Table of Contents

INTRODUCTION 5

PART A: DEVELOPMENT PLAN 9

1  Development Plan Process 9

2  The Plan 10
2.1  Development Principles 10
2.2  Development Plan and Land Budget 11
2.3  Neighbourhood Design 15
2.4  Activity Centre 16
2.5  Education 17
2.6  Industrial Land 17
2.7  Restricted Retail 17
2.8  Open space 19
2.8.1  Neighbourhood Parks 19
2.8.2  Linear open space 19
2.8.3  Rail Trail 20
2.8.4  Active Open Space (north-east area) 20
2.8.5  Community Open Space (Crown Land) 20
2.9  Road Network 21
2.9.1  Bypass Road 22
2.10  Drainage and Wetlands 24
2.10.1  Eastern Catchment 25
2.10.2  Central Catchment 27
2.10.3  Western Catchment 27

3  Implementation 28

PART B: ANALYSIS & ASSESSMENT 31

1  Site Context 34
1.1  Movement 37

2  Open Space and Environment 40
2.1  Flora and Fauna 42
2.2  Open Space and Recreation 43
2.3  Cultural Heritage 45

3  Drainage and Flooding 47
4  Servicing  50
4.1  Sewer  50
4.2  Potable Water  50
4.3  Electricity infrastructure  50
4.4  Telecommunications infrastructure  50
INTRODUCTION

CPG Australia were engaged by the Bass Coast Shire Council to prepare a development plan for the Wonthaggi North East Growth Area. The study area is illustrated in Figure 1.

The need for the Development Plan has been triggered by the Wonthaggi Dalyston Structure Plan which was adopted by the Bass Coast Shire (BCS) in October 2008. The Structure Plan established the strategic direction for future land use and development in Wonthaggi and Dalyston. These directions are summarised in Table 1.

The development plan is structured in two parts as follows:
- Part A: Development Plan
- Part B: Analysis

Table 1: Strategic Directions, Wonthaggi / Dalyston Structure Plan

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>Affected Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential</td>
<td>Land south of Heslop Road to Inverloch Road, east &amp; west of Korumburra Road.</td>
</tr>
<tr>
<td>The majority of residential growth should occur in the north east of town</td>
<td></td>
</tr>
<tr>
<td>(North East Growth Area) to manage sprawl toward sensitive coastal areas;</td>
<td></td>
</tr>
<tr>
<td>respond to the proposed bypass as a logical physical boundary to town;</td>
<td></td>
</tr>
<tr>
<td>and take advantage of the lack of undermined land in this area.</td>
<td></td>
</tr>
<tr>
<td>Consolidation of existing Low Density Residential in the north of Wonthaggi</td>
<td></td>
</tr>
<tr>
<td>(North East Growth Area) to standard density residential overtime.</td>
<td></td>
</tr>
<tr>
<td>Commercial</td>
<td>Inverloch Road frontage, between Cameys Road &amp; proposed bypass road.</td>
</tr>
<tr>
<td>Initiate a new Business 4 Zone (peripheral sales) precinct along the</td>
<td></td>
</tr>
<tr>
<td>frontage to Inverloch Road, between the existing Industrial 1 Zone and the</td>
<td></td>
</tr>
<tr>
<td>proposed alignment of the bypass road.</td>
<td></td>
</tr>
<tr>
<td>Industrial</td>
<td>Land east of Cameys Road to the bypass road, south of Inverloch Road.</td>
</tr>
<tr>
<td>An additional 20ha of land to be rezoned for industrial purposes to 2020.</td>
<td></td>
</tr>
<tr>
<td>The appropriate location of industrial land is nominated west of Cameys Road</td>
<td></td>
</tr>
<tr>
<td>to the eastern extent of the bypass road, integrating with the existing</td>
<td></td>
</tr>
<tr>
<td>industrial zoned land fronting Inverloch Road.</td>
<td></td>
</tr>
<tr>
<td>Open Space &amp; Recreation</td>
<td>North East Growth Area.</td>
</tr>
<tr>
<td>Provision of open space in the North East Growth Area is a priority, ideally</td>
<td></td>
</tr>
<tr>
<td>as part of a neighbourhood community node. The location of these spaces is</td>
<td></td>
</tr>
<tr>
<td>to be determined through detailed planning for the growth area.</td>
<td></td>
</tr>
<tr>
<td>Neighbourhood Nodes</td>
<td>North East Growth Area</td>
</tr>
<tr>
<td>New neighbourhood nodes to be incorporated into emerging urban growth areas,</td>
<td></td>
</tr>
<tr>
<td>incorporating social and community facilities suitable for a wide range of</td>
<td></td>
</tr>
<tr>
<td>users.</td>
<td></td>
</tr>
</tbody>
</table>
PART A: DEVELOPMENT PLAN

1 Development Plan Process

The Development Plan process has been informed by the significant base of existing technical information that has been prepared by consultants representing key individual developers or developer consortiums in the study area (Refer to Table 2, PART B). Much of this work is ongoing and has been provided to the process in an iterative manner.

In addition to the technical assessments, detailed concept plans have been prepared by consultants representing the key land owners. These plans have been submitted to Council in various forms. Where relevant these plans have informed the urban structure of the Development Plan.

A summary of all information received as part of the planning process is documented in Part B of the Development Plan.

The following tasks have been undertaken in the Development Plan process, to ensure the preparation of a considered, tested and consultative plan:

- Site investigation, analysis and documentation.
- Site based meetings with Council officers, relevant State agencies and service providers.
- Consultation with key stakeholders to confirm key opportunities and constraints; understand the development landscape including future potential planning applications; and establish an overall vision and strategic direction for the sites.
- Technical assessment and review (including existing technical documentation from key proponents in the study area).
- Draft concept plan and testing with Council officers and key external stakeholders.
- Draft Development Plan.
- Public exhibition and consultation.
- Final Development Plan and Planning Scheme Amendment.
2 The Plan

2.1 Development Principles
The development plan will facilitate the integrated development of this significant urban extension to Wonthaggi. Given the size and scale of the growth area and the multiple land owner interests, a series of development principles were established to guide the development planning process. The principles create a framework to plan for practical and deliverable outcomes for all land owners in the growth area.

The development principles for the growth area as follows:

- Acknowledge land development expectations of large land holdings.
- Maximise development outcomes on large consolidated sites.
- Minimise development costs through logical design.
  - Consider title boundaries when designing essential structural elements to ensure (early) delivery and avoid issues related to cost.
  - Consider title boundaries in neighbourhood design.
  - Utilise existing easements and reserves.
  - Connect to the existing grid / road network where possible.
  - Avoid single fronted roads.
  - Avoid irregular shaped lots that minimise development potential in the future.
- Utilise natural features in design and development.
- Respond to the quality of land in overall siting and design of subject area.
- Facilitate the achievement of sustainable neighbourhood outcomes.
- Provide legible connections to key community anchors within and surrounding the study area i.e. schools, recreation reserve.
- Provide for walkability in the new community.
2.2 Development Plan and Land Budget

The development plan is illustrated in Figure 2. The key elements of the development plan are discussed below.

The land budget for the development plan is contained in Table 2. The land budget determines the net developable area for the growth area, including land available for residential and commercial development, and parks and open space. All encumbered land including land required for drainage, wetlands and conservation, has been excluded from the net developable area.

The land budget also determines an approximate yield for the growth area applying variable densities for the identified conventional and medium density housing areas. In essence, the land budget provides land owners with a clear indication of their overall development potential. The land budget forms the basis for calculating infrastructure charges.
### Preliminary Land Budget

**General Information**

**Project Name:** Wonthaggi North East Development Plan Residential and Industrial

**Project No:** 133487

**Client (optional):**

**Prepared and checked by:**

**Area calculations by:**

**Zoning of site:**

**Planning overlays relevant to site:**

**Strategy Plan / LSP / DCP particulars**

**Strategy Plans or similar that apply to site:**

<table>
<thead>
<tr>
<th>1</th>
<th>2 ENCUMBERED LAND</th>
<th>118.90 Ha</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1</td>
<td>Drainage Reserves/Corridor L, R</td>
<td>88.44</td>
</tr>
<tr>
<td>2.2</td>
<td>Conservation Open Space</td>
<td>1.39</td>
</tr>
<tr>
<td>2.3</td>
<td>Sub Station</td>
<td>0.91</td>
</tr>
<tr>
<td>2.4</td>
<td>Urban Land Care Open Space</td>
<td>28.15</td>
</tr>
</tbody>
</table>

| 3 GROSS DEVELOPABLE AREA | 606.53 Ha |

<table>
<thead>
<tr>
<th>4</th>
<th>4.1 Bulky Goods Retail</th>
<th>76.45 Ha</th>
<th>994</th>
<th>13 lots / ha or 550m² ave.</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.1</td>
<td></td>
<td>North of Bass Highway</td>
<td>14.44</td>
<td>188</td>
</tr>
<tr>
<td>4.1</td>
<td></td>
<td>South of Bass Highway</td>
<td>11.36</td>
<td>148</td>
</tr>
<tr>
<td>4.2</td>
<td>Industrial</td>
<td>32.62</td>
<td>424</td>
<td></td>
</tr>
<tr>
<td>4.3</td>
<td>Neighbourhood Centre</td>
<td>0.32</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>4.4</td>
<td>School Site</td>
<td>17.72</td>
<td>230</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>5</th>
<th>5.1 Park A</th>
<th>56.95 Ha</th>
<th>9.4%</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.2</td>
<td>Park B</td>
<td>3.05</td>
<td></td>
</tr>
<tr>
<td>5.3</td>
<td>Park C</td>
<td>2.01</td>
<td></td>
</tr>
<tr>
<td>5.4</td>
<td>Park D</td>
<td>1.15</td>
<td></td>
</tr>
<tr>
<td>5.5</td>
<td>Park E</td>
<td>1.28</td>
<td></td>
</tr>
<tr>
<td>5.6</td>
<td>Park F</td>
<td>1.42</td>
<td></td>
</tr>
<tr>
<td>5.7</td>
<td>Park G</td>
<td>1.33</td>
<td></td>
</tr>
<tr>
<td>5.8</td>
<td>Park H</td>
<td>1.06</td>
<td></td>
</tr>
<tr>
<td>5.9</td>
<td>Linear Open Space</td>
<td>3.03</td>
<td></td>
</tr>
<tr>
<td>5.10</td>
<td>Active Open Space A</td>
<td>10.00</td>
<td></td>
</tr>
<tr>
<td>5.11</td>
<td>Community Open Space</td>
<td>20.21</td>
<td></td>
</tr>
<tr>
<td>5.12</td>
<td>Landscape Buffer</td>
<td>1.13</td>
<td></td>
</tr>
<tr>
<td>5.13</td>
<td>Rail Trail</td>
<td>4.89</td>
<td></td>
</tr>
<tr>
<td>5.14</td>
<td>Miscellaneous Passive Open Space</td>
<td>1.82</td>
<td>6.1%</td>
</tr>
</tbody>
</table>

| 6 | 6.1 Road Reserve Area | 473.12 Ha |

<table>
<thead>
<tr>
<th>7</th>
<th>7.1 Retirement Village</th>
<th>68.75 Ha</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.2</td>
<td>Existing Low Density Residential</td>
<td>11.85</td>
</tr>
<tr>
<td>7.3</td>
<td>Farm Zone</td>
<td>31.11</td>
</tr>
</tbody>
</table>

| 8 | 8.1 Farm Zone | 25.79 |

| 9 | 9.1 Roads | 135.22 |

| 10 | 10.1 RESIDENTIAL ALLOTMENT AREA | 269.16 Ha |

---

* Excluding Community Open Space (Crown Land)

Wonthaggi/Dalyston Structure Plan

---

Refer next sheet for notes

---

16/12/2009

\geelfs\Data\13\133487\G01 008 land budget Rev H.xls

Prepared by CPG Australia Pty Ltd
Notes

A Areas and yields are approximate only.
B The land budget has been prepared for preliminary purposes and the following information was not available:
   Levels and feature survey (limited data available only)
   Arborist report
   Ecological and Habitat assessment
   Net gain Assessment
   Archaeological or heritage assessment
   Contamination assessment
   Traffic input
C Size and location of waterways / wetlands is based on revisions to the 'Draft Wonthaggi North East Development Plan' prepared by Beveridge Williams (date unknown). The location and size is indicative and subject to detailed study.
D A site visit has been undertaken before the preparation of this land budget.
E Trees have been identified through an aerial photograph only, and have not been assessed for species, size, structure, habitat or 'value'.
F The site has not been assessed to determine if any grasslands or EVC's are present, or the value of any vegetation present.
G The land budget is based on an ideal mathematical yield and does not take into account inefficiencies in lots due to irregular boundaries, variations in lot mix, or subtleties or constraints of lot design etc.
H Areas are in hectares unless otherwise stated.
I Plan has been prepared in consultation with Council
J Proposal is subject to rezoning.
K Plan is based on available planning scheme information.
L Drainage Reserve/Corridor Area includes the Drainage Reserve/Corridor and Waterways/Wetlands Area. It includes areas of passive open space outside the 1:100 year flood line.
M Department of Education Land as indicated on the Wonthaggi Proposed Walking Track Network Plan prepared by Council (date unknown).
N Active Open Space A is indicative only and is anticipated to be approximately 6.5ha.
O Road Reserve Area includes Korumburra Road, McGibbonys Road, Wonthaggi Road, Wentworth Road and other existing roads.
P Alignment of Bypass Road (at the north east of the subject site) determined by Council and is subject to detailed design.
Q Equivalent lots (existing low density residential only) assumes that each existing lots will be sub divided into two.
R Alignment and the need for a drainage reserve to the east of the proposed bypass road determined by Council and is subject to detailed design.
2.3 Neighbourhood Design

The Development Plan represents significant urban extension to Wonthaggi to the north / north-east, of the existing residential area. The residential component of the growth area has been designed based on sustainable neighbourhood principles providing passive open space and high amenity wetlands within walking distance of all residents. The urban structure has sought to avoid loss of native vegetation, particularly in road reserves and intersection design.

The urban structure will deliver an outcome that enables integration both internal and external to the site, a critical ingredient for a new community within an existing established town. This will be achieved through an integrated road network that extends the existing grid and street network where possible; as well as the provision of high amenity and extensive wetland and linear park networks throughout the residential area linking key assets such as the activity centre and active open space. Each of these elements provides opportunities for people to be connected with and within this new residential growth area.

The residential area will accommodate approximately 4,000 dwellings. This supply will be characterised by a mixed housing offer at variable densities as discussed below.

1. Conventional density
A total of 269Ha of land is available for net residential development, the majority of which will be developed at conventional densities at an average rate of 13 dwellings per hectare. At this density, lots will average approximately 750sqm. This density is generally consistent with the established Wonthaggi area and is deemed appropriate for a new growth area.

2. Medium density:
Medium density housing will be located in high amenity locations proximate to the activity centre and large wetland in the north of the study area. Development in the medium density areas will achieve an average density of 20-22 dwellings per hectare, with lots approximately 450sqm.

Around the activity centre, a critical mass of people will live within a short work of every day retail and community facilities. This will improve the sustainability of the community by reducing the need for car trips into town to meet daily needs; and the sustainability of the retail centre by enhancing its vitality and overall viability.

The wetland location will provide an opportunity for townhouse and terrace development overlooking the water – an opportunity currently not available in Wonthaggi. High quality architecture and design will be required in this area to ensure good presentation and activation of the public realm.

3. Retirement Living
Housing for older residents is formally provided in a retirement village format to the south of the study area, close to town and existing services, and the proposed commercial area along Inverloch Road. A total area of 11.85Ha is provided for this use.
The retirement village will enjoy the aspect and amenity of the wetland area and surrounding bush reserve to the west of Carneys Road. Unnecessary traffic and rat running has been avoided by keeping Carneys Road closed to traffic at the Bass Highway in the south.

4. Low density transition
An area of Low Density Residential Zoned (LDRZ) land is located in the north-west of the development plan area, west of Korumburra Road. This land has been subdivided and generally built out over time, providing residents with the choice of a lifestyle block outside of the main town area.

The development plan provides for ongoing low density residential in this location at this point in time owing to the fact that only some landowners have expressed an interest in developing their land further, while others have deferred their desire to take up this option in the short term.

It is fully expected that over time this land will be re-developed for conventional density residential. Due to the current orientation and development of the lots and road network, it is assumed that lots in this area could generally be subdivided to accommodate a second lot and dwelling. Rezoning of individual parcels to achieve this outcome will be supported by Council, as land owners are ready to take up this option.

2.4 Activity Centre
A 3,000sqm neighbourhood activity centre is proposed in the northern portion of the residential growth area. This centre will provide for daily needs retailing and will include a small supermarket. Of particular importance to the emerging community will be the integration of retail and community services and facilities within this centre. It is proposed that the centre will contain maternal and child health facilities and child care, to service the newly establishing families moving into this area. Given the mix of people that will live in the growth area, a medical centre is also encouraged within this centre. The integrated retail and community outcome will provide benefits for not only the new residents of the growth area but also for the surrounding established residential area.

The proposed location of the neighbourhood centre on the Korumburra Road will deliver a number of benefits including:

- Early delivery of the centre due to its high exposure location.
- Ease of access from a main road network, with connections to the local road network for improved permeability.
- Convenient walking and cycling access by residents internal and external to the growth area.

Located proximate to the drainage reserve, key wetland area and the active open space the centre will act as a 'link in the chain' of significant amenity and community infrastructure in the growth area. It is considered integral for a newly establishing community to be provided these activities in a way that encourages vitality and helps build community.
It is proposed that the centre will be surrounded by medium density housing to maximise ‘life’ in the centre through high level activation of uses, provision of green spaces to improve amenity and sense of place, and opportunities for passive surveillance to improve overall safety and ownership of this place.

2.5 Education
Two sites to the west of Carneys Road have been identified as future education sites by the Department of Education. The plan has provided land to facilitate this development. Final details of land requirements and education facility type to be considered for this site will be resolved between Council and the Department.

2.6 Industrial Land
In accordance with the direction of the Wonthaggi Dalyston Structure Plan, the plan provides for the continuation of existing industrial uses south of Inverloch Road integrated into a significantly expanded industrial precinct in this area. The plan proposes a total area of approximately 32ha for industrial land uses, providing opportunity for the consolidation of this core employment activity in a high quality, accessible location.

The plan has responded to the existing industrial profile in this location, and the ongoing intentions of these operators to remain in this area in the future, by consolidating industrial uses around these sites.

Given the fragmentation of this land and the associated multiple ownership, it is considered appropriate that the existing land uses in this area be continued into the future; whilst providing opportunities for consolidation of sites over time to allow for business expansion and growth, as well as future integration with a new expanded industrial area to the south.

A mix of industry types will be encouraged in this location including service industry, transport, storage and distribution. It is anticipated that service industry uses will be located at the frontage of the site with more land intensive uses likely to be distributed to the rear.

The opportunity to locate higher order commercial uses (bulky goods) on land in the existing industrial area fronting Inverloch Road was seriously considered. This option was discounted, as it was deemed to be an unrealistic outcome in the life of this plan for the following reasons:
- the existing established industrial land use;
- the mix of lot sizes and fragmented ownership;
- the drainage issues along this frontage;
- the likely timing of transition to commercial uses given the above points.

On this basis, the development plan provides for significant industrial development that is contained by the future bypass road and proposed drainage reserve. A highly permeable road network will provide multiple opportunities for access to these sites and will ensure the separation of industrial and non-industrial traffic.

2.7 Restricted Retail
In accordance with the direction of the Wonthaggi Dalyston Structure Plan, the development plan provides for the development of approximately 25 Ha of land
for bulky goods. As identified by the structure plan, the bulky goods will be consolidated at the frontage to the Inverloch Road, with land provided along the northern extent within the study area and the western edge of the southern extent within the study area.

The bulky goods area to the south of Inverloch Road will be generally contained within one land title. This will enhance opportunities to realise a development outcome in a timely manner. This area will have a land use relationship with complimentary uses to the west in the industrial area, where it is assumed that the finer grain, service based industrial uses will continue to locate at the main road frontage.

The bulky goods area to the north of Inverloch Road will be limited to the western edge of the Kilgour land, contained between the north-south drain and a key entry street. The bulky goods area has been designed to ensure adequate depth for commercial development, and achieve adequate separation to surrounding residential uses.

In terms of urban structure the Development Plan proposes a linear park (30m) at the interface between the bulky goods area and residential area. This street based transition is proposed to deliver finer grain bulky goods fronting a landscaped median to residential uses to the north. While this is not a conventional outcome, the activation and creation of landscape improvements to the public realm as a screening mechanism is considered more desirable than a ‘back to back’ situation with housing and bulky goods separated by a private landscape buffer. The linear open space will continue east to connect with the adjacent residential area.

It is acknowledged that the bulky goods location to the west of the drainage reserve is potentially challenging, however a commercial outcome is preferred versus residential in this high traffic location.
2.8 Open space
A total area of 57ha of land has been provided for open space in the development plan (9.3% of the net developable area). In addition, passive open space will be provided in the proposed wetland and drainage reserves. The extent of open space in this area will be determined at the detailed drainage design phase. This will increase the overall amount of open space available to the new community.

The supply of recreation in the development plan area has been balanced against the current and programmed supply in the surrounding neighbourhood. Council will further investigate appropriate areas outside of the Development Plan area to address any shortfalls in open space and recreation provision. The proposed open space elements are discussed below.

2.8.1 Neighbourhood Parks
A total of eight local parks are provided in the development plan area. This equates to a total area of 15.87Ha. The parks have been evenly distributed to provide open space for all segments of the new community. The parks are located within a 400metre walkable catchments of 95% of dwellings in accord with the Growth Areas Authority (GAA) Precinct Structure Plan guidelines, and will compliment the passive open space offer provided by the significant wetland areas.

The parks will be designed to increase their attractiveness and overall use. Parks A-E and Park H will contain playgrounds, seating and walking paths to provide easy access to the play equipment. Park B will also contain interpretive signage and information related to the cultural heritage significance of part of this site.

Parks F and G provide for the logical expansion of the conservation area located at the eastern end of the McGibbony Road reserve, where the significant area of established native vegetation is proposed to be retained. These two parks will not include playgrounds, but will contain walking trails for passive recreation and enjoyment of this area.

2.8.2 Linear open space
Linear open space is provided through the wetland system central to the residential neighbourhood, within 1km of 95% of dwellings as per the GAA guidelines.

A series of 2.5m shared pathways are proposed adjacent to the drainage reserve to maximise use and activation of the linear open space network, and provide high amenity connections to key locations in the growth area including the activity centre in the north.

A number of “green streets” are proposed to connect the activity centre with the surrounding residential areas. These streets will include a vegetated median and shared path establishing a convenient desire line to the activity centre, wetlands and cultural heritage site.

Linear open space is proposed to the rear of the bulky goods, north of Inverloch Road. This will act as a landscape buffer to manage the interface to the residential area as well as providing an important link east and west to the regional open
space network. This linear open space will provide a clear link to the bush
reserve to the immediate west of Carneys Road.

2.8.3 Rail Trail
A rail trail connection to the proposed Inverloch trail is located south of the
industrial land. The trail is adjacent to a local road which ensure activation and
safety for users, particularly after hours when industry will generally be closed.
The trail extends east west and connects with the rail trail to the west of Carneys
Road.

2.8.4 Active Open Space (north-east area)
A 10Ha area of land has been provided in the north-east corner of the residential
area for active open space. This land is co-located with the proposed drainage
and wetland area. While typically in recent years the provision of active open
space has been discouraged on encumbered land, the recent GAA Precinct
Structure Planning Guidelines allow for the consideration of this where
appropriate.

The design and size of this active open space has been made on instruction from
the Council recreation officers on the basis of their own independent demand
assessment. This active open space area will include space for two ovals that can
be configured into three soccer pitches (1 senior pitch and 2 junior pitches), plus
car parking, pavilions, playground and passive open space as required by Council.

The co-location of the soccer pitch with the wetland and associated passive
recreation is in easy walking distance of the neighbourhood centre and a high
percentage of dwellings, and as such has strategic merit from a sustainable
neighbourhood perspective. In terms of design, the active recreation areas would
be constructed on elevated ground to overcome any issues associated with
drainage.

2.8.5 Community Open Space (Crown Land)
Community based active open space has been provided for at the southern edge
of the Crown land to the west of Carneys Road. The area of land provided for
recreation is 7Ha. This is on the basis that the DoE may require approximately 13
hectares of the 20 hectare Crown land site for future school purposes, leaving the
possibility open to utilise 7 hectares of this land for recreational purposes.

The opportunity for a recreation outcome is of strategic importance given the
synergy given the site location proximate to the proposed school site; the
fragmented provision of active recreation land in town; the significant
encumbrances on land in the growth area to accommodate more than what has
been proposed; and the needs at a regional level for new active open space.

It is considered that the consolidation of these uses with an integrated education
hub provides significant wins for the community and future users and it is
recommended that Council should be seriously considering this opportunity with
the DSE.
2.9 Road Network

The development plan proposes an integrated road network that achieves high level permeability and access for vehicles, pedestrians and cyclists. Where possible, the creation of existing un-made road reserves has been prioritised. Identified EVC’s have been avoided in road and intersection design. Any native vegetation in this area will be dealt with appropriately in terms of avoidance where possible and offsets if required.

Table 3 outlines the proposed treatments for key roads in the growth area. A traffic impact assessment has been undertaken by CPG Australia to determine the likely traffic implications at full development. The assessment has verified the proposed road network and intersection treatments.

In the residential area, the road network has been designed for easy integration with the key collector road network. Connections to the existing local road grid have been created where possible to allow for high level integration whilst avoiding opportunities for rat runs or un-desirable increases in traffic in residential streets.

A key area of consideration has been the treatment of access to Inverloch Road from the industrial area / bulky goods area, and any associated access from Carneys Road. It is understood that VicRoads will be keen to maintain a 80km speed zone for the Bass Highway, east of Carneys Road by minimising access opportunities to the future development area. As such, it is proposed that in the section between Carneys Road and the proposed new Bypass Road, access to industrial land (existing and proposed) should be limited to left in / left out or through the development of service roads.

In terms of access to the bulky goods area, it is considered that there will be a strong nexus between the two (north and south) precincts. The urban structure has been designed to ensure that the main access roads to the precincts should provide a cross intersection roundabout with the Inverloch Road for the safe and efficient management of traffic.

This intersection may also provide an opportunity for speed management of the highway and is well situated for this purpose being approximately 500m east of Carneys Road being the next major intersection to the west. The Carneys Road intersection is also proposed to provide a roundabout intersection.

The bulky goods precinct will be a significant generator of traffic and the internal layout of the residential area to the north of the precinct has been designed to reflect this with appropriate higher level of direct access roads.

The development plan creates provision for the potential future alignment of the bypass road. This road has no formal status with VicRoads. Given its current status it is unlikely that the bypass road will eventuate for some considerable time. On this basis, it has been advised the internal road layout should not entirely depend on the implementation of this arterial road. In addition the current traffic management planning for arterial intersection control (elsewhere on the Bass
Highway) should not predicate the type of treatment proposed for the Bypass Road / Bass Highway intersection.

The road network layout in the draft development plan has been designed to avoid cross intersections wherever possible. New development road intersections have been staggered in accordance with design guidelines and the planning scheme. Where cross intersections with existing roads are unavoidable they will be managed to avoid right turn conflicts through the use of appropriate treatments such as roundabouts.

For speed management, long lengths of development roads should be interrupted with the use of traffic management devices at strategic locations, such as roundabouts.

Shared pathways (2.5 metres) will be provided in the road reserve on all collector roads. Pedestrian and cycle greenways will also be provided as part of the key drainage / wetland areas connecting to the activity centre and active open space in the north, and the commercial and industrial employment area to the south. This network will also link into the landcare wetland area to the west of Carneys Road and the future proposed school and regional recreation site.

2.9.1 Bypass Road

The resolution of the bypass alignment has been determined by Council. The alignment proposed in the plan has assumed the edge of the study area as an appropriate location for the road reservation. In the fullness of time when all reservation details are available, it may be considered appropriate to locate the road further to the north on the Farming Zone land. It is understood that Council has begun working with VicRoads to address the construction of the Bypass and that a design and feasibility study will begin in 2010.

CPG have identified that the proposed alignment in the north-east corner (through the wetland) represents challenges from a drainage and open space perspective. In particular CPG have reservations about the overall wetland footprint and function given the timing of construction of the wetland (short term) and the timing of the construction of the road (long term). Council have confirmed that their infrastructure team will be pursuing a project to design the road in conjunction with the wetland design. It is anticipated by Council that while the road may not be constructed in the short term, it can be provided for in any design outcome for the wetlands.

If the road is located in the proposed alignment it is likely that it will be required to be elevated above the wetland. This will impact on the cost of infrastructure. Council will address this issue in their wetland design project.

In terms of open space, CPG note that the alignment of the road in this location may impact on the use and enjoyment of open space located to the north of the bypass road, effectively disconnecting it from the rest of the wetland area. Due to its separation, this land will be limited in its actual contribution to open space for the use and enjoyment of the community and may encourage anti-social behaviour. Council will seek to address this in their wetland design project.
### Table 3: Proposed Traffic Response – Key Intersections

<table>
<thead>
<tr>
<th>Road</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bass Highway</strong></td>
<td>Estimated 20,000 vpd at the south end of McKenzie Street by 2029. This is a trigger for duplication and should be considered in advance. For the industrial area, the development of Bass Highway (Graham Street) should include at a minimum, wide sealed shoulders and bike lanes, auxiliary turning lanes at all intersections and the consideration of a continuous median / right turn lane between Carneys Road and the new Bypass Road.</td>
</tr>
<tr>
<td><strong>Korumburra – Wonthaggi Road</strong></td>
<td>Estimated 6,700 vpd at full development. This may impact on some intersections such as Wentworth Road, and a roundabout should be considered. Intersections with the proposed Bypass Road (Heslop Road) should be two-lane roundabouts that will cater for the turning movements of B-double vehicles.</td>
</tr>
<tr>
<td><strong>Wentworth Road</strong></td>
<td>This road carries high traffic volumes for a local street. Wentworth Road to the south of Korumburra Road already shows signs of “rat running” as it provides an alternative route for Korumburra Road traffic to access the industrial area of Bass Highway, and bypassing the city centre. Increasing traffic on the narrow carriageway would impact on the amenity of the local street. Council will need to determine if they either require widening in lieu of the bypass road or traffic calming measures to attenuate traffic.</td>
</tr>
<tr>
<td><strong>Fincher Street</strong></td>
<td>Fincher Street plays a role as a bypass street. Increasing traffic as a result of the development may encourage “rat running”. Council will need to determine if they either require widening in lieu of the bypass road or traffic calming measures to attenuate traffic.</td>
</tr>
<tr>
<td><strong>Fuller Road</strong></td>
<td>Fuller Road will provide the principal access route for traffic of the north residential development area. To offset the increased traffic volume, auxiliary turning lanes at intersections, sealed shoulders and bike lanes should be applied.</td>
</tr>
<tr>
<td><strong>Heslop Road</strong></td>
<td>This road is currently unsealed. This road is earmarked as the future Ring Road. Prior to this, there is the potential for this road to become an alternative access to the Korumburra – Wonthaggi Road from the north development area. This option may require temporary sealing to cater for increasing traffic volumes.</td>
</tr>
<tr>
<td><strong>Bass Highway / Korumburra Road Intersection</strong></td>
<td>SIDRA analysis has demonstrated that this intersection may be currently operating at a poor level of service for Korumburra Road motorists. It is recommended that the planning for the placement of a roundabout at this intersection be immediately undertaken.</td>
</tr>
<tr>
<td><strong>McKenzie Street / Graham Street Intersection</strong></td>
<td>SIDRA analysis demonstrates that this intersection is currently operating satisfactorily, however will be significantly impacted by the proposed flows at full development. It is recommended that Vic Roads and Council plan for upgrading the roundabout to accommodate these flows by providing an extra circulating land and left turn lanes. Alternatively, traffic signals may be introduced to improve growing congestion and to improve the conditions for pedestrians at the intersection.</td>
</tr>
</tbody>
</table>
### Road Response

<table>
<thead>
<tr>
<th>Road</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Korumburra - Wonthaggi Road / Wentworth Road, Intersection</td>
<td>The traffic volumes on both these roads will increase significantly as a result of the Residential Development Areas. Both streets will have similar traffic flows and if the current give-way conditions for Wentworth Road (north) were to remain there will be significant delays in that street. If traffic volumes increase as expected, consideration should be given to the application of a roundabout at this intersection to improve conditions for the Wentworth Road motorists.</td>
</tr>
<tr>
<td>Bass Highway / Fuller Road, Intersection</td>
<td>Fuller Road traffic currently gives way to the Bass Highway. Traffic volumes will increase on both these roads and the conditions for Fuller Road motorists will be affected with increased delay and reduced safety for the turning movements. It is recommended that planning for improvement works is undertaken to improve the intersection through the implementation of auxiliary right and left turn lanes for the highway and the addition of a left turn lane in Fuller Road. A more detailed analysis may find that the application of a roundabout may be more appropriate treatment for this intersection.</td>
</tr>
<tr>
<td>Bilson Street</td>
<td>All roads of the Wonthaggi network will experience growth as development progresses and the Bilson Street is no exception. The crash statistics indicate a poor safety record for this road compared to other roads on the network. As development progresses it will be prudent for VicRoads and the Bass Coast Shire to investigate problem areas and implement measures to improve safety.</td>
</tr>
</tbody>
</table>

### 2.10 Drainage and Wetlands

A “masterplan” treatment strategy has been prepared for the development plan based on meeting the best practice pollutant reduction targets, namely:

- 70% removal of the total Gross Pollutant load
- 80% removal of total Suspended Solids
- 45% removal of total Nitrogen
- 45% removal of total Phosphorus

The water quality treatment train considers the Wonthaggi Development Plan as one entity. That is the objective is to meet the overall pollutant reduction targets prior to discharge across the northern boundary of the site. This holistic approach provides the mechanism to “over-treat” in one sub-area within the development to compensate for a lower treatment level achieved in another sub-area. The Best Practice Guidelines indicate that only land that will be developed must meet the reduction targets, not rural land.

A MUSIC (Model for Urban Stormwater Improvement Conceptualisation) modelling approach has been used to establish the proposed treatment train strategy. The model estimates the amount of pollutants the catchment produces, the performance of treatment measures and the pollutant load generated once the catchment is treated.

The proposed stormwater quality strategy is based on the use of distributed wetland treatment systems throughout the development. To meet the minimum stormwater quality requirements the following is required:
- “Eastern Catchment” – a wetland treatment area of 11 hectares. This is provided within the drainage reserve in the north east corner of the development plan (ie within the retarding basin)
- “Central Catchment” – a wetland treatment area of 2.6 hectares in the north west corner of the catchment.
- “Lower Catchment” – no specific wetland treatment. Stormwater quality requirements offset using distributed WSUD treatments such as raingardens and rainwater tanks. Alternatively “oversized” wetlands in the upper and middle catchments.

Whilst wetlands have been adopted as the base stormwater quality metric other distributed WSUD treatments should be encouraged and considered where appropriate (eg raingardens, swales, stormwater reuse etc.)

All infrastructure works will need to be approved by Council and the water sensitive urban design elements will need to be designed in accordance with Best practice or the Council’s standards. There may also be the need for interaction with other authorities during the approval process.

2.10.1 Eastern Catchment

Retardation

The criteria to be satisfied (refer to 6.1.1) is that peak stormwater flow rates from the Development Plan area need to be retarded back to equivalent flow rates under existing conditions. The estimated 1 in 100 year flood storage to required to achieve this outcome is 263,000m³ (ie 263ML)\(^1\) for the “Eastern Catchment”.

The required retardation storage could be provided in two ways:
- Distributed throughout the development plan area
- Centralised in one location

The development plan adopted a centralised location in the north east corner of the site. The reasoning behind this approach is as follows:
- The topography in the north east corner lends itself to be used for wetland and storage purposes. The land is low lying, poorly drained and therefore is not likely to be suitable for other urban development uses.
- The proposed drainage reserve area will retain the existing flood storage and provide the extra storage for development needs through excavation. This can integrate stormwater quality provisions through the construction of a large wetland.
- The flora and fauna reserve to the north of Bilson Street was investigated as a potential site to reduce the retardation requirements downstream. However a field inspection revealed that such an option would not be feasible or practical. Due to topographic constraints the majority of the catchment south of the Bass Highway would not be able to be controlled by a basin in this location. Also the physical disturbance to the existing vegetation within the flora and fauna reserve would be significant.

---

\(^{1}\) Based on 500m³/ha for residential land and 750m³/ha for industrial land within the development plan
Drainage Reserves / Waterways

The drainage gradients throughout most of the catchment are relatively flat and the existing constructed drains will need to be modified to accommodate the surface water hydrology from the development. The existing drains are severely degraded and the opportunity exists to re-create the desirable environmental values within a drainage reserve.

South of the Bass Highway (industrial area), the development plan has responded to the “sheet” flow nature of stormwater runoff from the upstream rural catchment. Based upon a site inspection and field survey the plan in Appendix 2 highlights the proposed drainage strategy in this area. The main features are:

- A drainage reserve north of the proposed bypass road is provided to control and collect sheet flow from the large rural catchment. Whilst the construction of the bypass is long term, the development plan will require the construction of this drainage reserve in the interim to manage flood flows.
- A drainage reserve is required to convey the existing catchment flows through the site as well as the future internal development flows that will be generated. Both the existing and future flow events will occur at different time of concentrations. The urban catchment flow will peak and pass quickly (in the order of 20 minutes) whereas the existing rural peak flow will peak and pass more slowly (in the order of 100 minutes). As a result the peaks of each catchment will not coincide and the proposed drainage reserve of 50 metres should be able to convey the combined flows as required.
- The drainage reserve will be vegetated with a meandering pilot channel.
- The upgrading and use of low energy culverts at the Bass Highway.
- The use of low energy culverts at other internal road crossings
- A 1 in 10 year minor drainage system (typically piped to the drainage reserve) with the remaining 1 in 100 year gap flow being conveyed along road reserves prior to overflow to the drainage reserve.
- The strategy has assumed that the catchment upstream of the proposed bypass road remains rural. Therefore any future development south of the proposed bypass road will require retarding basins upstream of the bypass road to restrict developed flows back to existing peak flow rates.

North of the Bass Highway the drainage strategy includes:

- A north-south drainage reserve that varies between 50-80 metres to convey the 100 year developed flow to the proposed retarding basin in the north east corner.
- The open waterway may incorporate pool and riffle forms to increase physical and biological diversity.
- In order to manage the flat hydraulic gradients the reserves may incorporate a series of wetland pondages.
- Tributary inflows from existing development and external rural catchments can be accommodated in drainages reserves of 40-50 metres in width.
2.10.2 Central Catchment
The minor and major drainage system will consist of an underground pipe and overland flows along the network of roadways. The outfall for the site is to the north. A drainage reserve has been provided for retardation of stormwater flows up to the 1 in 100 year ARI. An estimated retardations storage volume of 58,000m³ (or 58ML) is required.

2.10.3 Western Catchment
The minor and major drainage system will consist of an underground pipe and overland flows along the network of roadways. The outfall for the site is at the north west corner under Heslop Road.

The topography in the western catchment is less suited to a combined wetland and retarding basin. Within this small catchment on-site detention controls for stormwater management could be implemented. As suggested in the Condina report (2007) an alternative strategy could be based on a large rainwater tank on all allotments (10kL). The rainwater tank would be used for toilet flushing and garden irrigation whilst retaining at least 25% flood storage capacity (2.5kL) when full to overflow level.
3 Implementation

The following amendments to the Planning Scheme will be required to implement the development plan:

- Amendments to the MSS and Local Planning Policy as relevant.
- Introduction of a Development Plan Overlay (DPO) to cover the growth area.
- Introduction of a Development Contributions Plan Overlay (DCPO) to provide the equitable distribution of costs to the developable area.
- Rezoning of land in the growth area. The whole growth area will be rezoned through one single amendment. The rezoning will ensure appropriate residential zoned land is brought on line to respond to population growth and the current land supply situation. The rezoning will also ensure that land for industrial and commercial uses will be brought on line to respond to an immediate strategic need for this type of land.

A fast tracked process will be undertaken by Council and the DPCD Development Facilitation unit to implement this project. This approach has been taken given the immediate need for zoned industrial and residential land in Wonthaggi, and the extensive strategic assessment that has been undertaken by Council through the Wonthaggi Dalyston Structure Plan (2008) and this development plan process. It is anticipated that the Planning Scheme Amendment outlined above will be approved by early 2010.

In addition to the Planning Scheme amendment, the following work will be required to be undertaken to implement the project:

- **Subdivision planning:** All planning applications will be required to respond to the provisions of Clause 56 in terms of subdivision design as relevant. Applications will need to address all relevant requirements associated with cultural heritage and native vegetation.
- **Bypass and Wetland Design:** This project will be undertaken by Council in conjunction with VicRoads. This project is anticipated to commence in 2010.
- **Rail trail:** The design of the rail trail is required to implement a key component of the Development Plan. This work should be undertaken by Council.
- **Crown Land:** Further negotiation with the DoE, Wonthaggi Landcare and the DSE is required to determine the extent and layout of future development on this site. This is an important piece of work that should be prioritised by Council.
Part B
PART B: ANALYSIS & ASSESSMENT

Part B of the Development Plan contains all analysis and assessment undertaken to prepare and test the development plan.

The Development Plan has been informed by the significant base of existing technical information that has been prepared by consultants representing key individual developers or developer consortia in the study area (Refer to Table 4). Much of this work is ongoing and has been provided to the process in an iterative manner.

CPG reviewed all the existing technical information provided by Council. Some original assessments were required as a result of this review to confirm and test key technical elements including, drainage and flooding; traffic and road network; and, recreation and open space planning.

In addition to the technical assessments, detailed concept plans have been prepared by consultants representing the key land owners. These plans have been submitted to Council in various forms. Where appropriate these plans have guided the urban structure that has been resolved in the Development Plan process.

Additional information provided to CPG through the development plan process is summarised in Table 5.
Table 4: Summary of Existing Technical Information

<table>
<thead>
<tr>
<th>Existing Technical Assessment</th>
<th>Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cultural Heritage ▪ ‘Wonthaggi North East Development Plan, Desktop Cultural Heritage Assessment: Draft Report’, prepared by Tardis Enterprise Pty Ltd for Beveridge Williams, June 2007</td>
<td>▪ This report has been reviewed by CPG. ▪ The findings of this report have been applied to the Development Plan process.</td>
</tr>
<tr>
<td>Flora &amp; Fauna ▪ ‘Flora and Fauna Overview, Wonthaggi North East Development Plan, Wonthaggi Victoria’, prepared by Eciology Partners Pty Ltd for Beveridge Williams, April 2007.</td>
<td>▪ This report has been reviewed by CPG environmental consultant. ▪ CPG have been generally satisfied with the outcomes of the assessment. ▪ The Development Plan process has responded to this assessment and additional recommendations by the CPG expert.</td>
</tr>
<tr>
<td>Traffic ▪ Traffic assessment prepared by Traffix Group for Beveridge Williams.</td>
<td>▪ This report has been reviewed by CPG traffic engineering consultant. ▪ On the advice of Council, the Development Plan has applied the vpd’s contained in this report as appropriate in the assessment of the proposed urban structure and road network. ▪ A new traffic impact assessment has been undertaken of the draft Development Plan.</td>
</tr>
<tr>
<td>Drainage &amp; Flooding ▪ ‘Wonthaggi North East Drainage and Stormwater Management Strategy: Draft’, prepared by Pat Condina &amp; Associates for Condina &amp; Associates by Beveridge Williams, August 2007. ▪ ‘Wonthaggi South East Development Plan Preliminary Stormwater Management Strategy’, prepared by Bass Coast Shire Council, August 2008.</td>
<td>▪ These reports have been reviewed by CPG drainage engineers. ▪ CPG have been satisfied that the assessment prepared by Pat Condina &amp; Associates is accurate and the analysis / recommendations have been applied to the study area. ▪ CPG have acted on the recommendation of the Council document and have prepared a site features survey to determine 1m contours for the land to the south of Inverloch Road. The features survey enables accurate catchment analysis work to be prepared to inform the Development Plan.</td>
</tr>
</tbody>
</table>
Table 5: Additional Information

<table>
<thead>
<tr>
<th>Additional Information</th>
<th>Application</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Education</strong></td>
<td></td>
</tr>
<tr>
<td>Discussions with the Department of Education revealed opportunities for the following:</td>
<td>The DoE proposal provides a key opportunity for the integration of education and community uses, including recreation, within the Development Plan area proximate to the emerging growth area. This opportunity will be integrated into the proposed Development Plan.</td>
</tr>
<tr>
<td>- Relocation of the McKenzie Street campus of the secondary school to a Greenfield site adjacent to the Crown land located to the west of Carneys Road. Discussions with the DSE and DoE on this matter are well progressed. The re-location of the school would create a future development site on the McKenzie street land.</td>
<td>- The DoE proposal, if successful, would create potential development sites in town owing to surplus land coming online with the relocation of education uses. While these sites are outside of the Development Plan area, recommendations for the future use of these sites will be provided as appropriate.</td>
</tr>
<tr>
<td>- Preliminary consideration of a consolidated education hub on an extended site on the Crown Land identified above. This proposal would provide an opportunity for the re-location of the TAFE facility to this site, creating a new development site on this surplus land.</td>
<td>- The Development Plan will provide appropriate consideration to the potential re-location of the South Coast Christian College and the future use and integration of the existing site with the growth area.</td>
</tr>
<tr>
<td>- The relocation of the South Coast Christian College has been to a site outside of the existing town boundary, creating a potential development site proximate to the study area.</td>
<td>- The Development Plan will consider opportunities for integration with the subdivision and proposed road network as appropriate.</td>
</tr>
<tr>
<td><strong>Subdivision Application – South Coast Christian College</strong></td>
<td></td>
</tr>
<tr>
<td>It is understood that a subdivision application has recently been approved on a site to the southwest of the South Coast Christian College. This subdivision is for standard density residential. The subdivision provides for a road connection to the edge of the school.</td>
<td>The Development Plan will provide appropriate consideration to the potential re-location of the South Coast Christian College and the future use and integration of the existing site with the growth area.</td>
</tr>
<tr>
<td><strong>Bypass Road</strong></td>
<td></td>
</tr>
<tr>
<td>The Structure Plan proposes a bypass road following the alignment of Heslop Road, then running south at the edge of the study area to the Bass Highway around the industrial area.</td>
<td>The future alignment of the bypass road will be provided within the Development Plan area.</td>
</tr>
<tr>
<td>- The alignment of the bypass road has been tabled with VicRoads however no formal commitment to this road has been made.</td>
<td></td>
</tr>
</tbody>
</table>

G:\13\133487\Reports\final091208_Final_v.3.doc   Page 33
1 Site Context
The study area is a Greenfield site located to the north east of the established town area and covers approximately 725ha, representing a significant future urban extension to Wonthaggi. Wonthaggi currently has a resident population of around 7000 people according to the 2006 Census. Owing to the size of the growth area, and assuming a standard density, it is forecast that the growth area will accommodate in the order of 8,000 residents, effectively doubling the population at full development.

The residential component of the growth area will form an extension to the existing established urban area of Wonthaggi. Currently, the residential part of the study area is generally used for rural purposes however some residential development has occurred in the north and north-west of the study area, adjacent to the current edge of town as follows:

- A generally contained low density residential subdivision is located north of the existing residential area between Wentworth Road and Oates Road. This development backs on to the existing residential edge of town and is almost completely built out. Lots in this area range in size up to one hectare. This development is accessed via a court which limits future opportunities for integration.
- Existing and proposed standard density residential subdivisions to the west of the low density area. These subdivisions are in various stages of development. These subdivisions back on to an unmade, diagonal, road reserve which acts as an interface to the Greenfield component of the growth area.

The industrial / commercial component of the study area is partly subdivided and has been built out to varying degrees. The existing industrial uses generally front Inverloch Road, on the south side, with some larger land intensive development to the rear. Development generally reads as low amenity and has a poor presentation to the Inverloch Road frontage, contributed to by extended setbacks which seem to form part of a road reserve. There is a weak relationship between this industrial area and the established industrial area to the west in terms of form, use and access.

The study area is located within a variable walking distance to the local primary and secondary schools, with Wonthaggi North Primary and Wonthaggi Secondary School (Dudley Campus) in close proximity to the site. The site also has easy access to both the South Coast Christian College and St Joseph’s Primary School. The study area contains the proposed future consolidated education hub, proposed by the DoE. The hub is mooted on the land to the west of Carneys Road as part of the development of the component of the Parks Victoria Reserve. This hub will relocate the year 10-12 campus of the Wonthaggi Secondary School site with other education uses in the future.

In terms of retailing, the site is located outside of a walkable catchment to the core town centre. The Structure Plan anticipated this and proposed that a future neighbourhood node with community, open space and convenience facilities be provided in the growth area, proximate to Korumburra Road. This is supported
by the Council’s draft Open Space Strategy. The exact location of this centre has been refined through the development planning process. Additional convenience level facilities may be required to provide for local catchments.

Given the scope of development proposed in this growth area, the provision of community infrastructure will be required. Currently the distribution of community facilities within Wonthaggi is concentrated to the south of the town centre and limited facilities are provided within the residential areas of Wonthaggi North. Community facilities will be required within the growth area as identified in the Structure Plan. It is expected that neighbourhood facilities (including community and convenience retailing) should be easily accessible to all residential areas and ideally within an 800m radius of all residences where practical.

The site is currently not serviced, however servicing will be provided as part of the development of the growth area. In terms of servicing, a pumping station is provided at the south west corner of the study area, west of Carneys Road; and a sub station is located south of Korumburra Road in the study area.

The study area is located in a cultural heritage area that is managed by the Bunurong People. It is understood that potential significant sites are located in the study area.
1.1 Movement
The study area is serviced by key arterial roads including Korumburra Road, Bass Highway and a number of key collector roads including Wentworth Road, Oates Road, McGibbony’s Road and Loughran Drive. Opportunities for connections with the existing street network, and through the creation of road reserves, are available and should be maximised where possible to provide for seamless integration between the ‘new’ and the ‘old’ Wonthaggi, particularly in the residential area.

Figure 4 illustrates the key elements of the road network, including potential access points and links into the study area, sensitive road interfaces, and the proposed by-pass route. Table 6 provides a detailed summary of the existing conditions related to the road network and the opportunities and challenges this presents for the growth area.

Table 6: Existing Conditions, Movement Network

<table>
<thead>
<tr>
<th>Existing Conditions</th>
<th>Opportunities / Constraints</th>
</tr>
</thead>
<tbody>
<tr>
<td>Korumburra-Wonthaggi Road</td>
<td></td>
</tr>
<tr>
<td>Korumburra-Wonthaggi Road comprises a 5.6m wide sealed carriageway within a 40m road reservation. The carriageway widens in town and service lanes are provided for property access. The speed limit is 60km/h in town, increasing to 80km/h and then 100km/h within the site.</td>
<td></td>
</tr>
<tr>
<td>The Korumburra – Wonthaggi Road represents a key access for the growth area, however it also acts as a potential barrier to integration of the two parts of the residential area.</td>
<td></td>
</tr>
<tr>
<td>Opportunities to reduce the speed of this road as the area develops, to provide for safe and convenient local access with potential crossing points will be considered through the planning process.</td>
<td></td>
</tr>
</tbody>
</table>

| Bass Highway |
| Bass Highway is a state highway (Road Zone Category 1) that generally follows the coastline. In the vicinity of the site, Bass Highway comprises a 7.1m sealed carriageway with 1.5m-2.0m sealed shoulders on both sides, within a 20m road reservation. The speed limit increases from 60km/h to 100km/h away from town. |
| The existing industrial operations within Wonthaggi utilise the Bass Highway as the primary transportation route. At present the three main industrial areas are all accessed through the internal highway system. Bass Coast Council has proposed a bypass to address potential land use conflicts, reduce traffic congestion and conflict and address safety issues. |
| The Bass Highway will provide primary access at the commercial and industrial interface of the growth area. Opportunities to reduce the speed and provide for safe and convenient crossing points will be considered through the planning process. |

Table 6 continued: Existing Conditions, Movement Network
<table>
<thead>
<tr>
<th>Existing Conditions</th>
<th>Opportunities / Constraints</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Heslop Road</strong></td>
<td>• Heslop Road forms the future alignment of the proposed Bypass Road. This alignment will form part of the Development Plan to ensure land is set aside for its delivery and to ensure interface and residential access are appropriately designed at this early stage.</td>
</tr>
<tr>
<td></td>
<td>• Interim access and associated upgrades will be planned for in the Development Plan.</td>
</tr>
<tr>
<td></td>
<td>• Heslop Road is an unsealed local access road which forms the northern boundary of the development plan area. Heslop Road is a 6.5m carriage way within a 20m road reservation.</td>
</tr>
</tbody>
</table>

| **Bypass Road**     | • As noted above, the Development Plan assumes the construction of the Bypass Road will eventuate. |
|                     | • The Development Plan will provide an indicative alignment for the Bypass Road designed in collaboration with the Council Engineers. |
|                     | • The eastern extension of the bypass road would link with the Bass Highway to the east of Wonthaggi (approximately 500 metres east of the Wonthaggi East – Loughran Drive Industrial Estate). |
|                     | • The alignment of the potential bypass route between the Korumburra-Wonthaggi Road and the Bass Highway will determine the eastern edge and extent of the Wonthaggi North East Growth Area. |

| **Key Collector Roads** | • These key collector roads will provide opportunities for integration with the existing established areas and should be carefully planned for. |
|                        | • Key collector roads such as Wentworth Road, Oates Road, McGibbony’s Road and Miners Drive will require careful consideration as key access points. |
Figure Two - Site Context Plan - Movement

**Wonthaggi North East Development Plan**

- **Client:** Bass Coast Shire
- **Date:** 14.10.09
- **Revision:** 00.00.02

**DRAWING KEY**
- Development Plan Area
- Access points

**Proposed bypass**
- Generally consistent with the alignment of Heslop Road – the eastern extension of the bypass road would link to the Bass Highway approximately 500 metres east of Loughran Drive Industrial Estate.

**Design of residential areas adjacent to the proposed bypass will need to anticipate construction of the bypass.**

**Konumburra-Wonthaggi Road forms a barrier between future residential areas to the east and west.**

**Bass Highway (Inverloch Road) forms the entrance to Wonthaggi – appropriate design and built form is required.**

**Appropriate treatment of new junctions**

**Wonthaggi Golf Course**

**Flora and Fauna Reserve**

**State Coal Mine and Surrounding Environment**

**BASS HIGHWAY**

**KORUMBURRA - WONTHAGGI RD**

**CAPE PATERSON RD (Bunarong Rd)**

**To KORUMBURRA**

**To DALY'S FOW & MELBOURNE**

**To INVERLOCH**

**To DALY'S FOW & MELBOURNE**

**To CAPE PATRICK**

**Scale 1:20000**

**Figure Two:**

- Access points
- Development Plan Area
- Highway
- Proposed By-Pass Route
- Major Roads
- Unmade Road Reserves
- Unsealed Roads

- Appropriate treatment of new junctions

- Bass Highway (Inverloch Road) forms the entrance to Wonthaggi – appropriate design and built form is required.

- Konumburra-Wonthaggi Road forms a barrier between future residential areas to the east and west.

- Design of residential areas adjacent to the proposed bypass will need to anticipate construction of the bypass.

- Generally consistent with the alignment of Heslop Road – the eastern extension of the bypass road would link to the Bass Highway approximately 500 metres east of Loughran Drive Industrial Estate.
Open Space and Environment

The study area is affected by the Environmental Significance Overlay – Schedule 4. The environmental significance overlay covers a reasonable proportion of land within the study area; in the south-eastern corner of the land south of Inverloch Road, as well as on land to the east of Sharrock and McGibbonys Roads, north of Inverloch Road.

The ESO covers the land as a result of past mining activity in the area. The ESO aims to protect future development on the land from a possible risk of subsidence. As such, a geotechnical report will be required pre-development on the land to ensure that the constraints presented by possible subsidence are considered appropriately against the extent of development proposed.
Figure Three - Site Context Plan - Open Space

**DRAWING KEY**
- Development Plan Area
- Passive Open Space
- Active Open Space
- Highway
- Proposed By-Pass Route
- Major Roads
- Mature Vegetation (Within DP Area)
- Existing Buildings (Within DP Area Approximate Location Only)
- Catchment Boundaries (Approximate Location Only)
- Drainage Lines (Approximate Location Only)
- Land Subject to Inundation Overlay (LSIO)
- Environmental Significance Overlay (ESO4)
- Active Open Space Catchment Area
- Location of the Future Open Space Requirement Location is indicative of general area - not of final location of open space

Wonthaggi North East Development Plan

Client: Bass Coast Shire
Drawing No: 153 487
Date: 14.11.09
Revision: 00.00.02

CPG Australia Pty Ltd
A subsidiary of Downer EDI Limited
cpg-global.com

© CPG Australia Pty Ltd

Figure Three - Site Context Plan - Open Space

- Wonthaggi Golf Course
- Flora and Fauna Reserve
- State Coal Mine and Surrounding Environment
- Parks Victoria Flora and Fauna Reserve
- Bass Highway (Inverloch Road)
- Kooringal Rd
- Cape Paterson Rd (Bunarong Rd)
- Korumburra - Wonthaggi Rd
- To Korumburra
- To Dalyston & Melbourne
- To Cape Patterson
- To Inverloch
- Nyora - Wonthaggi Trail
- Powlett River
- Wonthaggi Primary School
- Wonthaggi Secondary College (Dudley Campus)
- Wonthaggi North Primary School
- St Joseph's Primary School
- Wonthaggi Wetlands
- Wonthaggi Recreation Reserve
2.1 Flora and Fauna

The flora and fauna analysis for the residential component of the study area north of Inverloch Road is based on an expert review of the 'Flora and Fauna Overview, Wonthaggi North East Development Plan', prepared by Ecology Partners (2007). The Ecology Partners assessment has been made available as a technical reference document to this Development Plan courtesy of Beveridge Williams.

The Ecology Partners report concluded the following:

- The study area is predominantly cleared agricultural land of low ecological value.
- The highest value indigenous remnant vegetation is contained in roadside reserves. The quality of this vegetation is variable ranging from good to poor.
- The Ecological Vegetation Classes (EVC’s) present in the study area are the endangered Swamp Scrub and Grassy Woodland, and the rare Damp Heathland.
- There are at least four valuable, scattered mature Swamp gums (Eucalyptus ovata) in the grazed paddocks which should be protected or will need to be offset.
- There were no National or State significant flora species recorded during the survey of the site, however 19 regionally significant plant species were observed.
- It was identified that two nationally significant species (Southern Brown Bandicoot, Growling Grass Frog) have been recorded in the area in the past and another four nationally significant species have the potential to be in the area (Swamp Antechinus, White footed Dunnart, Southern Toadlet, and Swamp skink). A further 12 State significant species have a low likelihood of being in the area.

The Ecology Partners assessment recommended that a net gain analysis be undertaken to satisfy the Native Vegetation Framework requirements prior to approval of works. Appropriate offset areas proximate to the study area in appropriate EVC’s should be explored, including land east of Sharrock Road, land east of Mullin Parade near the bush reserve, and potentially as part of the establishment of any proposed wetlands in the growth area.

Of note, the key areas of remnant vegetation are contained in roadside reserves and land provided for future road reservations, in particular the diagonal reservation in the southern part of the residential growth area. Intact, dense, remnant vegetation is particularly located at the southern end of this reservation.

No formal flora and fauna assessments of the land to the south of Inverloch Road have previously been prepared. A desktop review has been undertaken within the scope of works for the Development Plan. The desktop review of this land revealed the following:

- The aerial photography and site visit identified a similar condition to that described above, in that the land east of Carneys Road has generally been cleared for agricultural uses, and later industrial uses, over time.
The DSE Biodiversity mapping identifies the following EVC’s in this area:

- 53 – Swamp Scrub (endangered);
- 924 – Grassy Woodland/Swamp, Scrub Mosaic (endangered);
- 925 – Damp Sands, Herb-rich, Woodland/ Swamp Scrub, Mosaic (endangered).

The aerial photography reveals a high level of vegetation contained in future road reserves in this area, as well as along the proposed rail trail running east west across the northern portion of the site.

The aerial photography reveals the location of wind rows on rural properties north of the proposed rail trail.

A large proportion of the land to the west of Carneys Road is contained within a Crown Land Reserve.

The northern part of this Reserve, east of the rail trail, is heavily vegetated in parts. It is understood that the Wonthaggi Landcare group are currently preparing a plan to re-habilitate the northern part of this site, and will include a wetland area associated with passive open space.

The southern part of this Reserve, east of the rail trail, is cleared of all vegetation, except for some scattered roadside vegetation at the southern end of Carneys Road. The DSE support the development of this land for community and recreation uses in the future to meet the demands of the growing population. Development options on this land will need to consider flora and fauna considerations.

The western part of the Reserve, west of the rail trail, is largely cleared of vegetation except for some scattered trees and a small area of more dense vegetation in the northern edge. This part of the Reserve has been identified by the DoE for potential future education uses. Discussions with DSE have ensued. Any potential impacts on native vegetation of future development will be required to be offset. Offsets may be appropriate in the Landcare rehabilitation site.

Land to the west of the Reserve within the study area, west of Miners Drive, contains some remnant vegetation on the Department of Education land. Through discussions with DoE it is understood that some of this vegetation can be removed and offset on alternative sites.

It is considered highly likely that any habitat areas identified in the residential growth area may also be present in the southern part of the growth area. No targeted fauna surveys have been undertaken as part of this scope of works. The Development Plan will require resolution of this matter prior to the issue of any planning approvals.

2.2 Open Space and Recreation

Figures 3 & 5 illustrate that the established residential area of Wonthaggi is generally well served by passive and active opens space within an 800metre walkable catchment, including convenient access to the Wonthaggi Golf Course, Wetland Reserves, Wonthaggi Recreation Reserve (active recreation), Crown Land Reserve and the bush reserve west of Carneys Road.

Owing to its greenfield status, the study area does not contain any form of open space. As such, it will be important for the development plan to provide clear links to the existing established open space as well as providing a localised offer.
Council has adopted an Open Space Plan (November 2008). This plan has informed the development planning process.

The key recommendations of the Council’s Open Space Plan which are directly relevant to the development plan area are summarised below:

- **Open space contributions will be from net developable land and therefore shall not include land required for drainage purposes, for the protection of significant flora and fauna or sites of significant cultural heritage, or buffers.** However, it is desirable “for open space to abut encumbered land retained for floodway purposes, easements or buffers, to extend opportunities available on the designated open space.”
- **“Long narrow spaces should not be taken as open space. Minimum dimensions recommended are 70m in any direction, unless the space abuts the foreshore, buffer, or waterway or drainage corridor. In this case new unencumbered spaces abutting other open space corridors may be a minimum of 30m wide in any direction.”**
- **“Gateway development to townships, arterial roads and major distributor roads should be designed to incorporate a reservation for planting.”**

In addition, the Open Space Plan recommends that a 1 hectare park be provided to the north of White Road for social/family recreation. This recommendation is also reflected in the Structure Plan. Useable areas of open space should be easily accessible to all residential areas and ideally within an 800m radius of all residences. It is appropriate to provide a mix of active and passive recreational opportunities.

To determine the appropriate provision of active recreation for the growth area, CPG recreation planners undertook an assessment of the supply and demand based on current and forecast population and participation trends (Refer to Appendix 1 for the full report). It was concluded that overall, an estimated 66.7% of all people will participate in some form of physical activity at least once per week. An estimated 43.5% of the population will do so at least three times per week. The objective of the Development Plan is to build environments that encourage more people to be physically active more often. By doing so, we can create spaces that contribute to important health, wellbeing and social benefits to people and their communities. This is a central ingredient to building vibrant and prosperous communities.

The recreation assessment revealed that overall Wonthaggi has a high supply of open space including Guide Park Reserve, McMahon Reserve and Wonthaggi Reserve. Wonthaggi Reserve is the principal sports precinct for Wonthaggi. It provides an extensive mix of outdoor playing surfaces (ovals, netball courts, croquet greens and tennis courts). An indoor aquatic facility is also located at the site, including a 25m pool, toddlers pool, meeting room, gym and multi-purpose stadium. It is feasible that the Wonthaggi Reserve has some capacity to accommodate any additional use arising from the north east growth corridor.

The mooted relocation of the senior campus of Wonthaggi Secondary College to the growth area presents an opportunity for Council in terms of recreation.
provision. Recent Federal and State Government reforms have squarely positioned education facilities as central civic spaces with opportunities for co-location of recreation to allow for shared use of facilities, which in turn contribute to improved efficiencies in capital, maintenance and operational expenditure.

In terms of distribution and diversity of open space, it has been determined that a broad benchmark of open space to be available within 500m of households be applied. To allow for a local option for sports ground within the area it is considered that a larger area of open space be set aside north of Inverloch Road. Whilst the specific activity would need to be subject to more thorough assessment and local area consultation, it is based on the understanding that the growth area, when fully developed will have a potential market audience of over 100 people for at least five different sports.

The development of an off road, shared trail system through the centre of the development plan area is a core requirement for recreation open space consideration. Walking and cycling make the most profound contribution to individual health and community wellbeing as it is participated by more people than any other activity and more continuously throughout individual life cycles. Moreover, settings that encourage walking and cycling as a means of getting somewhere (ie. incidental activity) have the capacity to make the most significant contribution to individual health as it builds physical activity into our daily life. On this basis, it has been recommended that a shared trail follow the required drainage easements throughout the site.

In addition to active recreation; passive open space, neighbourhood parks and wetland areas for passive recreation will be required to be provided throughout the growth area. The provision of passive open space will be co-located within high amenity wetlands and linear drainage reserves where possible.

2.3 Cultural Heritage

A review of cultural heritage affecting the study area has been undertaken via two means: review of the Aboriginal Affairs Victoria (AAV) database and review of existing cultural heritage studies.

Aboriginal Affairs Victoria

The AAV website identifies some land in the study area as having potential cultural heritage sensitivity, including land south of Inverloch Road located along the drainage lines. Detailed assessments of this land will be required pre development. It is assumed that the Development Plan will be able to adequately respond to any cultural heritage issues identified through this assessment.

Existing Technical Reports

A desktop level cultural heritage assessment was prepared by Tardis Enterprise Pty Ltd for Beveridge Williams (2007). This assessment is provided as a technical reference document to the Development Plan courtesy of Beveridge Williams. This assessment only applies to the northern part of the residential growth area, north of the McGibbony’s Road reservation.

The cultural heritage assessment revealed the following:
The study area has been significantly modified from its original state due to historic land use. This will have reduced the potential for significant sites. However, the site contains land forms that have been locally shown to contain Aboriginal archaeological deposits.

- No previously recorded Aboriginal sites were identified during the desktop assessment.
- Four historic structures of possible cultural heritage value were identified in the assessment.
- Additionally, a possible ephemeral hot spring is located within the study area that would have been a site of interest to past Aboriginal people.
- Some sections of the study area were assessed as containing potential for surface and sub-surface Aboriginal and/or historic cultural material.

Having regard to the potential site locations, the assessment concluded that:

“...previously disturbed and small scatters of stone artefacts are the most probable cultural remains within the study area. Whilst these sites, evidence of transient and infrequent occupation, will have originally been as small discrete clusters they are now widely distributed across the landscape. Sites such as these provide very little scientific information and require minimal management.” (p.II)

In addition, the assessment made specific comment on potential high significance sites as follows:

“(However) areas deemed as having archaeological potential are considered to potentially contain higher density of cultural material that may reflect slightly increased utilisation. These landforms, if they are to be impacted by future ground disturbance should be further investigated to clarify the risk to heritage values. Further investigations would include both surface and sub-surface investigations. If a significant deposit is found, then recommendations would be made to avoid the site via changes in development design. Under condition of the new Aboriginal Heritage Act 2006, if a site is to be impacted by development, comprehensive salvage would be required.” (p.II)

It is proposed that appropriate cultural heritage assessments be undertaken prior to approvals for works associated with subdivision of land in the study area.
Drainage and Flooding

The study area is affected by the following overlay:

- Land Subject to Inundation Overlay

A drainage assessment for the residential component of the study area, north of Inverloch Road, was prepared by Pat Condina and Associates for Beveridge Williams (2007). This assessment was reviewed by CPG drainage engineers who were satisfied with the contents, method, calculations and overall findings. In terms of recommendations, the Pat Condina and Associates report concluded that:

‘...the most appropriate strategy for the central and east catchments in the Wonthaggi North East entails use of linked linear wetland pondages (with sediment traps at inlet pipe locations), stormwater storage in the airspace above the wetlands, reuse of stored water in wetlands or other pondages for open space irrigation, and provision of suitable rain tanks for garden watering and toilet flushing on individual properties. Wider catchment floodplain management issues appear to be significant in the northern sector of the east catchment.

In the west catchment land slopes are less suited for wetlands although it would be feasible to construct one in the north east corner of the Fullers Road / Haywood Road intersection. An alternative strategy for this catchment could be based entirely on large (10KL) rainwater tanks on all roofs, hard-plumed to supply all toilet flushing and garden irrigation needs and retaining at least 25% flood storage capacity (2.5KL) when full to overflow level.” (p.22, Pat Condina & Associates, Neil M Craigie Pty Ltd)

To understand the drainage and flooding implications for land south of Inverloch Road, CPG undertook a site features survey. The features survey was used by CPG to analyse the catchment and to inform the development plan response. The stormwater strategy for this development plan parcel was integrated with the general requirements identified by the Condina report. The stormwater and drainage strategy is contained in Appendix 2.

Existing conditions

Within the proposed development the site is divided into three distinct sub-catchments referred to as the “West Catchment”, the “Central Catchment” and the “East Catchment” (refer to the “Overall Catchment Plan” in Appendix 2). Each of these catchments ultimately drain to the Powllett River via unnamed tributaries.

The following provides an overview of the existing conditions of drainage catchments in the study area.

Eastern Catchment

The “Eastern Catchment” is the largest catchment within the Wonthaggi Development Plan. Whilst this consists of approximately 570 hectares from within the development plan area it also includes a significant external catchment that flows through the development plan (refer to subcatchment plan in Appendix B).
The largest external catchment is south of the Bass Highway (616 ha), of which the majority is rural. A small retarding basin exists south of Bass Highway. However due to the topography of the existing catchment overland/sheet flow flooding has occurred and impacted the Bass Highway frontage. North of Bass Highway an open drain conveys flows to the Powlett River.

Northwest of the Bass Highway approximately 94ha of external catchment enters the development plan area. This area includes existing residential development.

Northeast of the Bass Highway approximately 200ha of predominantly rural land enters the development plan area. An existing drainage line and depression, located about 1100 metres north of the Bass Highway, carries flows into the proposed development plan area. This drainage line joins with the existing open drain that flows in a northerly direction through the development plan site. The catchment boundary to the east is relatively ill-defined. Two large additional catchments to the east known as the Outtrim Road catchment (1670 ha) and the Kirrak / Shepherd Road catchment appear to join the “East Catchment” just north of the Development Plan area. Therefore there is the potential of flooding from these catchments to impact upon the north eastern part of the development plan.

Much of the area is poorly drained and the eastern catchment is serviced by a number of constructed channels. These highly modified drains and agricultural practices have removed significant remnant vegetation that would have existed. Whilst the modified drains are degraded due to the lack of vegetation, the physical form appears to be relatively stable.

The land is generally low lying, particularly in the north. The north eastern section of the development plan and parts of Heslop Road are covered by a Land Subject to Inundation Overlay (LSIO), which could be influenced by the backwater floodplain of the Powlett River.

Central Catchment
The “Central Catchment” consists of approximately 117 hectares from within the development plan area, with about 12 additional hectares from an external residential catchment to the south. An existing open channel drains the catchment under Heslop Road and into the Powlett River.

Western Catchment
The “Western Catchment” consists of approximately 38 hectares from within the development plan area, with about 23 additional hectares from an external rural catchment to the west.

Drainage Strategy
A drainage strategy has been prepared for the development area (Refer Appendix 2). The drainage strategy for the proposed development is based on the major/minor approach. The minor drainage system is the network that is capable of carrying runoff from minor storms (typically gutter and pipe systems or swales). The major system comprises the planned and unplanned drainage flow paths that convey runoff from major storms. The word “major” does not relate to catchment size but to the size of the storm or rainfall event. For a new
development this philosophy should be adopted along with requirement to ensure that there is a “net no impact” on surrounding and downstream properties.

The “net no impact” approach is supported by regulation through statements in Clause 56.09 of the Victorian Planning Provisions. An extract of the relevant statements are provided below:

- **Standard C31 (Minor Drainage)** - The minor drainage system should be designed to ensure that existing downstream flows are restricted to pre-development levels unless otherwise agreed to by the responsible authority.

- **Standard C35 (Major Drainage)** – The drainage system should be designed to ensure that flows downstream of the site are restricted to pre-development levels unless increased flows are approved by the responsible drainage authority. The built environment downstream of the proposed residential development should not be degraded by major drainage flows or floodwaters.

As the pre-developed situation has a lower fraction imperviousness than post-developed, there will potentially be an adverse impact if the stormwater runoff is not mitigated. Therefore to achieve the objective of “net no impact” it is necessary for the development plan to cater for a reduction runoff rate to pre-development levels. The drainage discharge should also follow the existing/natural flow path.
4 Servicing

4.1 Sewer

South Gippsland Water is the responsible water authority for Wonthaggi. South Gippsland Water advised that the Lance Creek Water Supply System can continue to supply future growth in Wonthaggi (both infill and growth areas) over the next 20 years.

South Gippsland Water have a strategy to promote the re-use of wastewater over the summer irrigation period and to undertake minor upgrades of the treatment plant to cater for additional loadings over the winter period. This is consistent with the Bass Coast Municipal Strategic Statement (Clause 21.05-5) to ‘actively promote opportunities that exist for innovative enterprises to use the recycled wastewater from sewerage treatment plants…’

Existing sewers on the northern, southern and eastern fringes of Wonthaggi could service future urban growth. However, pumping stations may be required to access the existing sewers.

4.2 Potable Water

South Gippsland Water has advised that the Lance Creek Water Supply System can continue to supply future growth in Wonthaggi (both infill and growth areas) over the next 20 years. If currently unserviced towns are connected to the system, alternative sources of water supply can be accessed to meet demand.

4.3 Electricity infrastructure

Electricity infrastructure can be extended through the development plan area.

4.4 Telecommunications infrastructure

Existing telecommunications infrastructure can be extended through the development plan area.
Wonthaggi Implementation and Development Plan
Recreation Assessment

8 June 2009

Prepared by CPG Australia for Bass Coast Shire Council
## Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Introduction</td>
<td>1</td>
</tr>
<tr>
<td>2 Background Context and Assumptions</td>
<td>2</td>
</tr>
<tr>
<td>3 Recommended Recreation Provision</td>
<td>3</td>
</tr>
<tr>
<td>3.1 A review of the current supply of public open space for recreation activity</td>
<td>5</td>
</tr>
<tr>
<td>3.2 Anticipated demand for sport and recreation activities</td>
<td>9</td>
</tr>
<tr>
<td>3.3 Proposed developments associated with the relocation of Wonthaggi Secondary College (Y10 – 12 campus)</td>
<td>12</td>
</tr>
<tr>
<td>3.4 Distribution of open space within the Development Plan area</td>
<td>13</td>
</tr>
<tr>
<td>4 Conclusion</td>
<td>15</td>
</tr>
</tbody>
</table>
1 Introduction

CPG Australia has been engaged by Bass Coast Shire Council to complete an Implementation and Development Plan for its principal growth area in north east Wonthaggi. The Development Plan will provide the important technical and strategic framework from which to manage residential growth and development in the area.

The need for a recreation assessment for Wonthaggi has been identified during the course of this project. Specifically, Council has requested that CPG consider, within the context of the Development Plan:-

- The identification of the distribution, diversity and quality of recreation facilities and settings across the area.
- Influences to current and future demand and the strategic planning context for sport and recreation infrastructure and settings, based upon a review of existing strategic information, contemporary participation trends, expected population characteristics and resourcing capacities.
- The assessment within a context of local, neighbourhood and a regional supply of facilities and settings.
- An analysis of the features described above, drawing conclusions about the capacity of existing facility provision to accommodate future participation targets and to identify and prioritise any areas of unmet demand and / or areas of surplus provision.

This report documents the outcome of the recreation assessment.
2 Background Context and Assumptions

Sport and recreation is an important ingredient to community life. It provides an opportunity for people of all ages to be physically active, strengthen social connections and to engage in community life. These are core ingredients to building vibrant and prosperous communities.

Consideration of recreation opportunities and settings for future communities at the Development Plan stage is a key opportunity to ensure that current and future residents have access to a sustainable and diverse mix of recreation opportunities. Settings such as parks, walking trails, community and sports facilities, make a direct contribution to liveability, community wellbeing and therefore development potential of urban areas.

With this in mind, a recreation assessment for Wonthaggi has been prepared giving regard to:

– The recreation needs of the immediate population forecast for the north east growth corridor of Wonthaggi
– The capacity of existing open space and recreation facilities to accommodate anticipated demand from the growth area, and in turn,
– The extent to which recreation provision should be considered within the context of the Development Plan in accordance to both anticipated need and current supply of recreation settings.
– The strategic opportunity for recreation and open space developments within Wonthaggi, giving regard to anticipated developments across the township.

A number of assumptions have been applied to this assessment and are listed below:

– The total expected number of dwellings to be realised within the development area is 1,300. An average of 2.44 people per household\(^1\) has been assumed to suggest a total estimated population of 3,173 people.
– That the rate in which the total population yield is expected to be realised is between a 15 to 20 year period.

This report has been researched and drafted following a site visit, review of planning information and limited discussions with Council staff and other stakeholders. The report has been a desk-top assessment only. It has not incorporated any consultation with local organisations and clubs to verify issues of local area demand and capacity.

3 Recommended Recreation Provision

The following page provides a schematic interpretation of the recommended scope of recreation and open space provision, taking into account the impact of residential demand stemming from the north east growth corridor. It has been prepared giving due regard to:

– The existing supply of public open space suitable for recreation activity
– Current participation trends in sport and recreation activity and the expected market size for specific recreation activities.
– Potential developments associated with the relocation of Wonthaggi Secondary College (Y10-12 campus)
– The opportunity for a north south trail corridor following the drainage easements required for the site.

Further discussion relating to each of the considerations, and their consequence to future open space and facility needs, as listed above are outlined in subsequent sections of this report.
WONTHAGGI DEVELOPMENT PLAN
RECREATION ASSESSMENT: PROPOSED PROVISION
June 2009

Wildflower Reserve Master Plan
This is the central sports precinct for Wonthaggi. A site master plan is would allow for improved traffic circulation and greater synergy between facilities and playing surfaces.

Secondary Active Sports Area
A larger parcel of open space has been set aside to accommodate active sport. It acknowledges a lack of larger parcels north of the Bass Highway and the increased demand for local open space for family participation. Subject to further local area assessment, provision should allow for turf playing surface (soccer), basic pavilion facility, family BBQ area and play area. Informal active structures such as half court basketball court / rebound wall could be considered for the site.

Active open space growth area
This site reflects a potential land swap between the Department of Education and Early Childhood and the Department of Sustainability and Environment. It assumes the eventual relocation of the Year 10 to 12 Campus of Wonthaggi Secondary College to a new site off McKenzie Street and the opportunity to develop shared education and community facilities and open space. With this comes the opportunity for synergies with facility development, maintenance and operation and a capacity to pool resources across a number of partners. This would otherwise be unavailable were it not aligned with an education development.

Shared Trail Network
A major trail system is proposed for the growth area. It takes advantage of and follows the drainage easements across the site. Implicit to the system is that it:
- Links into the broader township trail system
- Connects residential areas to civic spaces and facilities, such as schools and shopping areas
- Incorporates a suite of supporting amenities including signage, distance markers and seating

DRAWING KEY
- Shared pathway (current and proposed)
- On road trail (current and proposed)

Active Open Space
Passive Open Space
Possible future school site
3.1 A review of the current supply of public open space for recreation activity

Much of the open space throughout Wonthaggi is flora and fauna reserves. These are areas of Crown Land that are managed by Parks Victoria. A scan of the supply of other public spaces identifies three distinct areas of public recreation space across Wonthaggi. The following page provides a map of existing recreation provision in Wonthaggi and focuses upon the three principal public recreation spaces at McMahon Reserve, Guides Park Reserve and Wild Flower Reserve.

Specific characteristics of existing supply are as follows:

**Overall**

With an estimated resident population of in excess of 6,500, Wonthaggi residents have access to a comprehensive mix of facilities and settings, which were identified to include:

- 3 sports ovals (catering for AFL football, football and cricket)
- 7 netball courts
- Indoor 25m pool and toddlers pool
- Indoor multi purpose court (not including school facilities)
- Croquet greens
- Connection to the Bass Coast Rail Trail
- Flora and fauna Reserves
- Golf Club
- Tennis courts
- Numerous playgrounds

Whilst in the main, Wonthaggi has a diverse and reasonable extent of open space, there is a clear lack of local open space north of Bass Coast Highway. This will need to be a specific requirement to be addressed within the context of the Development Plan for the North East growth corridor.

There is an extensive mix of connecting trail systems (either constructed or proposed as part of Councils Bicycle Strategy, 2007) which provide important infrastructure to connect people to civic destinations as well as support incidental recreation through enhanced pedestrian and cycling provision.

**Guide Park Reserve**

- Guide Park Reserve is a formal, passive recreation park that provides a place for BBQ’s play for visitors and residents.
- The space is landscaping is highly formalised with an access road running through the spine of the reserve. Bollards separate pedestrian and vehicle circulation.
The reserve links to the broader Parks Victoria Flora and Fauna and abuts the Bass Coast Rail Trail (although there was no suggestion of the trail at the Reserve). This is a major trail system that reportedly attracts approximately 3,500 visitors each month. It includes a 15km trail from Anderson to Wonthaggi and is the only coastal bicycle rail trail in Victoria. From Wonthaggi, the first five kilometres of the trail is fully constructed and suitable for cycling, walking and horse riding, with the remainder of the trail is suitable for mountain biking, walking and horse riding.

**McMahon Reserve**

- McMahon Reserve provides a home base for cricket and soccer. The site is a long narrow active sports pitch that has residents located on the north, south and western borders. There is minimal clearance between the boundary of the playing surfaces and resident boundaries.
- The site was previously an athletics pitch and still retains the turf embankments that supports spectator viewing.
- The site is undersized and has limited area to control vehicles associated with competitive sport. Areas of ground compaction suggest that vehicles face the reserve which would result in a narrow corridor between cars and resident boundaries for pedestrian and vehicular circulation.
- Overall McMahon Reserve offers a pleasant and low-level sporting amenity for competitive sport and informal family play. It provides clear sightlines into the reserve and provides a setting that would support informal family play activities such as kicking a footy, running the dog and walking.
- It is the considered view that there is no capacity to extend the reserve to accommodate greater use.

**Wild Flower Reserve**

- This is the principal sports precinct for Wonthaggi. It accommodates almost all sporting facilities including turf-based sports, tennis, netball, croquet. It is also the base of the Wonthaggi Leisure Centre which includes an indoor 25m pool, toddlers pool, gymnasium and single, multi-purpose court.
- There are at least three separate vehicle entrances to the precinct and few examples of integration of facilities. Rather, the site reflect the sum of at least four separate zones. There were no examples of shared facilities or integration of infrastructure, such as access roads or a consistent identity reflected through signage and landscaping.
- Wild Flower Reserve would greatly benefit from the master plan. It will examine current usage patterns, site functionality and build a development direction to accommodate future and demonstrable demand expectations. In principle, it is preferred that any further sports infrastructure consolidate on existing sites, rather than build a satellite site at another venue. Whilst it is expected that the site has both the available space and capacity for some further development, the capacity and suitability is unknown and would need to be further addressed through the development of a master plan.
Concrete skate park. Council website identifies that it will be removed (see Sept 08 media release). Fencing would suggest a closed facility although it is still accessible through the fence.

Wonthaggi Development Plan: Recreation Assessment: Executive Summary

June 2009
3.2 Anticipated demand for sport and recreation activities

This issue draws from State participation information prepared by the Australian Sports Commission (ERASS Reports) and also considers the impact of the potential yield as influenced by the North East growth area of Wonthaggi.

2006 census information describes a total population of approximately 6,500 for Wonthaggi. Furthermore, previous comments (see page 2), anticipate a yield of approximately 3,170 people for the North East Growth corridor. Assuming a total population of 9,670, approximately has been applied to ascertain projected demand for sport and recreation activity.

2007 ERASS data identifies that 66.7% of people will participate in sport, recreation or physical activity at least once per week. On this basis, we can expect that approximately 4,300 of people living in Wonthaggi will regularly participate in some form of recreation activity.

The following table describes the projected demand for selected recreation activities. The participation rate, as shown below, describes the percentage of Victorians who participate in each activity, as reported by the Australian Sports Commission.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Participation Rate (%)</th>
<th>Projected Demand</th>
<th>Wonthaggi</th>
<th>Wonthaggi + Development Area</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Walking</td>
<td>34.0</td>
<td>2,210</td>
<td>3,288</td>
<td>1,078</td>
<td></td>
</tr>
<tr>
<td>Cycling</td>
<td>10.7</td>
<td>696</td>
<td>1035</td>
<td>339</td>
<td></td>
</tr>
<tr>
<td>Aerobics / Fitness</td>
<td>20.8</td>
<td>1,352</td>
<td>2,011</td>
<td>659</td>
<td></td>
</tr>
<tr>
<td>Tennis</td>
<td>6.4</td>
<td>416</td>
<td>619</td>
<td>203</td>
<td></td>
</tr>
<tr>
<td>AFL Football</td>
<td>3.3</td>
<td>215</td>
<td>319</td>
<td>105</td>
<td></td>
</tr>
<tr>
<td>Cricket</td>
<td>3.3</td>
<td>215</td>
<td>319</td>
<td>105</td>
<td></td>
</tr>
<tr>
<td>Netball</td>
<td>3.8</td>
<td>247</td>
<td>367</td>
<td>120</td>
<td></td>
</tr>
<tr>
<td>Swimming</td>
<td>11.3</td>
<td>735</td>
<td>1093</td>
<td>358</td>
<td></td>
</tr>
<tr>
<td>Golf</td>
<td>6.8</td>
<td>442</td>
<td>658</td>
<td>216</td>
<td></td>
</tr>
</tbody>
</table>

2 ERASS Reports refer to an annual publication prepared by the Australian Sports Commission, Exercise, Recreation and Sport Survey. Information identified in this report refers to the most recent publication (2007)

3 As identified from the Gippsland Research and Information Service, Bass Coast Statistical Profile, 2008
Participation in formal, organised sporting activity declines with age. As such, and giving regard to a progressive increasing proportion of older age groups, we can expect that activities such as walking, cycling and swimming will become increasingly important to the population.

The Development Plan will have a consequential effect to demand in settings that support sport, recreation and physical activity, particularly in informal recreation activities such as walking, cycling, aerobics and fitness activities and swimming. The proportion of the population who will regularly participate in these activities surpasses all other activities. It is important to note that the participation rates for walking and cycling do not include incidental recreation (such as walking to school). For this reason, integrated trail systems with connections to key community destinations further enhance the opportunity for increased activity, through incidental recreation activity.

Of interest in the projected demand for aerobics and fitness activities. This does not include weight training (with a participation rate of 2.3%) and yoga (3.1%). Collectively, these activities are commonly provided for within indoor leisure centres, and on this basis, a potential yield from the development plan area of over 800 people is in the realm of possibilities. This activity is experiencing a marked rise in participation, reflecting the growing individualisation and also a rise in consumer orientation towards recreation participation. On this basis, it is expected that the development plan will trigger increased demand on facilities at the Indoor Leisure Centre. This project has not consulted with the YMCA, and as such there is no view as to whether the facility (particularly the gymnasium) could accommodate the growth. Having said that however it is likely that the yield would be close to doubling the existing gymnasium memberships at the Leisure Centre.

To a lesser extent, the residential yield anticipated by the north eastern growth corridor is expected to result in a net increase of between 100 and 200 participants for a number of specific sporting activities. Given that the yield is anticipated to be realised over a 15 to 20 year timeframe, notionally increases could be reflected through an average annual increase of between 5 to 10 participants per year. On this basis, the impact of residential growth will be a slow and is not anticipated to present any urgent challenges to Council in terms of ground accommodation.

An exception to this trend may be football (soccer). With existing facilities limited at McMahon Reserve (and potentially school facilities), there is likely to be a rising increase in the demand for soccer as the profile of the sport continues to grow across the Country. The strength and rise of soccer in Australia, and Victoria is self evident. Australia’s performance in the Oceanic region and in the World Cup will continue to attract considerable resources to the game in this country. Coupled with its capacity to provide a comparatively non-contact opportunity for juniors and its ability to cater for women and girls participation in

| Football (soccer) | 3.6 | 234 | 348 | 114 |

© CPG Australia Pty Ltd
sport has meant that the sport has experienced a steady rise in participation across all age groups.
3.3 Proposed developments associated with the relocation of Wonthaggi Secondary College (Y10 – 12 campus)

Discussions held as part of the broader development Plan have mooted the possibility of the relocation of the existing Wonthaggi Secondary College. In brief, the proposal looks at relocating the School from its McKenzie Street site to a portion of the larger land reserve off Carneys Road (see below).

Wonthaggi Secondary College is split over two sites, being the Dudley Campus (years 7 to 9) and the McBride Campus (years 10 to 12). The school has a combined enrolment of approximately 1,100 students.

The proposed site (incorporating the proposed school site) is held by the Crown and zoned Public Park and Recreation. It used for environmental revegetation purposes with the total site reported to be in the order of 20 Hectares.

Discussions with the Gippsland Regional Office\(^4\) for the Department of Education and Childhood Development (DEECD) indicate that:

- It is acknowledged that the relocation provides an opportunity for the school. DEECD have held preliminary discussions with private operators with the view of establishing a trade training centre.

- The possibility is only in its infancy and as such the Department has yet to fully investigate the strategic priority of the development compared to other works in the Gippsland Region. On face value however, it is acknowledged that the relocation will provide a considerably improved site for the Year 10 to 12 campus of the school.

\(^4\) Discussions were held with Michonne Van Rees, Regional Manager and Dom Papross, from the Gippsland Region for the Department of Education and Early Childhood.
The relationship of the site to public open space is viewed as a considerable advantage. With this in mind, Council officers have mooted the possibility of a land swap involving a range of partners which could see a new school site, public open space and flora and fauna reserve.

The proposition brings an opportunity to consider the development of shared community facilities that service both education and broader community purposes. This is a key feature of Federal and State government policy in relation to the central role of schools in communities and the potential to foster partnerships with other levels of government and the wider community. This concept is one that underpins the initial interest by DEECD.

The school has confirmed that its site (approximately 13 hectares), is of sufficient size to accommodate school facility and dispersal space requirements.

Whilst important, there are a number of other education priorities across the region, and in comparison, the Wonthaggi proposal is of lesser significance.

Notwithstanding competing projects, it is understood that the project could be considered within the context of providing other funding opportunities associated with the desalination project provides an opportunity that may

Education facilities are cornerstone civic facilities. They are well established and familiar community spaces. The development of broader community facilities as an extension of education developments provide a clear opportunity to augment civic spaces and to build a range of economies of scale and synergies that come with shared use and co-location of facilities. Such facilities may include:

- Shared use of sports grounds and associated toilet / change facilities
- Indoor multi purpose facilities
- Playgrounds

For this reason, it is the considered view that the Development Plan for North East Wonthaggi acknowledge the possible relocation of Wonthaggi Secondary College and in turn, identify the potential to develop a new public open space area adjacent to the site.

3.4 Distribution of open space within the Development Plan area

There are a number of principles that have contributed to the recommended provision of open space. They include:

- That residents should have open space within reasonable walking distance from their home. While what actual distance this translates to can be an area of contention, standards adopted by different local governments generally fall between 400m and 800m. Given the expectation that the development area will attract young families, a general rule of thumb of 500m has been applied (it is noted that the Council’s Draft Open Space Strategy identifies a principle of 400m).

- That residents should have access to a diverse range of areas that support a range of different recreation activities. The scope of open space outlined for the
development area allows for areas for a range of activities such as formal sport, quite reflection, family play, walking and cycling.

- An allowance for the provision of an active sports precinct is recommended. It acknowledges the lack of larger open space areas north of Bass Highway, and as such, is anticipated to take on an active sport function. Given previous comments with regard to the possible relocation of Wonthaggi SC, it is proposed that the new sports precinct within the development area be of sufficient size to accommodate a senior cricket oval, basic pavilion and circulation area. In the event that the relocation of the school does not proceed, the role and catchment of the sports area would be elevated and would need to be increased to accommodate a larger scale of amenity (up to 4 hectares in total area).

- That shared, off road trails are an integral feature of the subject site. It is understood that the site requires considerable drainage easements to manage surface run off across the site. This provides a clear opportunity to develop a central spine within throughout the Reserve. It is expected that the trail will support participation for approximately 1,000 residents who will walk for recreation on a regular basis. Furthermore, it provides a setting that will promote walking and cycling as a means of transport. This feature, above all other recreation provision for the development plan region, will directly contribute to the health and wellbeing of the population by supporting walking and cycling. Supporting features that will need to be included within the scope of works include:
  
a. Signage, reinforcing a integrated trail system, distance markers and directions  
b. Consideration of CTED principles, such as clear sightlines and an open interface with adjoining residential properties  
c. Regular seating, incorporating landscaping.
4 Conclusion

This report has described the outcome of an assessment of open space and recreation facilities to be included as part of the Development Plan for the north eastern growth corridor for Wonthaggi.

It has drawn a number of conclusions with regard to the provision of open space and recreation opportunities to be considered for Wonthaggi, taking into account the impact and opportunities presented by residential development in the north east. Specific observations and recommendations are summarised below:

– Overall, Wonthaggi has a high supply of open space, with most areas consisting of flora and fauna reserves.

– Specific areas set aside for sport and recreation exist at Guide Park Reserve, McMahon Reserve and Wild Flower Reserve. McMahon Reserve is undersized and presents some clear pedestrian and vehicle circulation challenges. There is no capacity to extend the scope of infrastructure on this site without significantly compromising circulation areas and residential amenity.

– Guide Park Reserve offers an informal, family picnic and play site. There were no issues identified for this site in relation to the impact of the development plan area.

– Wild Flower Reserve is the principal sports precinct for Wonthaggi. It provides an extensive mix of outdoor playing surfaces (ovals, netball courts, croquet greens and tennis courts). An indoor aquatic facility is also located at the site, including 25m pool, toddlers pool, meeting room, gym and multi-purpose stadium. Given the scope of facilities and the lack of alternative indoor facilities, it is expected that the facility would service a regional catchment, particularly during the Winter season. Usage patterns of the total site are expected to be extensive, particularly during the football season for netball and football. There was no evidence of any shared use of facilities or synergy between playing zones or pavilion facilities across the park. There are, for example, three separate entrances to the Park. All buildings relate to a single playing arena and as such there was no evidence of any economy of scale associated with co-located building arrangements. Similarly, it is understood that the turf wicket oval does not have a winter tenant.

With that in mind, it is feasible that the site has some capacity to accommodate any additional use arising from the north east growth corridor. More specifically, it is recommended that the site undergo a master planning process in order to maximise the usage potential of the site in a sustainable way, and to develop an agreed development direction in a manner that efficient and effective use of the space and resources available.

– A broad analysis of projected demand for specific activities has been undertaken. It has applied upon State participation references to apply a broad appreciation of current and potential demand for specific recreation activities, and more
specifically, quantified the impact of residential growth emanating from the development plan site. The analysis identifies a number of salient points:

- Walking and cycling for recreation are the most common and most frequently participated activities. These activities will be more important as the community ages as they are one of very few recreation options participated by older age groups. It is expected that over 1,000 people from the total development area will walk for recreation.

- The development area is likely to trigger a rise in demand for a range of sporting activities, with the number of new participants for common sporting activities expected to be over 100 people in many instances. Having said that however, it is growth that is likely to be realised over a 15 to 20 year period, roughly translating to an average annual rate of growth of approximately 5 to 10 people. Considering the natural shift away from active sport as the rest of the population ages, the net annual increase is likely to be smaller again. On this basis, the projected demand for selected activities suggests that the development area is not anticipated to trigger an urgent demand for sport facilities for Council. It does however trigger the need to address infrastructure for walking and cycling. A notable exception to this may however be football (soccer), which has historically experienced a rise in the rate of participation.

- The suggestion of the relocation of the senior campus of Wonthaggi Secondary College presents an opportunity for Council. Recent Federal and State Government reforms have squarely positioned education facilities as central civic spaces. Indeed, there are numerous examples of education facilities having been augmented to fulfil broader community needs and interests. Such developments allow for shared use of facilities, which in turn contribute to improved efficiencies in capital, maintenance and operational expenditure. Co-location can also directly contribute to synergies between partners (in areas such as service delivery, funding capacity and political influence), which would otherwise be unavailable.

On this basis, and subject to the eventual direction of the DEECD, there is a clear and present opportunity to earmark open space adjacent to the proposed school site. The site is linked with an off-road shared trail system to support independent access by walking and cycling. The site provides the opportunity to consider additional sports ground (such as for soccer), indoor gymnasium and community meeting space. All of these would need to be subject to more rigorous assessment, but each have a shared appeal for both community and education interests.

- Finally, the report has examined the distribution and diversity of open space recommended to be set aside within the development plan area. It has recommended that a broad benchmark of open space to be available within 500m of households be applied. Whilst not as small a radius as identified in the Draft Open Space Strategy, it is has been acknowledged that the development area is likely to have a high proportion of young families. It has also recommended that a larger area of open space be set aside north of

---

5 Some examples of joint ventures are currently under development or consideration between local Councils and the DEECD at Kyneton, Ballarat, Wallan and Caroline Springs.
Bass Highway in order to allow for a local option for sports ground within the area. Whilst the specific activity would need to be subject to more thorough assessment and local area consultation, it is based on the understanding that the growth area, when fully developed will have a potential market audience of over 100 people for at least five different sports.

– Finally, the development of an off road, shared trail system through the centre of the development plan area is a core requirement for recreation open space consideration. Walking and cycling make the most profound contribution to individual health and community wellbeing as it is participated by more people that any other activity and more continuously throughout individual life cycles. Moreover, settings that encourage walking and cycling as a means of getting somewhere (ie. incidental activity) has the capacity to make the most significant contribution to individual health as it builds physical activity into our daily life. On this basis, it is recommended that a shared trail follow the required drainage easements required throughout the site. It is expected that the design of the system would provide an opportunity to connect residential areas with important destinations and gives due regard to CTPED principles as well as supporting amenities such as signage, landscaping and seating.

Overall, an estimated 66.7% of all people will participate in some form of physical activity at lease once per week. An estimated 43.5% of the population will do so at least three times per week. Our objective is to build environments that encourage more people to be physically active more often. By going so, we can create spaces that contribute to important health, wellbeing and social benefits to people and their communities. This is a central ingredient to building vibrant and prosperous communities.
Appendix 2
## Contents

1. **Introduction**  
2. **Background Information and Assessment Process**  
3. **Review of the Pat Condina & Associates Report**  
4. **Site Characteristics**  
5. **Water Sensitive Urban Design**  
   5.1 **Best Planning Practices**  
   5.2 **Best Management Practices**  
6. **Stormwater Quantity Strategy**  
   6.1 **Philosophy**  
   6.1.1 The Criteria for Stormwater Runoff Rate:  
   6.2 **The Eastern Catchment**  
   6.2.1 Existing Conditions  
   6.2.2 The Proposed Drainage Strategy  
   6.3 **The Central Catchment**  
   6.3.1 Existing Conditions  
   6.3.2 The Proposed Drainage Strategy  
   6.4 **The Western Catchment**  
   6.4.1 Existing Conditions  
   6.4.2 The Proposed Drainage Strategy  
7. **Stormwater Quality Treatment Strategy**  
8. **Conclusion**

## Appendix A –
1 Introduction

CPG have been engaged by the Bass Coast Shire Council to prepare development plans for two key growth areas in Wonthaggi. The study area is defined in the brief as:
- Development Plan 1: Wonthaggi North Residential Growth Area and
- Development Plan 2: Wonthaggi East Industrial Growth Area.

The need for the preparation of the Development Plan has been triggered by the Wonthaggi Dalyston Structure Plan which was adopted by the Bass Coast Shire (BCS) in December 2008. CPG has prepared one integrated development plan to cover both sites. A single development plan overlay is proposed to apply to this site.

This report summarises the stormwater management strategy for the site and has adopted a water sensitive urban design philosophy to inform the preparation of the development plan.

2 Background Information and Assessment Process

The process for the stormwater management assessment has been based upon the following information:

- The Victorian Planning Provisions (Clause 56.07)
- Australian Rainfall & Runoff (1997) - Engineers Australia
- Australian Runoff Quality (2006) - Engineers Australia
- The reports on the site prepared by Coomes and other specialist consultants which were lodged with the planning permit application
- Base map plans with 10 metre contour intervals supplemented with site inspection.
- Field survey within the Industrial Growth Area south of the Bass Highway.
- Site inspections.

Hydrologic and hydraulic modelling of the catchment (RO RB and HecRas) should be completed by the responsible parties to inform the detail design phase.
3 Review of the Pat Condina & Associates Report

A drainage assessment for the residential component of the study area, north of Inverloch Road (Bass Highway), was prepared by Pat Condina and Associates for Beveridge W illiams (2007). This assessment was reviewed by CPG and we are satisfied with the general content and recommendations proposed for stormwater management north of Bass Highway. Details of the catchment analysis conducted for Beveridge W illiams are not contained in this report to avoid unnecessary overlap.

To understand the stormwater management issues for land south of the Inverloch Road, Coomes undertook a site feature survey. The feature survey was used by CPG to analyse the catchment and to inform the development plan response. The stormwater strategy for this development plan parcel was integrated with the general requirements identified by the Condina report.

4 Site Characteristics

The study area is a Greenfield site located to the north east of the established town area and covers approximately 725ha, representing a significant future urban extension to Wonthaggi.

The residential part of the study area is generally used for rural purposes however some residential development has occurred in the north and north-west of the study area.

The industrial / commercial component of the study area is partly subdivided and has been built out to varying degrees.

Within the proposed development the site is divided into three distinct sub-catchments referred to as the “West Catchment”, the “Central Catchment” and the “East Catchment” (refer to the “Overall Catchment Plan” in Appendix A). Each of these catchments ultimately drain to the Powlett River via unnamed tributaries.

5 Water Sensitive Urban Design

W ater Sensitive U rban D esign (W S U D) is often confused with the terms Ecologically Sustainable Development (ESD) and W ater Cycle Management. In fact, the three terms are all intrinsically linked as shown in Figure 1 (ARQ draft Guidelines, 2003). This forms the framework for best practice for new urban development.
ESD is effectively an umbrella which covers a wide range of issues, of which water is one element (others include transport, waste, energy, social etc.). In contrast W SUD specifically focuses on the relationship between the urban built form and the water cycle. The primary focus for this report is stormwater, therefore the following documentation will concentrate on the issues surrounding this “stream” of the water cycle.

Water sensitive urban design (W SUD) provides an alternative to the traditional conveyance approach to water, stormwater and wastewater management. W SUD focuses on the integration of urban planning and development with the management, protection and conservation of the water cycle. The design philosophy recognises that it is impractical to replicate the natural system, however it is possible to mitigate changes to the existing water balance.

Water sensitive design provides a holistic approach to stormwater management as it seeks to combine the elements of Best Planning Practice (BPP) with Best Management Practice (BMP) to match the site conditions and constraints. This assessment and selection requires input from a multi-disciplinary team including engineers, hydrologists, landscape architects and ecologists (see Figure 2).
To meet these water cycle goals the following objectives must be satisfied: **Quantity**: the introduction of flow management techniques to control the hydrology off the site to meet downstream constraints, which will involve retention and detention. **Quality**: all water discharging from the site should minimise impact on receiving waters. This will involve a treatment train approach to the management of stormwater generated from the site.

### 5.1 Best Planning Practices
The following land-use planning techniques and concepts need to be considered to optimise the opportunity for implementing water sensitive urban design into the development:
- Public open space layout
- Road alignments and streetscaping
- Subdivisional lot layouts

### 5.2 Best Management Practices
There are a number of different “Best Practice” techniques that should be considered as a “tool box” of water sensitive urban design opportunities, which can be tailored and selected to match the site specific conditions. A description of the “tool-kit” is provided below.
6 Stormwater Quantity Strategy

6.1 Philosophy

The drainage strategy for the proposed development is based on the major/minor approach. The minor drainage system is the network that is capable of carrying runoff from minor storms (typically gutter and pipe systems or swales). The major system comprises the planned and unplanned drainage flow paths that convey runoff from major storms. The word “major” does not relate to catchment size but to the size of the storm or rainfall event. For a new development this philosophy should be adopted along with requirement to ensure that there is a “net no impact” on surrounding and downstream properties.

The “net no impact” approach is supported by regulation through statements in Clause 56.09 of the Victorian Planning Provisions. An extract of the relevant statements are provided below:

Standard C31 (Minor Drainage) - The minor drainage system should be designed to ensure that existing downstream flows are restricted to pre-development levels unless otherwise agreed to by the responsible authority.

Standard C35 (Major Drainage) - The drainage system should be designed to ensure that flows downstream of the site are restricted to pre-development levels unless increased flows are approved by the responsible drainage authority.

The built environment downstream of the proposed residential development should not be degraded by major drainage flows or floodwaters.

As the pre-developed situation has a lower fraction imperviousness than post developed, there will potentially be an adverse impact if the stormwater runoff is not mitigated.

WSUD TOOL KIT

Neighbourhood
- Precinct retention (infiltration)
- Porous pavement
- Sand filter
- Buffer strip
- Vegetated swales
- Bioretention system
- Urban forest
- Retarding basins
- Constructed wetlands & ponds
- Stormwater reuse

Local
- On site retention (infiltration)
- Porous pavement
- Sand filter
- Buffer strip
- Vegetated swales
- Bioretention system
- Rain garden
- On-site detention
- Rainwater tank for stormwater reuse

Estate
- Public open space
- Multiple use corridors
- Retarding basins
- Constructed wetlands & ponds
- Stormwater reuse

Neighbourhood
- Precinct retention (infiltration)
- Porous pavement
- Sand filter
- Buffer strip
- Vegetated swales
- Bioretention system
- Urban forest
- Retarding basins
- Constructed wetlands & ponds
- Stormwater reuse

Local
- On site retention (infiltration)
- Porous pavement
- Sand filter
- Buffer strip
- Vegetated swales
- Bioretention system
- Rain garden
- On-site detention
- Rainwater tank for stormwater reuse
Therefore to achieve the objective of “net no impact” it is necessary for the development plan to cater for a reduction runoff rate to pre-development levels. The drainage discharge should also follow the existing/natural flow path.

6.1.1 The Criteria for Stormwater Runoff Rate:

Therefore the peak design flow rates from a new development need to be mitigated so that the magnitude of this flow leaving the development site is no greater than the pre-developed peak flow rate for the same average recurrence interval (ARI) storm. Therefore the development must demonstrate compliance with this criteria across a representative suite of design recurrence storms. That is for example:

- The peak 1 in 100 year ARI developed design flow must be no greater than the peak 1 in 100 year ARI pre-developed flow plus
- The peak 1 in 20 year ARI developed design flow must be no greater than the peak 1 in 20 year ARI pre-developed flow plus
- The peak 1 in 10 year ARI developed design flow must be no greater than the peak 1 in 10 year ARI pre-developed flow plus
- The peak 1 in 5 year ARI developed design flow must be no greater than the peak 1 in 5 year ARI pre-developed flow

The methodology used to achieve this criteria is usually in the form of a detention system or retarding basin. In practice and during detailed design it is difficult to stage a detention system that achieves the exact pre-developed flow for the full suite of recurrence interval events. Therefore the designer should identify which storms “sit” on the critical discharge path. This may result in a system that only releases less than 100% of the permissible site discharge for a certain design event.
6.2 The Eastern Catchment

6.2.1 Existing Conditions

The “Eastern Catchment” is the largest catchment within the Wonthaggi Development Plan. Whilst this consists of approximately 570 hectares from within the development plan area it also includes a significant external catchment that flows through the development plan (refer to subcatchment plan in Appendix B).

The largest external catchment is south of the Bass Highway (616 ha), of which the majority is rural. A small retarding basin exists south of Bass Highway. However due to the topography of the existing catchment overland/sheet flow flooding has occurred and impacted the Bass Highway frontage. North of Bass Highway an open drain conveys flows to the Powlett River.

Northwest of the Bass Highway approximately 94ha of external catchment enters the development plan area. This area includes existing residential development.

Northeast of the Bass Highway approximately 200ha of predominantly rural land enters the development plan area. An existing drainage line and depression, located about 1100 metres north of the Bass Highway, carries flows into the proposed development plan area. This drainage line joins with the existing open drain that flows in a northerly direction through the development plan site. The catchment boundary to the east is relatively ill-defined. Two large additional catchments to the east known as the Outtrim Road catchment (1670 ha) and the Kirrak / Shepherd Road catchment appear to join the “East Catchment” just north of the Development Plan area. Therefore there is the potential of flooding from these catchments to impact upon the north eastern part of the development plan.

Much of the area is poorly drained and the eastern catchment is serviced by a number of constructed channels. These highly modified drains and agricultural practices have removed significant remnant vegetation that would have existed. Whilst the modified drains are degraded due to the lack of vegetation, the physical form appears to be relatively stable.

The land is generally low lying, particularly in the north. The north eastern section of the development plan and parts of Heslop Road are covered by a Land Subject to Inundation Overlay (LSIO), which could be influenced by the backwater floodplain of the Powlett River.

6.2.2 The Proposed Drainage Strategy

Retardation

The criteria to be satisfied (refer to 6.1.1) is that peak stormwater flow rates from the Development Plan area need to be retarded back to equivalent flow rates under existing conditions. The estimated 1 in 100 year flood storage to required to achieve this outcome is 263,000m3 (ie 263ML)\(^1\) for the “Eastern Catchment”.

\(^1\) Based on 500m3/ha for residential land and 750m3/ha for industrial land within the development plan.
The required retardation storage could be provided in two ways:
- Distributed throughout the development plan area
- Centralised in one location

The development plan adopted a centralised location in the north east corner of the site. The reasoning behind this approach is as follows:
- The topography in the north east corner lends itself to be used for wetland and storage purposes. The land is low lying, poorly drained and therefore is not likely to be suitable for other urban development uses.
- The proposed drainage reserve area will retain the existing flood storage and provide the extra storage for development needs through excavation. This can integrate stormwater quality provisions through the construction of a large wetland.
- The flora and fauna reserve to the north of Bunarong Road was investigated as a potential site to reduce the retardation requirements downstream. However a field inspection revealed that such an option would not be feasible or practical. Due to topographic constraints the majority of the catchment south of the Bass Highway would not be able to be controlled by a basin in this location. Also the physical disturbance to the existing vegetation within the flora and fauna reserve would be significant.

**Drainage Reserves / Waterways**

The drainage gradients throughout most of the catchment are relatively flat and the existing constructed drains will need to be modified to accommodate the surface water hydrology from the development. The existing drains are severely degraded and the opportunity exists to re-create the desirable environmental values within a drainage reserve.

South of the Bass Highway (industrial area), the development plan has responded to the "sheet" flow nature of stormwater runoff from the upstream rural catchment. Based upon a site inspection and field survey the plan in Appendix B highlights the proposed drainage strategy in this area. The main features are:
- A drainage reserve north of the proposed bypass road is provided to control and collect sheet flow from the south-western rural catchment. Whilst the construction of the bypass is long term, the development plan will require the construction of this drainage reserve in the interim to manage flood flows.
- A drainage reserve is required to convey the existing catchment flows through the site as well as the future internal development flows that will be generated. Both the existing and future flow events will occur at different time of concentrations. The urban catchment flow will peak and pass quickly (in the order of 20 minutes) whereas the existing rural peak flow will peak and pass more slowly (in the order of 100 minutes). As a result the peaks of each catchment will not coincide and the proposed drainage reserve of 50 metres should be able to convey the combined flows as required.
- The drainage reserve will be vegetated with a meandering pilot channel.
- The upgrading and use of low energy culverts at the Bass Highway.
- The use of low energy culverts at other internal road crossings
- A 1 in 10 year minor drainage system (typically piped to the drainage reserve) with the remaining 1 in 100 year gap flow being conveyed along road reserves prior to overflow to the drainage reserve.
- The strategy has assumed that the catchment upstream of the proposed bypass road remains rural. Therefore any future development south of the proposed bypass road will require retarding basins upstream of the bypass road to restrict developed flows back to existing peak flow rates.
The resolution of the bypass alignment has been determined by Council. At present, there is no formal commitment from VicRoads to the provision of this road or its alignment. CPG generally support the proposed alignment. However, CPG have identified that the proposed alignment in the north-east corner (through the wetland) represents significant challenges:

- The timing of construction of the wetland (short term) and the timing of construction of the road (long term) may impact on the overall wetland function as well as its footprint. If the proposed alignment is pursued, an appropriate amount of land will need to be set aside to accommodate the future road reservation at the time of construction of the wetland. Given the expected timing of the road, this land will remain vacant or un-constructed for a long time and will impact on the form and function of the wetland and open space. To ensure the wetland can function properly, more land may be required to compensate for the loss of land to road reservation to ensure an appropriate drainage solution can be engineered.
- On the basis of the above, it is likely that the road will be required to be elevated. This will impact on the cost of infrastructure.
- The alignment in this location may also impact on the use and enjoyment of open space located to the north of the road. This area will be effectively disconnected from the rest of the wetland area.

North of the Bass Highway the drainage strategy includes:

- A north-south drainage reserve that varies between 50-80 metres to convey the 100 year developed flow to the proposed retarding basin in the north-east corner.
- The open waterway may incorporate pool and riffle forms to increase physical and biological diversity.
- In order to manage the flat hydraulic gradients the reserves may incorporate a series of wetland pondages.
- Tributary inflows from existing development and external rural catchments can be accommodated in drainages reserves of 40-50 metres in width.

6.3 The Central Catchment

6.3.1 Existing Conditions

The “Central Catchment” consists of approximately 117 hectares from within the development plan area, with about 12 additional hectares from an external residential catchment to the south. An existing open channel drains the catchment under Heslop Road and into the Powlett River.

6.3.2 The Proposed Drainage Strategy

The minor and major drainage system will consist of an underground pipe and overland flows along the network of roadways. The outfall for the site is to the north. A drainage reserve has been provided for retardation of stormwater flows up to the 1 in 100 year ARI. An estimated retardations storage volume of 58,000m3 (or 58ML) is required.
6.4 The Western Catchment

6.4.1 Existing Conditions

The “Western Catchment” consists of approximately 38 hectares from within the development plan area, with about 23 additional hectares from an external rural catchment to the west.

6.4.2 The Proposed Drainage Strategy

The minor and major drainage system will consist of an underground pipe and overland flows along the network of roadways. The outfall for the site is at the north west corner under Heslop Road.

The topography in the western catchment is less suited to a combined wetland and retarding basin. Within this small catchment on-site detention controls for stormwater management could be implemented. A suggested in the Condina report (2007) an alternative strategy could be based on a large rainwater tank on all allotments (10kL). The rainwater tank would be used toilet flushing and garden irrigation whilst retaining at least 25% flood storage capacity (2.5kL) when full to overflow level.

7 Stormwater Quality Treatment Strategy

A “masterplan” treatment strategy has been prepared for the development plan based on meeting the best practice pollutant reduction targets, namely:

- 70% removal of the total Gross Pollutant load
- 80% removal of total Suspended Solids
- 45% removal of total Nitrogen
- 45% removal of total Phosphorus

The water quality treatment train considers the Wonthaggi Development Plan as one entity. That is the objective is to meet the overall pollutant reduction targets prior to discharge across the northern boundary of the site. This holistic approach provides the mechanism to “over-treat” in one sub-area within the development to compensate for a lower treatment level achieved in another sub-area. The Best Practice Guidelines indicate that only land that will be developed must meet the reduction targets, not rural land.

A MUSIC (Model for Urban Stormwater Improvement Conceptualisation) modelling approach has been used to establish the proposed treatment train strategy. The model estimates the amount of pollutants the catchment produces, the performance of treatment measures and the pollutant load generated once the catchment is treated.

The proposed stormwater quality strategy is based on the use of distributed wetland treatment systems throughout the development. To meet the minimum stormwater quality requirements the following is required:
“Eastern Catchment” – a wetland treatment area of 11 hectares. This is provided within the drainage reserve in the north east corner of the development plan (ie within the retarding basin).

“Central Catchment” – a wetland treatment area of 2.6 hectares in the north west corner of the catchment.

“Lower Catchment” – no specific wetland treatment. Stormwater quality requirements offset using distributed WSUD treatments such as raingardens and rainwater tanks. Alternatively “oversized” wetlands in the upper and middle catchments.

Wetlands have been adopted as the base stormwater quality metric other distributed WSUD treatments should be encouraged and considered where appropriate (eg raingardens, swales, stormwater reuse etc...)

All infrastructure works will need to be approved by Council and the water sensitive urban design elements will need to be designed in accordance with Best practice or the Council’s standards. There may also be the need for interaction with other authorities during the approval process.

8 Conclusion

The Wonthaggi Development Plan has been based upon WSUD principles and the stormwater management strategy has considered the two main issues and impacts relating to:

– Stormwater quantity
– Stormwater quality

The urban design layout encourages the natural cleansing of stormwater, where it will be detained and filtered through the subdivision and golf course. The development plan has also responded to the need for overland flow conveyance through the provision of roadways and drainage reserves.
Appendix A – Overall Catchment Plan
Appendix B – Subcatchment Analysis
Wonthaggi Development Plan

Traffic Impact Assessment

December 2009

Client:

Bass Coast Shire
Table of Contents

1. INTRODUCTION ........................................................................................................... 1
   1.1 Assessment Team & Assessment Process ................................................................. 1

2. WONTHAGGI NORTH-EAST DEVELOPMENT PLAN ............................................. 2
   2.1 Staging of the Development Plan ........................................................................... 2
   2.2 Development Yield ................................................................................................. 3
       2.2.1 DP Residential & Industrial Yield (40 year) ......................................................... 3
       2.2.2 Staged Residential & Industrial Yield (20 year) .................................................. 3

3. THE EXISTING ROAD ENVIRONMENT .................................................................. 4
   3.1 Wonthaggi Township ............................................................................................. 4
   3.2 Bass Highway (McKenzie St – Graham St) ............................................................. 4
   3.3 Korumburra – Wonthaggi Road .............................................................................. 4
   3.4 Traffic Volumes and Speed ..................................................................................... 4
   3.5 Crash History .......................................................................................................... 6

4. TRAFFIC GENERATION & IMPACTS ................................................................. 7
   4.1 Traffic Generation & Distribution Assumptions ...................................................... 7
   4.2 Traffic Generation & Correlation with Traffic Growth ........................................... 7
   4.3 Estimated Traffic Volumes 2029 ............................................................................. 8
   4.4 Traffic Impacts ........................................................................................................ 9
       4.4.1 Bass Highway .................................................................................................... 9
       4.4.2 Korumburra – Wonthaggi Road ....................................................................... 10
       4.4.3 Wentworth Road .............................................................................................. 10
       4.4.4 Fincher Street .................................................................................................. 10
       4.4.5 Fuller Road ....................................................................................................... 11
       4.4.6 Heslop Road ..................................................................................................... 11
       4.4.7 Bass Highway / Korumburra – Wonthaggi Road Intersection ......................... 11
       4.4.8 McKenzie Street / Graham Street Intersection ................................................ 11
       4.4.9 Korumburra – Wonthaggi Road / Wentworth Road Intersection .................. 11
       4.4.10 Bass Highway / Fuller Road, Intersection ....................................................... 11
       4.4.11 Bunurong Road ............................................................................................... 12
   4.5 Impacts on Pedestrians ......................................................................................... 12

5. STRATEGIC INITIATIVES ....................................................................................... 13

6. RECOMMENDED MITIGATION WORKS ......................................................... 14

7. CONCLUDING REMARKS ...................................................................................... 15

8. REFERENCES ........................................................................................................... 16
Appendices

ATTACHMENT A ........................................................................................................ DEVELOPMENT PLAN

ATTACHMENT B ................................................................................................. STAGED DEVELOPMENT PLAN

ATTACHMENT C ................................................................................................. CRASH STATISTICS
1. INTRODUCTION

CPG Australia Pty Ltd (Traffic) has been engaged by Bass Coast Shire Council to undertake a traffic impact assessment for the Wonthaggi Development Plan.

This report results from a traffic assessment conducted in accordance with VicRoads guidelines for the preparation of a Traffic Impact Assessment Report (TIAR). This desk top study is based on the proposed Wonthaggi (North-East) Development Plan and an assessment of the existing traffic environment of greater Wonthaggi. Traffic data and other supportive information were provided by the Bass Coast Shire.

The primary focus of this study is the assessment of traffic impacts on the existing arterial roads and the major intersections, as a result of the proposed development plan.

This report consists of:

- A description of the project proposal;
- An examination of the existing road network;
- An assessment of the impacts of traffic on the local network, including intersections;
- A description of mitigation measures for the local road network; and
- A list of conclusions and recommendations based on the assessment.

Please Note: The recommendations of this desk top study are based on a number of general assumptions and should be used as a guide to more detailed analysis as the overall Development Plan is progressed.

1.1 Assessment Team & Assessment Process

The assessment was carried out by:

- Kevin Flynn – Senior Traffic Engineer and Senior Road Safety Auditor

The assessment was reviewed by:

- Bob Citroën – Principal Consultant (Traffic) and Senior Road Safety Auditor

In accordance with the Australian Standards, VicRoads and Austroads guidelines, the assessment examines the impacts the development may have on the local road network. The impacts are documented and mitigation treatments recommended. To a lesser level, the assessment also covers any effects the proposal may have on other road users, particularly pedestrians and cyclists.

The assessment team however, points out that no guarantee can be made that every issue has been identified. Further, if all the recommendations in this report were to be followed, this would not guarantee that the proposal and local road network will be completely “safe and efficient”. Rather, adoption of the recommendations should improve the level of safety and efficiency as a result of the overall development plan.
2. Wonthaggi North-East Development Plan

The Bass Coast Shire Council is preparing a master plan for the future urban development of Wonthaggi. According to the Development Plan (DP), a majority of future development will be encouraged on the north and the east fringes of the existing township.

Refer to Development Plan in Attachment A

The gross area covered by the DP is approximately 725ha, and will include residential, wetland, commercial, recreational and industrial development. The residential development will be encouraged to the north and north-east of the town and the commercial / industrial area will be confined along the Bass Highway to the east of the town.

The residential component of the DP is estimated at approximately 280ha and is estimated to yield approximately 3,890 allotments. The overall commercial / industrial area is estimated at 76ha.

A majority of the generated traffic from the proposed residential areas will impact on the Bass Highway (McKenzie Street) north of the town and the Korumburra-Wonthaggi Road. The commercial / industrial areas will impact directly on the Bass Highway (Graham Street) east of the town.

A new high class ring road is proposed for the north and east of the DP to allow through traffic on the Bass Highway to bypass the township.

2.1 Staging of the Development Plan

It is expected that full development of the DP area will occur over 40 years (by 2049). During that time it is expected that the Eastern Bypass road will be constructed, however it is reasonable to assume that it is unlikely to be constructed for at least 20 years (not by 2029).

The DP has identified the areas of likely initial development and it is reasonably estimated that these areas will be targeted for growth over the first half of the development life (by 2029).

This study has assumed that the construction of the ring road will not occur in the initial 20 years of development life and as such the development traffic generated over this period will impact directly on the existing road network. The DP also indicates that no major internal connector roads will be developed in this period to inter-connect the new development areas and to mitigate the impacts on the existing major arterials.

After construction of the ring road, it is expected that traffic volumes on the existing network will reduce significantly due to the high proportion of tourist traffic (through), however over time and after full occupancy of the DP, the traffic volumes are expected to return to pre 2029 levels.

The DP areas targeted for initial development (by 2029) include:

1. **Residential Development Area A** - An area on the northern fringe of the town bounded by Fuller Road and Wentworth Road, approximately 50ha;

2. **Residential Development Area B** - An area to the north-west fringe of the town centred around the Korumburra – Wonthaggi Road, approximately 90ha; and

3. **Commercial / Industrial Development Area** - An area on the eastern fringe of the town centred on the Bass Highway (Inverloch Road), approximately 43ha.

Refer to Staging Plan in Attachment B
2.2 Development Yield

2.2.1 DP Residential & Industrial Yield (40 year)

Traffic generation for the overall Wonthaggi DP is determined by the number of residential allotments and the employment capacity of the commercial / industrial precinct.

For the full development of the DP (over 40 years), CPG Australia has estimated that the residential allotment component will be approximately 270 ha, yielding approximately 3,900 lots.

The commercial / industrial component is estimated at 77ha with a potential yield of approximately 2,100 jobs (Assuming a job rate of 28 per hectare derived from the RTA Guide to Traffic Generating Developments 2002). The commercial component is estimated at 26 ha.

2.2.2 Staged Residential & Industrial Yield (20 year)

Traffic generation for residential developments is determined by the number of occupied dwellings. For the purposes of this report a yield of 11 allotments per hectare is assumed for the residential development areas of the staged development. The staged yield is indicated in Table 2.2.2.

Table 2.2.2 – Staged Development Area and Estimated Lot Yield

<table>
<thead>
<tr>
<th>Staged Development Area</th>
<th>Area (ha)</th>
<th>Allotment Yield</th>
</tr>
</thead>
<tbody>
<tr>
<td>Development Area A</td>
<td>50</td>
<td>550</td>
</tr>
<tr>
<td>Development Area A</td>
<td>90</td>
<td>990</td>
</tr>
</tbody>
</table>

Traffic generation for industrial developments is determined by the number of potential employees. At 28 employees per hectare, the 43ha staged industrial development is expected to yield approximately 1,200 jobs. The commercial traffic generation (attraction) is generally determined by the gross floor area under commercial (retail) development. As this area is not known for the initial stages of the development an estimation of 10ha for commercial development has been assumed.
3. THE EXISTING ROAD ENVIRONMENT

The VicRoads declared arterial roads in the study area include the Bass Highway (B460), the Korumburra – Wonthaggi Road (C437) and the Bunurong Road (C435).

All other roads are local roads under the authority of the Bass Coast Shire Council.

3.1 Wonthaggi Township

The township of Wonthaggi is an important regional economic and service hub in Victoria’s south east. It is also a tourist gateway to the coast of the region and South Gippsland.

The vital statistics of Greater Wonthaggi, sourced from the ABS 2006 Census, are:

- Population = 6,204
- Households = 2,694
- Household density = 2.30 persons per household
- Car fleet = 3,731
- Household car ownership = 1.38 per household

Over the last 25 years the population has been growing by an average of 1.2% per annum, however growth has slowed to 0.52% per annum over the last 15 years.

3.2 Bass Highway (McKenzie St – Graham St)

The Bass Highway (B460) is the principal road through the local network. It is the principal transport route between Melbourne, Wonthaggi and Inverloch. Its local names include White Rd, McKenzie St and Graham St.

From South Dudley Road to Graham Street the Bass Highway (White Rd – McKenzie St) it is a two-lane two-way road with generally 3.5m wide traffic lanes and 3.0m wide parking / bike lanes (13m kerbed pavement width). The north-side kerb commences opposite Sherwood Court. Auxiliary turn lanes are provided at major intersections. This cross-section generally continues to the south-east to Graham Street. The intersection of the Bass Highway and Korumburra Road is “Statcon” controlled with give-way facing Korumburra Road. A single lane roundabout is situated at the Graham Street intersection (Bass Highway east). This full length is subject to a signed 60 km/h speed limit. (I presume)

From McKenzie Street to the east, the Bass Highway (Graham St) is generally a two-lane two-way road with 3.5m traffic lanes and unsealed shoulders of various widths. The seal extends 500mm beyond a painted edge-line. A right turn lane is provided at Fincher St (westbound). The 60km/h to 80km/h transition occurs just west of Mullin Parade.

3.3 Korumburra – Wonthaggi Road

The Korumburra – Wonthaggi Road (C437) is an important transport route to Korumburra and access road to the city centre and other community facilities on the north-east of the township. The kerbed carriageway is approximately 8m to 9m wide with marked centreline. 90 deg parking is provided adjacent to North Wonthaggi Oval reserve for approximately 400m. A service road on the north-west side is provided to the north of Elizabeth Street. A left turn slot is provided into Darryl Avenue.

The kerbs are discontinued to the north of Darryl Avenue and the carriageway continues with unsealed shoulders. The 60km/h to 80km/h transition occurs just south of Ivor Street, and the sealed shoulders discontinue.

3.4 Traffic Volumes and Speed

The 2009 estimated traffic volumes for the local streets are shown in Table 3.4 below. Base traffic volume data was provided by the Bass Coast Shire and projected to the estimated 2009 traffic volumes by applying a growth
factor of 2%. The hourly flows on the Bass Highway indicate a typical tourist route with high traffic volumes occurring around midday and no distinct AM and PM peaks. The peak weekday traffic event on all sections occurred generally between 3pm and 4pm with the combined tourist traffic and school pick up activity.

<table>
<thead>
<tr>
<th>Road &amp; Location</th>
<th>Daily Volume (Weekday) vpd</th>
<th>Peak Hour Traffic vph</th>
<th>Peak Directional Split vph</th>
<th>Posted Speed 85%ile Speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bass Highway (McKenzie St) At White Road</td>
<td>Approx 10,000</td>
<td>1,000</td>
<td>600 (Southbound) 400 (Northbound)</td>
<td>60 60</td>
</tr>
<tr>
<td>Bass Highway (McKenzie St) South of Korumburra Road</td>
<td>12,652</td>
<td>1,200</td>
<td>537 (Southbound) 662 (Northbound)</td>
<td>60 55</td>
</tr>
<tr>
<td>Bass Highway (Graham St) At Inverloch Road</td>
<td>7,062</td>
<td>683</td>
<td>299 (Eastbound) 385 (Westbound)</td>
<td>60 72</td>
</tr>
<tr>
<td>Korumburra – Wonthaggi Road West of Bass Highway</td>
<td>2,059</td>
<td>206</td>
<td>108 (Eastbound) 100 (Westbound)</td>
<td>60 47</td>
</tr>
<tr>
<td>Korumburra – Wonthaggi Road West of Wentworth Road</td>
<td>2,873</td>
<td>325</td>
<td>164 (Eastbound) 160 (Westbound)</td>
<td>60 58</td>
</tr>
<tr>
<td>Fuller Road North of Bass Highway</td>
<td>1,292</td>
<td>124</td>
<td>77 (Southbound) 47 (Northbound)</td>
<td>60 79</td>
</tr>
<tr>
<td>Bunurong Road (Billson St) North of Baillieu Street</td>
<td>4,137</td>
<td>413</td>
<td>222 (Southbound) 191 (Northbound)</td>
<td>60 57</td>
</tr>
<tr>
<td>Cameron Street South of Baillieu Street</td>
<td>1,923</td>
<td>191</td>
<td>111 (Southbound) 80 (Northbound)</td>
<td>60 62</td>
</tr>
<tr>
<td>South Dudley Road North of Graham Street</td>
<td>4,881</td>
<td>522</td>
<td>273 (Southbound) 249 (Northbound)</td>
<td>60 80 79</td>
</tr>
<tr>
<td>Wentworth Road North of Korumburra Rd</td>
<td>3,501</td>
<td>377</td>
<td>130 (Southbound) 246 (Northbound)</td>
<td>50 40 50</td>
</tr>
<tr>
<td>Wentworth Road South of Korumburra Rd</td>
<td>1,248</td>
<td>123</td>
<td>58 (Southbound) 68 (Northbound)</td>
<td>50 50</td>
</tr>
<tr>
<td>Fincher Street West of Wentworth Rd</td>
<td>675</td>
<td>68</td>
<td>42 (Eastbound) 26 (Westbound)</td>
<td>50 58</td>
</tr>
</tbody>
</table>

(85%ile Speeds exceeding the Posted Speeds by 5km/h or greater are shown in red.)
3.5 Crash History

The VicRoads crash database indicates that a total of 42 casualty crashes have occurred within the Wonthaggi Township in the last five years of recorded crashes. (July 2002 to end June 2007).

Refer to crash listing in Attachment C.

These crashes can be summarised as follows:

- Eight crashes involved pedestrians and accounted for 20% of all crashes. Pedestrian crashes in Wonthaggi are over represented as the state average proportion is approximately 10%.
- Five of the eight pedestrian crashes occurred on Bunurong Road, in the main shopping centre.
- 17 crashes occurred along Bunurong Road (40% of all crashes).
- 12 crashes were cross traffic and accounted for 29% of all crashes. Cross traffic crashes in Wonthaggi are over represented as the state average proportion is approximately 6.5%.
- There were no fatal crashes, 11 were serious and 31 minor injury.

Intersections / road lengths where multiple crashes have occurred include:

- Intersection of Bass Highway and Bunurong Road – 2 crashes (1 cross traffic, 1 rear end);
- Intersection of Bunurong Road and Hunter Street – 2 crashes (both cross traffic);
- Intersection of Bunurong Road and Merrin Crescent – 4 crashes (all cross traffic);
- Intersection of Matthew Street and Merrin Crescent – 2 crashes (both cross traffic);
- Intersection of Bunurong Road and Billson Street – 2 crashes (1 pedestrian, 1 other);
- On Bunurong Road, between Moyle Lane and Bass Hwy – 2 crashes (1 pedestrian, 1 other);
- On Bunurong Road, between Billson St and Tabener Lane – 3 crashes (2 pedestrian, 1 rear end).

It is noted that mitigation work has been carried out at the intersection of Bunurong Road and Merrin Crescent in response to the 4 crashes and that no crashes have been recorded at this location since 2005.

Future detailed design elements related to the Wonthaggi Development Plan are to include a safety consideration for all road users, particularly pedestrians.
4. TRAFFIC GENERATION & IMPACTS

4.1 Traffic Generation & Distribution Assumptions

Due to the preliminary nature of this assessment, a number of assumptions have been used in the estimation of traffic generation and distribution of the staged and full development of the DP.

The assumptions used are based on rules of thumb, experience of similar size communities, known traffic behaviour and inferences from the data provided.

The assumptions include:

- Residential areas will yield 11 allotments per hectare. TE&M – 2003 (Monash);
- Occupied allotments will generate 10 trips per household. AMCORD 1997;
- 10% of generated residential trips will be undertaken in the peak period. TE&M – 2003 (Monash);
- 20% of residential trips will be internal and not impact on the external arterial network;
- 70% of households will be occupied at any one time;
- For the AM peak 80% of residential trips will exit the development area;
- For the PM peak 60% of residential trips will enter the development area;
- 70% of all trips will be attracted to the Wonthaggi town centre;
- The Industrial / Commercial area will yield 28 jobs per hectare. RTA – 2002;
- The industrial daily trip rate for Cars is 2,032 per 1,000 employees;
- The industrial daily trip rate for CV’s is 268 per 1,000 employees;
- For capacity estimation one CV is the equivalent of two cars;
- Industrial AM Peak trip rate is 330 vehicles per 1,000 employees;
- Industrial PM Peak trip rate is 380 vehicles per 1,000 employees;
- Commercial (bulky goods) development traffic generation rate is 3 vehicles per hour per 100m² floor space;
- 10% of commercially available land will be converted to floor area;

4.2 Traffic Generation & Correlation with Traffic Growth

Traffic growth on the existing arterial network will be a function of the effects of the direct development impacts over time as well as the effects of normal or background growth. Normal growth can be defined as background or external growth based on the effects of regional and state development as distinct from the development of the town. This steady background growth includes the general effects of economic and population growth and, in the case of Wonthaggi, it will also include an element for growth in tourism.

Based on studies in other areas, it is estimated that, as a result of regional / state development, background traffic growth can be reliably estimated at approximately 1% per annum.

Without the availability of the ring road and any other major collector road in the development area, the full impact of the staged development will be on the existing road network, in particular the arterial roads of the Bass Highway and the Korumburra-Wonthaggi Road.

The estimated traffic generation of the staged development using the assumptions in Section 4.1 is indicated in Table 4.2.
Table 4.2 – Estimated 2029 Traffic Generation of Staged Development

<table>
<thead>
<tr>
<th>Staged Development Area</th>
<th>Area (ha)</th>
<th>Yield</th>
<th>Daily Generated Trips</th>
<th>Peak Hour Trips</th>
</tr>
</thead>
<tbody>
<tr>
<td>Development Area A</td>
<td>50</td>
<td>550 Lots</td>
<td>3,850</td>
<td>385</td>
</tr>
<tr>
<td>Development Area B</td>
<td>90</td>
<td>990 Lots</td>
<td>6,930</td>
<td>693</td>
</tr>
<tr>
<td>Industrial Area</td>
<td>33</td>
<td>900 Employees</td>
<td>2,310</td>
<td>340</td>
</tr>
<tr>
<td>Commercial Area</td>
<td>10</td>
<td>10,000m² Floor Area</td>
<td>2,400</td>
<td>300</td>
</tr>
</tbody>
</table>

Estimation of the traffic generated by the DP, using the generation and distribution assumptions above, indicates an average increase of 2% per annum will be experienced by the arterial roads of Wonthaggi.

The combined average effects of the DP traffic and background traffic growth will increase traffic on the local arterial network by an estimated 3% per annum. It is estimated that the Bass Highway, both north and east of the township, will experience growth at a rate of approximately 2.5%, while the Korumburra Road will experience growth at approximately 4% per annum.

4.3 Estimated Traffic Volumes 2029

The following Table 4.3 indicates the future traffic volumes on the local network as a result of the staged development, utilising the above growth factors.
### Table 4.3 – Estimated 2029 Traffic Volumes - Wonthaggi Local Streets

<table>
<thead>
<tr>
<th>Road &amp; Location</th>
<th>Daily Volume (Weekday) vpd</th>
<th>Peak Hour Traffic vph</th>
<th>Peak Directional Split vph</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bass Highway (McKenzie St) At White Road</td>
<td>16,400</td>
<td>1,640</td>
<td>984 (Southbound) 656 (Northbound)</td>
</tr>
<tr>
<td>Bass Highway (McKenzie St) South of Korumburra Road</td>
<td>20,700</td>
<td>2,070</td>
<td>930 (Southbound) 1,140 (Northbound)</td>
</tr>
<tr>
<td>Bass Highway (Graham St) At Inverloch Road</td>
<td>11,600</td>
<td>1,160</td>
<td>500 (Eastbound) 660 (Westbound)</td>
</tr>
<tr>
<td>Korumburra – Wonthaggi Road West of Bass Highway</td>
<td>4,500</td>
<td>450</td>
<td>230 (Eastbound) 220 (Westbound)</td>
</tr>
<tr>
<td>Korumburra – Wonthaggi Road West of Wentworth Road</td>
<td>6,300</td>
<td>630</td>
<td>325 (Eastbound) 305 (Westbound)</td>
</tr>
<tr>
<td>Fuller Road North of Bass Highway</td>
<td>2,400</td>
<td>240</td>
<td>150 (Southbound) 90 (Northbound)</td>
</tr>
<tr>
<td>Wentworth Road North of Korumburra Rd</td>
<td>5,800</td>
<td>580</td>
<td>200 (Southbound) 380 (Northbound)</td>
</tr>
<tr>
<td>Wentworth Road South of Korumburra Rd</td>
<td>2,050</td>
<td>205</td>
<td>95 (Southbound) 110 (Northbound)</td>
</tr>
<tr>
<td>Fincher Street West of Wentworth Rd</td>
<td>1,100</td>
<td>110</td>
<td>68 (Eastbound) 42 (Westbound)</td>
</tr>
</tbody>
</table>

### 4.4 Traffic Impacts

Problems with safety and efficiency increase as the traffic volumes on two-lane two-way arterial roads approach 10,000 vpd. It is at this time road authorities plan for remedial treatments particularly at major intersections. Treatments planned may range up to the ultimate of carriageway duplication. Congestion and delay generally occurs on the side roads at “statcon” controlled intersections.

#### 4.4.1 Bass Highway

As indicated above, it is estimated the Bass Highway on average may experience traffic growth in the order of 2.5% per annum for the first 20 years of the life of the development plan. As indicated in Table 4.3 above, the 2029 traffic volume at the south end of McKenzie Street may be in the order of 20,000 vpd. Road authorities generally plan for the carriageway duplication of roads with capacity approaching 20,000 vpd. Without mitigating
treatments there will be a potential for inappropriate rat running through existing and proposed residential streets.

As a result of the full development of the DP, VicRoads and the Bass Coast Shire should plan for appropriate treatments of the Bass Highway through Wonthaggi. Such treatments may include duplication of the carriageway for all or part of the road length in the urban area. More detailed analysis may confirm the extent of duplication required.

For the industrial area, to the east of the town, the development of the Bass Highway (Graham Street) should include at minimum, wide sealed shoulders and bike lanes, auxiliary turning lanes at all intersections and the consideration of a continuous median / right turn lane between Carneys Road and the new Bypass Road. Intersections of future major roads (including the Bypass Road) should be two lane roundabouts that will cater for the turning movements of B-double vehicles. The existing intersection with Carneys Road may require the application of a roundabout with consideration to the rate of adjacent development.

The application of intersection treatments such as roundabouts at desirable frequencies will provide opportunities for speed attenuation as the existing traffic studies show the 85%ile speed is possibly 12km/h in excess of the posted operating speed on the Bass Highway to the east of the town (refer to Table 3.4).

4.4.2 Korumburra – Wonthaggi Road

Future traffic volume estimates indicated in Table 4.3 show that as a result of the staged DP the traffic volume of the Korumburra-Wonthaggi Road (east of Wentworth Road) may be in the order of 6,700 vpd. This is a result of the 90ha north-east development area and equates to an annual growth rate of approximately 4%. As traffic increases some intersections will become problematic, such as the Wentworth Road intersection and a roundabout should be considered. Appropriate treatment of the existing roadway may include auxiliary turning lanes at intersections, wide sealed shoulders and the application of bike lanes.

Intersections of Korumburra Road with future major arterials and collector roads including the Bypass Road (Heslop Road) should be two-lane roundabouts that will cater for the turning movements of B-double vehicles.

4.4.3 Wentworth Road

The staged developments to the north and the north-east of Wonthaggi will significantly increase traffic on this road, being the only direct connector road to residential development areas north of the Bass Highway. The Wonthaggi North Primary school is also accessed from this road. The exiting traffic volumes on Wentworth Road north of Korumburra Rd are already high for the function of the local street. Remedial treatments may be required at intersections and pedestrian / cycle facilities improved.

Wentworth Road to the south of Korumburra Road already shows signs of “rat running” as it provides an alternative route for Korumburra Road traffic to access the industrial area of the Bass Highway, an bypassing the city centre and the busy intersection of Graham Street and McKenzie Street. This section of Wentworth Road is a local street designed to provide access to adjacent residential properties. Increasing traffic on the narrow carriageway will impact on the amenity of the local street.

Council should decide if it wishes to upgrade the street to cater for through traffic by widening the carriageway in lieu of the bypass road, or apply traffic calming measures to attenuate traffic.

4.4.4 Fincher Street

Fincher Street provides an alternative route for Bass Highway traffic to bypass the city centre and the busy intersection of Graham Street and McKenzie Street. The increasing traffic volumes and congestion on the Bass Highway may induce undesirable “rat running” on this street that has been constructed primarily for residential access.

Council should decide if it wishes to upgrade Fincher Street to cater for through traffic by widening the carriageway (in lieu of the bypass road), or conversely apply traffic calming measures to attenuate traffic.

Improvement measures should include speed attenuation as the existing traffic studies show the 85%ile speed is 8km/h in excess of the posted operating speed in Fincher Street (refer to Table 3.4).
4.4.5 Fuller Road

Along with Wentworth Road, Fuller Road will provide the principal access route for development traffic of the North Residential Development Area. To offset the increased traffic volume, the application of appropriate treatments on Fuller Road should include auxiliary turning lanes at intersections, sealed shoulders and the application of bike lanes. Improvement measures should include speed attenuation as the existing traffic studies show the 85%ile speed is 19km/h in excess of the posted operating speed (refer to Table 3.4).

4.4.6 Heslop Road

Heslop Road on the northern fringe of the DP is an existing unsealed road. It is proposed that the existing road reserve will be widened to accommodate the future Ring Road along this alignment. Prior to the implementation of the ring road, there is a potential for this road to become an alternative access to the Korumburra-Wonthaggi Road from the North Residential Development Area. Council should consider temporary sealing of the road to cater for the increasing traffic volumes.

4.4.7 Bass Highway / Korumburra – Wonthaggi Road Intersection

This intersection is currently under “Statcon” control where Korumburra Road traffic gives way to the Bass Highway. Capacity analysis using SIDRA shows that this intersection may currently be operating at a poor level of service for Korumburra Road motorists, with significant delays and queuing indicated in the analysis results. It is estimated that on average motorists in Korumburra Road may be delayed for up to 90 seconds.

It is recommended that planning for the placement of a roundabout at this intersection is immediately undertaken. SIDRA analysis of a single lane roundabout at the intersection shows significant improvement in operating conditions for Korumburra Road motorists without any undue delays for Bass Highway motorists. Eventual upgrading to a two-lane roundabout should be catered for in the initial design.

4.4.8 McKenzie Street / Graham Street Intersection

This intersection currently operates as a roundabout, with capacity analysis using SIDRA and assumed turning movement volumes showing satisfactory operation. However with the application of the 2029 expected flows the intersection shows a poor level of service with average delays on all movements of up to 4 minutes. A further SIDRA analysis of the roundabout (2029 flows) with an additional circulating lane and an additional left turn lane on all approaches, shows significant improvement and delays are reduced to satisfactory levels.

It is recommended that VicRoads and Bass Coast Shire plan for upgrading the roundabout to accommodate the 2029 expected flows by providing an extra circulating lane and left turn lanes. Alternatively, traffic signals may be introduced to improve growing congestion and to improve the conditions for pedestrians at the intersection.

4.4.9 Korumburra – Wonthaggi Road / Wentworth Road Intersection

The traffic volumes on both these roads will increase significantly as a result of the Residential Development Areas. Both streets will have similar traffic flows and, if the current give-way conditions for Wentworth Road (north) were to remain, there will be significant delays in that street. If traffic volumes increase as expected, consideration should be given to the application of a roundabout at this intersection to improve conditions for the Wentworth Road motorists.

4.4.10 Bass Highway / Fuller Road, Intersection

This intersection is currently under “Statcon” control where Fuller Road traffic gives way to the Bass Highway. Traffic volumes will increase on both these roads and the conditions for Fuller Road motorists will be affected with increased delay and reduced safety for the turning movements.

It is recommended that planning for improvement works is undertaken to improve the intersection through the implementation of auxiliary right and left turn lanes for the highway and the addition of a left turn lane in Fuller Road. A more detailed analysis may find that the application of a roundabout may be a more appropriate treatment for this intersection.
**4.4.11 Bunurong Road**

All roads of the Wonthaggi network will experience growth as development progresses and the Bunurong Road is no exception. The crash statistics indicate a poor safety record for this road compared to other roads on the network. As development progresses it will be prudent for VicRoads and the Bass Coast Shire to investigate problem areas and implement measures to improve safety, particularly for pedestrians.

**4.5 Impacts on Pedestrians**

The VicRoads “Crashstats” records already show a high proportion of pedestrian crashes in Wonthaggi. The increasing traffic volumes as a result of the DP will further diminish conditions for pedestrians on all roads of the network. It is recommended that providing safe pedestrian facilities is considered an integral part of all future works in Wonthaggi and that existing problem areas are identified and remedial actions undertaken. The detailed development of the DP must include appropriate pathway networks for pedestrians and cyclists with good connectivity and safe crossing points.
5. STRATEGIC INITIATIVES

Based on this study, the following strategic measures should be adopted to support the desired outcomes of the Wonthaggi North-East Development Plan:

1. There is a need to develop a road hierarchy for Wonthaggi;

2. The functional classification of roads should be supported with a set of physical standards appropriate to each classification;

3. It is recommended that the reservation for the 80km/h bypass road should be a minimum of 50m to allow for:
   a) the appropriate carriageway width (and possible future duplication) of 10m with sealed shoulders;
   b) the verge and table drain development (estimated at 5m both sides);
   c) the road side clear zone width (estimated at 8m both sides);
   d) possible cut and fill batters (dependant upon terrain);
   e) major underground and overground service installations;
   f) future opportunities for bicycle / pedestrian links.

4. The bypass reservation may require extra width at intersections to develop the appropriate intersection treatments, such as roundabouts;

5. Until the bypass road is implemented there will be a need to develop a significant transport route to link the north and north-east residential development areas with the industrial / commercial zone in the south east. Failing this, all the development traffic wishing to access the commercial hub will impact on the existing street network. Of particular concern will be the impact on Wentworth Street between Korumburra Road and Fincher St, this being primarily a narrow residential access street.

6. In the long term, the Graham St / Bass Highway intersection should be upgraded to traffic signals to improve pedestrian access and safety;

7. The Korumburra Road / Bass Highway intersection, at minimum, should be upgraded to a two lane roundabout or traffic signals.

8. All intersections between the proposed bypass road, the Bass Highway and the Korumburra Road should be 2 lane roundabouts (at minimum the roundabouts should be planned to convert to two lanes over time).

9. The curved alignment option to transition the bypass route between Heslop Street and the north-south corridor, unnecessarily divides a conservation area of potential importance.
6. RECOMMENDED MITIGATION WORKS

Based on this study, the following infrastructure works are recommended to improve the safety and efficiency of the existing road network as a result of the estimated traffic impacts of the Wonthaggi Development Plan:

1. Preliminary analysis indicates that the “statcon” controlled intersection of the Bass Highway (B460 - McKenzie Street) and the Korumburra – Wonthaggi Road (C437) currently offers a poor level of service to motorists on Korumburra Road and it is recommended that a roundabout is planned at this site to reduce delay and improve safety.

2. It is recommended that the following improvement treatments are considered for the Bass Highway:
   a) Detailed analysis may support the application of a roundabout at the Fuller Road intersection. However at minimum, improvement treatments, as a result of increased traffic volumes, should include the application of auxiliary turn lanes on all approaches to the intersection.
   b) Increasing traffic volumes will require the implementation of auxiliary turning lanes at most intersections along the length of the Bass Highway. A more detailed investigation may support the future duplication of the Bass Highway (McKenzie Street) between Korumburra Road and Graham Street.
   c) Consideration should be given to the ultimate upgrading the Bass Highway east of the town (industrial area) by including a central median / right turn lane, sealed shoulders and bike lanes. Turning facilities are to be designed for B-Double trucks.
   d) Two lane roundabouts should be applied to the intersections of all arterial and collector road intersections on the Bass Highway, including the proposed Bypass Road. Sufficient space should be provided for the implementation of 30m diameter roundabouts (central island) at the Bypass Road intersection.

3. The Korumburra – Wonthaggi Road should be upgraded over time to cater for the traffic growth. Treatment measures include the provision of auxiliary turning lanes at intersections, the application of wide sealed shoulders and bike lanes. Two-lane roundabouts should be applied to the intersections of all arterial and collector roads, including the proposed Bypass Road. Sufficient space should be provided for the implementation of 30m diameter roundabouts (central island) at the Bypass Road intersections.

4. Council should determine the primary functionality of Wentworth Road (south of Korumburra Road) and Fincher Street. Prior to the construction of the Bypass Road and the implementation of any other major development road, these roads may become preferred transport routes and should be widened and upgraded accordingly or treated to actively discourage through traffic.

5. Fuller Road should be upgraded over time to cater for the traffic growth. Treatment measures include the provision of auxiliary turning lanes at intersections, the application of wide sealed shoulders and bike lanes.

6. Heslop Road may become a preferred route to the Korumburra Road from the northern residential development area. Consideration should be given to the application of a seal surface prior to the implementation of the ring road.

7. Analysis of 2029 estimated flows shows that the existing roundabout at the McKenzie Street / Graham Street intersection will operate at a very poor level of service. Upgrading of the roundabout to provide two circulating lanes and two approach lanes will be required for satisfactory operation. Alternatively, traffic signals should be considered.

8. Estimated future traffic volumes of Wentworth Road and the Korumburra – Wonthaggi Road show that a roundabout should be considered for this intersection.

9. Opportunities should be continually sought to improve the overall safety of Bunurong Road, particularly for pedestrians.

10. Providing safe pedestrian facilities is considered an integral part of all future works in Wonthaggi and that existing problem areas are identified and remedial actions undertaken. The detail development of the DP is to include appropriate pathway networks for pedestrians and cyclists with good connectivity and safe crossing points.
7. CONCLUDING REMARKS

It can be seen that without the benefit of the Bypass Road and without the benefit of any new link road on the east of the township, the traffic generated by the development will have a significant impact on the existing road network.

In the early stages of development it may be prudent to focus on providing an alternative transport route from the Korumburra – Wonthaggi Road to the Bass Highway (east), which may be integrated into the overall DP. McGibbony Road and the planned north-south connector road between McGibbony Road and the Bass Highway may be an option for a link road.

Report was prepared by

Kevin Flynn
Senior Traffic Engineer and Senior Road Safety Auditor

and reviewed by

Bob Citroën
Principal Consultant (Traffic) and Senior Road Safety Auditor
8. REFERENCES

The following documents have been referenced in the course of this study:

1. Austroads Guide to Traffic Engineering Practice - Parts 1 to 16.
3. Drawings for Development Plan prepared by CPG Australia Pty Ltd.
4. The Bass Coast Planning Scheme.
5. Relevant VicRoads and Austroads Guidelines.
ATTACHMENT A
DEVELOPMENT PLAN
ATTACHMENT B

STAGED DEVELOPMENT PLAN
ATTACHMENT C
CRASH STATISTICS
<table>
<thead>
<tr>
<th>Map Refs</th>
<th>Location</th>
<th>Severity</th>
<th>All Fatal</th>
<th>Serious</th>
<th>Other Injury</th>
<th>DCA Groups</th>
<th>Pedes Cross</th>
<th>Right Turn</th>
<th>Right Hit</th>
<th>Left Hit</th>
<th>Rear Hit</th>
<th>Against Control</th>
<th>End Hit</th>
<th>Fence</th>
<th>Pole</th>
<th>Tree</th>
<th>Wall</th>
<th>Car</th>
<th>Truck</th>
<th>Cycle</th>
<th>Bike</th>
<th>Financial Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>VCD ED5</td>
<td>Lower Powlett Road</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>'03</td>
<td>'04</td>
<td>'05</td>
<td>'06</td>
<td>'07</td>
<td>'08</td>
<td></td>
</tr>
<tr>
<td>102 B3</td>
<td>between with Webb Road</td>
<td>160182</td>
<td>2.750 Km</td>
<td>Bass Coast</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VCD ED5</td>
<td>Lower Powlett Road</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>'03</td>
<td>'04</td>
<td>'05</td>
<td>'06</td>
<td>'07</td>
<td>'08</td>
<td></td>
<td></td>
</tr>
<tr>
<td>102 C3</td>
<td>between Unnamed</td>
<td>160182</td>
<td>3.660 Km</td>
<td>Bass Coast</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VCD ED5</td>
<td>Lower Powlett Road</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>'03</td>
<td>'04</td>
<td>'05</td>
<td>'06</td>
<td>'07</td>
<td>'08</td>
<td></td>
<td></td>
</tr>
<tr>
<td>102 C3</td>
<td>between Unnamed</td>
<td>2710</td>
<td>50.680 Km</td>
<td>Bass Coast</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VCD ED5</td>
<td>Lower Powlett Road</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>'03</td>
<td>'04</td>
<td>'05</td>
<td>'06</td>
<td>'07</td>
<td>'08</td>
<td></td>
<td></td>
</tr>
<tr>
<td>102 C3</td>
<td>betweenUnnamed</td>
<td>160182</td>
<td>4.298 Km</td>
<td>Bass Coast</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VCD ED5</td>
<td>Lower Powlett Road</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>'03</td>
<td>'04</td>
<td>'05</td>
<td>'06</td>
<td>'07</td>
<td>'08</td>
<td></td>
<td></td>
</tr>
<tr>
<td>102 D3</td>
<td>between Unnamed</td>
<td>154473</td>
<td>0.114 Km</td>
<td>Bass Coast</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VCD ED5</td>
<td>Kirrak Road</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>'03</td>
<td>'04</td>
<td>'05</td>
<td>'06</td>
<td>'07</td>
<td>'08</td>
<td></td>
<td></td>
</tr>
<tr>
<td>358 E6</td>
<td>between Unnamed</td>
<td>2710</td>
<td>45.596 Km</td>
<td>Bass Coast</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VCD ED5</td>
<td>South Dudley Road</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>'03</td>
<td>'04</td>
<td>'05</td>
<td>'06</td>
<td>'07</td>
<td>'08</td>
<td></td>
<td></td>
</tr>
<tr>
<td>358 E8</td>
<td>between Bass Hwy</td>
<td>192960</td>
<td>1.565 Km</td>
<td>Bass Coast</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VCD ED5</td>
<td>South Dudley Road</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>'03</td>
<td>'04</td>
<td>'05</td>
<td>'06</td>
<td>'07</td>
<td>'08</td>
<td></td>
<td></td>
</tr>
<tr>
<td>358 E9</td>
<td>between Station Street</td>
<td>192960</td>
<td>0.067 Km</td>
<td>Bass Coast</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VCD ED5</td>
<td>Hagelthorn Street</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>'03</td>
<td>'04</td>
<td>'05</td>
<td>'06</td>
<td>'07</td>
<td>'08</td>
<td></td>
<td></td>
</tr>
<tr>
<td>358 E11</td>
<td>between Brown Street</td>
<td>142172</td>
<td>0.176 Km</td>
<td>Bass Coast</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VCD ED5</td>
<td>Billson Street</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>'03</td>
<td>'04</td>
<td>'05</td>
<td>'06</td>
<td>'07</td>
<td>'08</td>
<td></td>
<td></td>
</tr>
<tr>
<td>358 F9</td>
<td>between Murray Street</td>
<td>109425</td>
<td>0.129 Km</td>
<td>Bass Coast</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(c) 2004 VicRoads
<table>
<thead>
<tr>
<th>Location (Road names)</th>
<th>ALL Injury</th>
<th>Fatal</th>
<th>Serious</th>
<th>Other Injury</th>
<th>Pedes</th>
<th>Cross Right</th>
<th>Right</th>
<th>Traffic Near</th>
<th>Near</th>
<th>Against</th>
<th>Control</th>
<th>End</th>
<th>Pole</th>
<th>Tree</th>
<th>Wall</th>
<th>Motor</th>
<th>Car</th>
<th>Truck</th>
<th>Cycle</th>
<th>Bike</th>
<th>FINANCIAL YEAR</th>
</tr>
</thead>
<tbody>
<tr>
<td>VCD EDS 358 F9</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>'03 '04 '05 '06 '07 '08</td>
</tr>
<tr>
<td>140243</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.711 Km</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VCD EDS 358 F10</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>'03 '04 '05 '06 '07 '08</td>
</tr>
<tr>
<td>115675</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.977 Km</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VCD EDS 358 F11</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>'03 '04 '05 '06 '07 '08</td>
</tr>
<tr>
<td>182330</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.214 Km</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VCD EDS 358 G7</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>'03 '04 '05 '06 '07 '08</td>
</tr>
<tr>
<td>2710</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>46.482 Km</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VCD EDS 358 G7</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>'03 '04 '05 '06 '07 '08</td>
</tr>
<tr>
<td>2710</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>47.023 Km</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VCD EDS 358 G8</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>'03 '04 '05 '06 '07 '08</td>
</tr>
<tr>
<td>2710</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>47.417 Km</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VCD EDS 358 G9</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>5</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>'03 '04 '05 '06 '07 '08</td>
</tr>
<tr>
<td>2710</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>47.990 Km</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VCD EDS 358 G9</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>'03 '04 '05 '06 '07 '08</td>
</tr>
<tr>
<td>4025</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.069 Km</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VCD EDS 358 G9</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>'03 '04 '05 '06 '07 '08</td>
</tr>
<tr>
<td>4025</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.224 Km</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VCD EDS 358 G9</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>'03 '04 '05 '06 '07 '08</td>
</tr>
<tr>
<td>4025</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.386 Km</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(c) 2004 VicRoads
<table>
<thead>
<tr>
<th>VCD ED5</th>
<th>Location</th>
<th>Date of accident</th>
<th>Casualties</th>
<th>Severity</th>
<th>DCA Groups</th>
<th>Lost Rear</th>
<th>Rear Fence</th>
<th>Pole Tree</th>
<th>Light</th>
<th>VEHICLE NUMBERS</th>
<th>FINANCIAL YEAR</th>
</tr>
</thead>
<tbody>
<tr>
<td>358 G9</td>
<td>Bunurong Road</td>
<td>01/07/2002</td>
<td>2</td>
<td>Fatal</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>'03 '04 '05 '06 '07 '08</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Billson Street</td>
<td></td>
<td></td>
<td>Serious</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td>'00 '04 '05 '06 '07 '08</td>
<td></td>
</tr>
<tr>
<td>358 G9</td>
<td>Mcbride Avenue</td>
<td>01/07/2002</td>
<td>1</td>
<td>Serious</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td>'00 '04 '05 '06 '07 '08</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Murray Street</td>
<td></td>
<td></td>
<td>Other</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td>'00 '04 '05 '06 '07 '08</td>
<td></td>
</tr>
<tr>
<td>358 G10</td>
<td>Bunurong Road</td>
<td>01/07/2002</td>
<td>1</td>
<td>Casualty</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td>'00 '04 '05 '06 '07 '08</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hagelhorn Street</td>
<td></td>
<td></td>
<td>Pedestrian</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td>'00 '04 '05 '06 '07 '08</td>
<td></td>
</tr>
<tr>
<td>358 G10</td>
<td>Bunurong Road</td>
<td>01/07/2002</td>
<td>2</td>
<td>Casualty</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td></td>
<td>'00 '04 '05 '06 '07 '08</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hunter Street</td>
<td></td>
<td></td>
<td>Pedestrian</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td>'00 '04 '05 '06 '07 '08</td>
<td></td>
</tr>
<tr>
<td>358 G10</td>
<td>Bunurong Road</td>
<td>01/07/2002</td>
<td>2</td>
<td>Casualty</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td></td>
<td>'00 '04 '05 '06 '07 '08</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Watt Street</td>
<td></td>
<td></td>
<td>Pedestrian</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td></td>
<td>'00 '04 '05 '06 '07 '08</td>
<td></td>
</tr>
<tr>
<td>358 G10</td>
<td>Bunurong Road</td>
<td>01/07/2002</td>
<td>4</td>
<td>Casualty</td>
<td>4</td>
<td>4</td>
<td>7</td>
<td>1</td>
<td></td>
<td>'00 '04 '05 '06 '07 '08</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Merrin Crescent</td>
<td></td>
<td></td>
<td>Pedestrian</td>
<td>4</td>
<td>4</td>
<td>7</td>
<td>1</td>
<td></td>
<td>'00 '04 '05 '06 '07 '08</td>
<td></td>
</tr>
<tr>
<td>358 G11</td>
<td>Bunurong Road</td>
<td>01/07/2002</td>
<td>2</td>
<td>Casualty</td>
<td>2</td>
<td>2</td>
<td>4</td>
<td>1</td>
<td></td>
<td>'00 '04 '05 '06 '07 '08</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Merrin Crescent</td>
<td></td>
<td></td>
<td>Pedestrian</td>
<td>2</td>
<td>2</td>
<td>4</td>
<td>1</td>
<td></td>
<td>'00 '04 '05 '06 '07 '08</td>
<td></td>
</tr>
<tr>
<td>358 H7</td>
<td>White Road</td>
<td>01/07/2002</td>
<td>1</td>
<td>Casualty</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td>'00 '04 '05 '06 '07 '08</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Kingston Road</td>
<td></td>
<td></td>
<td>Pedestrian</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td>'00 '04 '05 '06 '07 '08</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Wentworth Road</td>
<td></td>
<td></td>
<td>Pedestrian</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td>'00 '04 '05 '06 '07 '08</td>
<td></td>
</tr>
</tbody>
</table>

(c) 2004 VicRoads
### Road Crash Statistics: Victoria Accidents By Site

**Location** is Town(s): Wonthaggi; Query: Casualty accidents; Date range is 01/07/2002 to 30/06/2007; Sorted by location.

<table>
<thead>
<tr>
<th>Map Refs Location</th>
<th>Severity</th>
<th>Road Number (Road names)</th>
<th>Km from start</th>
<th>Location</th>
<th>ID CA Groups</th>
<th>Object Hit</th>
<th>Accident numbers tallied within each category except for VEHICLE subsection where number and type of vehicles within the accident are tallied.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Road</td>
<td>Event</td>
<td>Casualty</td>
<td>Injury</td>
<td>Fatality</td>
<td>Serious</td>
<td>Other</td>
<td>Pedestrian</td>
</tr>
<tr>
<td>VCD ED5 At Korumburra-Wonthaggi Road &amp; Wentworth Road</td>
<td></td>
<td>358 H8</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>VCD ED5 At Beard Street &amp; Brook Street</td>
<td></td>
<td>358 H9</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td><strong>Totals:</strong></td>
<td></td>
<td></td>
<td>42</td>
<td>11</td>
<td>8</td>
<td>31</td>
<td>12</td>
</tr>
</tbody>
</table>

**Note:**

Object Hit: Only most common categories listed. An animal or object is not his in every crash.

Road Condition: Only dry and wet provided, other excluded.

Accident numbers are tallied within each category except for VEHICLE subsection where number and type of vehicles within the accident are tallied.

The crashes on roads that make up local government area (lga) borders are allocated to both lgas. Double counting only occurs when two or more lgas are queried separately (not together).