1			8		0.000	17.6	0.0	
Across N approach				1			8		0.000	17.6	0.0	
Across W approach				1			22		0.000	7.8	0.0	

=====												
ALL VEHICLES				Tot	%		Cycle	Max	Aver.	Max		
				Arv.	HV		Time	X	Delay	Queue		
				1212	5		50	0.760	13.7	110		
=====												

Total flow period = 60 minutes. Peak flow period = 60 minutes.

Note: Basic Saturation Flows (in through car units) have been adjusted for grade, lane widths, parking manoeuvres and bus stops.

Values printed in this table are back of queue.

LENTY ROAD / THE BOULEVARD INTERIM TRAFFIC ANALYSIS * BOULEV2 *
AM PEAK HOUR ANALYSIS

Intersection ID: A
Fixed-Time Signals, Cycle Time = 50

Table S.15 - CAPACITY AND LEVEL OF SERVICE (HCM STYLE)

Mov No.	Mov Typ	Green Ratio	Time (g/C)	Total Flow (veh/h)	Total Cap. (veh/h)	Deg. of Satn (v/c)	Aver. Delay (sec)	LOS

		1st grn	2nd grn					

South: South Approach								
1	L	0.540		45	502<	0.090	20.0	B
2	T	0.540		195	1019	0.191	6.4	A

				240	1521	0.191	8.9	A

North: North Approach								
8	T	0.540*		775	1020	0.760*	11.8	B
9	R	0.500		6	394<	0.015	21.0	C

				781	1414	0.760	11.9	B

West: West Approach								
10	L	0.260		11	453	0.024	25.1	C

12 R.	0.260*	180	466	0.386	27.3	C
		191	920	0.386	27.2	C

Pedestrians						
51	(Ped) 0.160	1	3200	0.000	17.6	B
55	(Ped) 0.160	1	3200	0.000	17.6	B
57	(Ped) 0.440	1	8800	0.000	7.8	A

		3	15200	0.000	14.4	B

ALL VEHICLES:		1212	3855	0.760	13.7	B

INTERSECTION:		1215	3855	0.760	13.7	B

Level of Service calculations are based on average control delay including geometric delay (HCM criteria), independent of the current delay definition used. For the criteria, refer to the "Level of Service" topic in the SIDRA Output Guide or the Output section of the on-line help. Intersection capacity is calculated considering vehicle movements only.

< Reduced capacity due to a short lane effect

* Maximum v/c ratio, or critical green periods

--- End of SIDRA Output ---

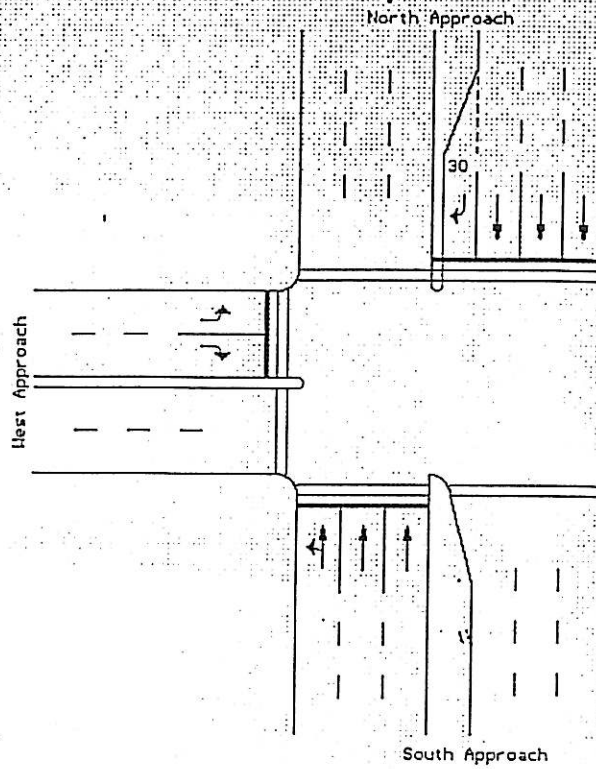
APPENDIX 2

**THE BOULEVARD/PLENTY
ROAD INTERSECTION
(ULTIMATE): SIDRA ANALYSIS**

User: ..

GEOMETRY

1^N



Legend

SO-Short
lane
length
(metres)

ARAB TR SIDGRA
File: BOULEVS
Esc-Close Window

Registered User No. .

Time and Date of Analysis 9:41 AM, 6 Oct 2000

CENTY ROAD / THE BOULEVARD ULTIMATE TRAFFIC VOLUMES

* BOULEV5 *

AM PEAK HOUR ANALYSIS

Intersection ID: A

Fixed-Time Signals, Cycle Time = 70

IN INFORMATION

* Basic Parameters:

Intersection Type: Signalised - Fixed Time

Driving on the left-hand side of the road

Input data specified in Metric units

Default Values File No. 1

Peak flow period (for performance): 60 minutes

Unit time (for volumes): 60 minutes (Total Flow Period)

Delay definition: Control delay

Geometric delay included

Delay formula: SIDRA standard

Level of Service based on: Delay (HCM)

Queue definition: Back of queue, 95th_Percentile

* No. of Main (Timing-Capacity) Iterations = 1

Comparison of last two iterations:

Difference in intersection degree of satn = 0.0 %

Difference in total vehicle capacity = 0.0 %

Largest difference in eff. green times = 0 secs

(max. value for stopping = 0 secs)

CENTY ROAD / THE BOULEVARD ULTIMATE TRAFFIC VOLUMES

* BOULEV5 *

I PEAK HOUR ANALYSIS

Intersection ID: A

Fixed-Time Signals, Cycle Time = 70

Table S.3 - INTERSECTION PARAMETERS

Critical Movements: 12, 9, 2

L= 62 Y= 0.000 U= 0.000 T= 62.0

Cycle Time:

Minimum	Maximum	Practical	Chosen
62	120	62	70

Degree of saturation (highest)	=	0.503
Practical Spare Capacity (lowest)	=	79 %
Total vehicle flow (veh/h)	=	1926
Total pedestrian flow (ped/h)	=	3
Total vehicle capacity, all lanes (veh/h)	=	5295
Average intersection delay (s)	=	21.4
Largest average movement delay (s)	=	47.5
Total vehicle delay (veh-h/h)	=	11.45
Total pedestrian delay (ped-h/h)	=	0.02
Largest back of queue, 95% (m)	=	73
Performance Index	=	81.67
Total fuel (L/h)	=	361.7
Total cost (\$/h)	=	1189.14

Intersection Level of Service = C
Worst movement Level of Service = D

LENTY ROAD / THE BOULEVARD ULTIMATE TRAFFIC VOLUMES
AM PEAK HOUR ANALYSIS

* BOULEV5 *

Intersection ID: A
Fixed-Time Signals, Cycle Time = 70

Table S.4 - PHASE INFORMATION

Phase Change Times: 0, 38, 49
Phase Green Times: 33, 6, 16

Current Phase Sequence No.: 8
Input phase sequence: B E H
Output phase sequence: B E H

LENTY ROAD / THE BOULEVARD ULTIMATE TRAFFIC VOLUMES
AM PEAK HOUR ANALYSIS

* BOULEV5 *

Intersection ID: A
Fixed-Time Signals, Cycle Time = 70

Table S.6 - INTERSECTION PERFORMANCE

Total Flow (veh/h)	Total Delay (veh-h/h)	Aver. Delay (sec)	Prop. Queued	Eff. Stop Rate	Perf. Index	Aver. Speed (km/h)
--------------------	-----------------------	-------------------	--------------	----------------	-------------	--------------------

PEDESTRIANS:

3	0.02	22.3	0.795	0.80	0.11	3.2
---	------	------	-------	------	------	-----

ALL VEHICLES:

926	11.45	21.4	0.805	0.73	81.57	65.0
-----	-------	------	-------	------	-------	------

INTERSECTION:

929	11.47	21.4	0.805	0.73	81.67	64.9
-----	-------	------	-------	------	-------	------

LENTY ROAD / THE BOULEVARD ULTIMATE TRAFFIC VOLUMES
AM PEAK HOUR ANALYSIS

* BOULEV5 *

Intersection ID: A
Fixed-Time Signals, Cycle Time = 70

Table S.7 - LANE PERFORMANCE

Lane No.	Mov No.	Effective Red and Green Times (sec)				Arv Flow Cap (veh/h)		Deg. Satn x	Aver. Delay (sec)	Eff. Stop Rate	Queue 95% Back Lane	
		R1	G1	R2	G2	(veh/h)	(veh/h)				(vehs)	(m)

South: South Approach

1 LT	1	54	16	0	0	123	413	0.298	36.8	0.78	4.9	31
2 T	2	54	16	0	0	128	431	0.298	24.7	0.70	5.1	32
3 T	2	54	16	0	0	128	431	0.298	24.7	0.70	5.1	32

North: North Approach

1 T	8	43	27	0	0	367	728	0.503	17.9	0.70	11.3	71
2 T	8	43	27	0	0	367	728	0.503	17.9	0.70	11.3	71

3 T	8	43	27	0	0	367	728	0.503	17.9	0.70	11.3	71
4 R	9	64	6	0	0	6	142	0.042	47.5	0.66	0.3	2 30

West: West Approach												
1 L	10	37	33	0	0	20	845	0.024	20.5	0.71	0.6	4
2 R	12	37	33	0	0	420	845	0.497	23.8	0.82	11.6	73

PLENTY ROAD / THE BOULEVARD ULTIMATE TRAFFIC VOLUMES * BOULEV5 *
 1 PEAK HOUR ANALYSIS
 Intersection ID: A
 Fixed-Time Signals, Cycle Time = 70

Table S.10 - MOVEMENT CAPACITY AND PERFORMANCE SUMMARY

Mov No.	Mov Typ	Arv Flow (veh /h)	Total Cap. (veh /h)	Lane Util (%)	Deg. Satn x	Eff. Grn 1st Grn	Grn 2nd Grn	Aver. Delay (sec)	Eff. Stop Rate	95% Back of Queue (veh)	Perf. Index
South: South Approach											
1 L		105	353	100	0.298	16		36.8	0.79	4.9	4.91
2 T		275	924	100	0.298	16*		25.5	0.70	5.1	11.74
North: North Approach											
8 T		1100	2185	100	0.503*	27		17.9	0.70	11.3	42.85
9 R		6	142	100	0.042	6*		47.5	0.66	0.3	0.31
East: West Approach											
10 L		20	845	100	0.024	33		20.5	0.71	0.6	0.89
12 R		420	845	100	0.497	33*		23.8	0.82	11.6	20.86
Pedestrians											
51	(Ped)	1	5429	100	0.000	19		18.6	0.73	0.0	0.03
55	(Ped)	1	4571	100	0.000	16		20.8	0.77	0.0	0.04
57	(Ped)	1	2286	100	0.000	8		27.5	0.89	0.0	0.04

* Maximum degree of saturation, or critical green periods

PLENTY ROAD / THE BOULEVARD ULTIMATE TRAFFIC VOLUMES * BOULEV5 *
 1 PEAK HOUR ANALYSIS
 Intersection ID: A
 Fixed-Time Signals, Cycle Time = 70

Table S.12A - FUEL CONSUMPTION, EMISSIONS AND COST - TOTAL

Mov No.	Fuel Total L/h	Cost Total \$/h	HC Total kg/h	CO Total kg/h	NOX Total kg/h	CO2 Total kg/h	Lead Total kg/h
INTERSECTION:	361.7	1189.14	1.216	54.64	2.497	898.3	0.02894

PLENTY ROAD / THE BOULEVARD ULTIMATE TRAFFIC VOLUMES * BOULEV5 *
 1 PEAK HOUR ANALYSIS
 Intersection ID: A
 Fixed-Time Signals, Cycle Time = 70

Table S.14 - SUMMARY OF INPUT AND OUTPUT DATA

Lane No.	Arrival Flow (veh/h)				%HV	Adj.	Eff Grn		Deg	Aver.	95%	Shrt
	L	T	R	Tot		Basic	(secs)		Sat	Delay	Queue	Lane
						Satf.	1st	2nd	x	(sec)	(m)	(m)

South: South Approach												
LT	105	18	0	123	5	1950	16		0.298	36.8	31	
T	0	128	0	128	5	1950	16		0.298	24.7	32	
3 T	0	128	0	128	5	1950	16		0.298	24.7	32	

	105	275	0	380	5				0.298	28.6	32	

North: North Approach												
T	0	367	0	367	5	1950	27		0.503	17.9	71	
2 T	0	367	0	367	5	1950	27		0.503	17.9	71	
3 T	0	367	0	367	5	1950	27		0.503	17.9	71	
R	0	0	6	6	17	1950	6		0.042	47.5	2	30
	0	1100	6	1106	5				0.503	18.0	71	

West: West Approach												
1 L	20	0	0	20	5	1950	33		0.024	20.5	4	
2 R	0	0	420	420	5	1950	33		0.497	23.8	73	
	20	0	420	440	5				0.497	23.6	73	

Pedestrians												
Across S approach				1			19		0.000	18.6	0.0	
Across N approach				1			16		0.000	20.8	0.0	
Across W approach				1			8		0.000	27.5	0.0	

ALL VEHICLES							Tot Arv.	% HV	Cycle Time	Max X	Aver. Delay	Max Queue
							1926	5	70	0.503	21.4	73

Total flow period = 60 minutes. Peak flow period = 60 minutes.

Note: Basic Saturation Flows (in through car units) have been adjusted for grade, lane widths, parking manoeuvres and bus stops.

Values printed in this table are back of queue.

LENTY ROAD / THE BOULEVARD ULTIMATE TRAFFIC VOLUMES * BOULEV5 *

AM PEAK HOUR ANALYSIS

Intersection ID: A

Fixed-Time Signals, Cycle Time = 70

Table S.15 - CAPACITY AND LEVEL OF SERVICE (HCM STYLE)

Mov No.	Mov Typ	Green Ratio	Time (g/C)	Total Flow (veh /h)	Total Cap. (veh /h)	Deg. of Satn (v/c)	Aver. Delay (sec)	LOS
		1st grn	2nd grn					

South: South Approach								
1	L	0.229		105	353	0.298	36.8	D
2	T	0.229*		275	924	0.298	25.5	C
				380	1276	0.298	28.6	C

North: North Approach								
8	T	0.386		1100	2185	0.503*	17.9	B

9 R.	0.086*	6	142	0.042	47.5	D
------	--------	---	-----	-------	------	---

1106	2328	0.503	18.0	B
------	------	-------	------	---

West: West Approach

10 L	0.471	20	845	0.024	20.5	C
------	-------	----	-----	-------	------	---

12 R	0.471*	420	845	0.497	23.8	C
------	--------	-----	-----	-------	------	---

440	1691	0.497	23.6	C
-----	------	-------	------	---

Pedestrians

51	(Ped) 0.271	1	5429	0.000	18.6	B
----	-------------	---	------	-------	------	---

55	(Ped) 0.229	1	4571	0.000	20.8	C
----	-------------	---	------	-------	------	---

57	(Ped) 0.114	1	2286	0.000	27.5	C
----	-------------	---	------	-------	------	---

3	12286	0.000	22.3	C
---	-------	-------	------	---

ALL VEHICLES:	1926	5295	0.503	21.4	C
---------------	------	------	-------	------	---

INTERSECTION:	1929	5295	0.503	21.4	C
---------------	------	------	-------	------	---

Level of Service calculations are based on average control delay including geometric delay (HCM criteria), independent of the current delay definition used. For the criteria, refer to the "Level of Service" topic in the SIDRA Output Guide or the Output section of the on-line help. Intersection capacity is calculated considering vehicle movements only.

* Maximum v/c ratio, or critical green periods

--- End of SIDRA Output ---