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# MURRAY BRIDGE

## *Residential Growth Areas Structure Plans*



### Draft Report

Prepared by



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# TABLE OF CONTENTS

<b>Executive Summary</b>	<b>i</b>
<b>1. Introduction</b>	<b>1</b>
1.1 Report Background	1
1.2 Report Objectives	1
1.3 Study Areas	2
<b>2. Strategic Context</b>	<b>0</b>
2.1 SA Planning Strategy	0
2.2 Murray Bridge Structure Plan	1
<b>3. Land Demand and Supply Analysis</b>	<b>4</b>
3.1 Residential Land	4
3.1.1 Population Growth Targets	4
3.1.2 Summary	6
3.2 Housing Stock	7
3.2.1 Demand and Supply	7
3.2.2 Summary	8
3.3 Land Supply	8
3.3.1 Quantum of Land Supply	8
3.3.2 Importance of ownership and land supply distribution	10
3.3.3 Summary	10
3.4 Employment Land	11
3.4.1 Employment Growth Targets	11
3.4.2 Demand and Supply	11
3.4.3 Summary	12
<b>4. Community Engagement</b>	<b>13</b>
4.1 Process	13
4.2 Key Themes	13
4.3 Level of landowner support for future development	14
<b>5. Opportunities and Constraints</b>	<b>15</b>
5.1 Areas 1 and 2	15
5.1.1 Opportunities	15
5.1.2 Constraints	16
5.2 Area 3	18
5.2.1 Opportunities	18
5.2.2 Constraints	19
<b>6. Structure Plan Recommendations</b>	<b>21</b>
6.1 Areas 1 and 2	21
6.2 Area 3	24
<b>7. Infrastructure Requirements</b>	<b>27</b>
7.1 Current Provision of Physical Infrastructure	27
7.1.1 Water	27
7.1.2 Wastewater	28
7.1.3 Stormwater Infrastructure	28
7.1.4 Telecommunications	29
7.1.5 Gas	29
7.1.6 Electricity	30

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7.1.7	Roads Infrastructure	30
7.2	Current Provision of Human Services Infrastructure	31
7.3	Future Physical Infrastructure Upgrades	32
7.3.1	Water & Wastewater	32
7.3.2	Stormwater Infrastructure	34
7.3.3	Telecommunication, Gas and Electricity	36
7.3.4	Road Infrastructure	36
7.3.5	Summary of Physical Infrastructure Upgrades	39
7.4	Future Human Services Infrastructure Upgrades	40
<b>8.</b>	<b>Infrastructure Funding Analysis</b>	<b>42</b>
8.1	Direct Funding Option for Rural City of Murray Bridge	42
8.1.1	Council Costs and Revenue	42
8.2	Developer Contributions	44
8.3	Other Infrastructure Provision Options & Incentives	45
8.4	Development Facilitation and Council Role	49
<b>9.</b>	<b>Recommended Policy Changes</b>	<b>50</b>
9.1	New Residential Areas	50
9.1.1	Areas 1 and 2	50
9.1.2	Area 3	51
9.2	Freeway Buffer Area	53
9.3	Industry Areas	54
9.4	Mobilong Prison and Correctional Services Expansion Area	55
9.5	Whites Hill Escarpment	55
9.6	Adelaide Road Light Industry Zone	55
9.6.1	Land Use Assessment	55
9.7	General Policies	58
<b>10.</b>	<b>REFERENCES</b>	<b>59</b>
<b>11.</b>	<b>Appendices</b>	<b>60</b>
11.1	Appendix 1 - List of People Consulted	61
11.2	Appendix 2 - Infrastructure Calculations and Assumptions	62
11.3	Appendix 3 - Costings for Future Infrastructure Provision	63
11.4	Appendix 4 - Financial Analysis Assumptions and Rationale	65
11.5	Appendix 5 - Structure Plan Assumptions and Calculations	68
11.6	Appendix 6 - Location of Sub Areas 1A, 1B, 2A, 2B	69
11.7	Appendix 7 – Illustrative Master Plans for Areas 1 and 2	70
11.8	Appendix 8 – Copy of Structure Plans, Areas 1, 2 and 3	71

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## EXECUTIVE SUMMARY

This report has been prepared for the Rural City of Murray Bridge to inform about how and where future residential growth is accommodated in Murray Bridge so that it can appropriately plan for rezoning of suitable land in advance. As such, this report will inform a future Development Plan Amendment by Council.

This report seeks to:

- Quantify the residential land supply and demand in Murray Bridge in support for additional residential zoned land
- Identify existing and required infrastructure based on the recommended extent of additional growth areas
- Identify a preferred funding mechanism for the provision of infrastructure
- Prepare concept plans for the identified study areas which can be adapted for use within a future DPA
- Make recommendations as to the desired policy changes, and
- Review the Light Industry Zone situated along Adelaide Road and Maurice Road, considering the future role of this area within the township structure.

The three identified study areas (refer page 3) arose from submissions to Council as part of the Strategic Directions Report process undertaken by Council.

The 30 Year Plan for Greater Adelaide identifies Murray Bridge as a significant focus for residential growth within the Adelaide Hills Region, and this is also reflected within the Murray Bridge Structure Plan prepared for Council in 2012.

### Land Supply and Demand

There has been consistent growth within the Murray Bridge township over the last 10 years, albeit at a reduced rate to that forecast by DPTI and the Structure Plan (which provides aspirational targets). Statistics indicate that the Rural City of Murray Bridge is urbanising, with the rate of growth within the township higher than that of the remainder of the Council area (where growth is actually slightly in decline). Population forecasts have been extrapolated based on known average annual growth rates to determine the following projections:

	Recommended
Population Growth (additional people to 2038)	11,400
Population Growth Rate (per annum)	1.63%
Additional Dwellings (based on 2.2 people per household average)	5,100
Dwelling Construction Rate (average per annum)	170
15 Year Rolling Supply of Dwellings	2550

An analysis of available undeveloped land identifies that there is currently 619.1 hectares of residential zoned land within the Murray Bridge township and a further 888.4 hectares of Rural Living zoned land within and surrounding the township (of which 200 hectares is within Study Area 1). However, a significant proportion (81%) of the residential zoned land is within the ownership of Companies or Associations and specifically one land owner (associated with Gifford Hill and Newbridge).

While the underlying demand for housing can be accommodated by the supply of Residential zoned land within the Murray Bridge township, the fact that a significant proportion of this land lies in the



control of one developer implies a need to source alternative land supply options to prevent monopolising of the market into the future and to mitigate risk in land supply.

In 2010 it was estimated that 134 hectares of industrial land would be required in the Adelaide Hills and Murray Bridge region for the next 30 years. This was revised up to 160 hectares in the revised HELSP Report in 2012. The 15 year demand was estimated at being 81 hectares and the one-year demand at 5 hectares. There was 96 hectares of developable industrial land available in 2012 within the Murray Bridge and Adelaide Hills Region, in excess of the amount required for the next 15 years (81 hectares).

### **Outcomes of Engagement**

A workshop was held for each of the three study areas and were well attended by land owners (123 people overall). Engagement also occurred with key stakeholders within interests in the study areas, to ascertain their future ambitions and desires for the development of the study areas (a full list of stakeholders can be found in Appendix 1).

The outcomes of the engagement demonstrated that there was general support from the majority of land owners to undertake development, or allow a developer to take on development (including previous approaches to a number of land owners by one developer). Indeed, many land owners indicated a willingness to work with neighbours to get a coordinated outcome if necessary. There were concerns and scepticism about the timing and provision of infrastructure, which was seen as a barrier to developing land and a major challenge for the study areas.

### **Opportunities and Constraints**

An analysis of the opportunities (as identified by study team and land owners) and constraints of the land within the three identified study areas was undertaken and are summarised as follows:

#### *Areas 1 and 2*

- these locations are contiguous with the existing residential areas and can connect to existing infrastructure and services
- the land form is large flat or of gentle slope which facilitates residential development, with some clear drainage lines. The exception to this is the Whites Hill escarpment which has gradients and vegetation not conducive to orderly residential development
- there is an existing road network in place which facilitates easy connections and permeability for future development
- there may be a relocation of the previously identified Heavy Vehicle Bypass route along Bremer Road and Agricultural Avenue (making it more attractive for residential development)
- the nearby Boral Quarry has separation buffers slightly within the study area, and potential uses within future industrial areas could also impacts on this interface
- there is a need to continue to accommodate the Mobilong Prison expansion within the study area (along with the Bremer Road cemetery)
- there is a SEAGas Port Campbell to Adelaide Transmission Pipeline along Bremer Road which has land use and density proximity restrictions on adjacent development
- there is a need to maintain a visual buffer from the South eastern freeway
- these areas are under fragmented land ownership, making it more complex to get coordinated development outcomes, and integrated infrastructure improvements

#### *Area 3*

- proximity to intensive land uses such as the Viterra Silos and the Thomas Foods Abattoir (separation guidelines by EPA run well into the study area)



- the rail line acts as a barrier for access, as well as a noise and vibration source for neighbouring residential development (proximity of train services expected to increase into the future)
- there is only one entry and exit to Adelaide – Mannum Road (across rail line) and the condition of Hume Reserve Road is poor
- the topography falls quite steeply down to the floodplains to the northern edge of the study area
- there is no sewer connection to this location (and likely to be unviable to provide one)
- portion of the study area is subject to an Aboriginal Heritage agreement with the Ngarrindjeri People

### Structure Plan Recommendations

Having regard to the opportunities and constraints associated with the study areas a Structure Plan was prepared for the three study areas (can be found within Appendix 8). Key aspects of the Structure Plans include:

#### Areas 1 and 2

- maintain the Whites Hill escarpment as a backdrop to the township and a conservation / recreation area
- retain and consolidate the General Industry Zone areas along Maurice Road and Hindmarsh / Brinkley Road, with potential for small expansion of industry land between Woodlands Road and Bremer Road (south of Maurice Road)
- maintain the Mobilong Prison and expansion area for future prison development
- residential development be established for the remainder of the study area, subject to the following design considerations:
  - provide a variety of densities and housing choices, although ensure a level of compatibility with the adjacent established neighbourhoods
  - establish open space corridors along existing drainage lines and infrastructure connected to the Stormwater Management and Reuse Scheme – this should include a buffer to the prison expansion area, and connection to the Whites Hill escarpment conservation / passive open space area
  - open up potential for small and medium scale centres for a range of community, retail and business uses at the prominent junctions of Adelaide Road/Bremer Road/Agricultural Drive and Maurice/Hindmarsh/Brinkley Roads
  - retain the properties adjacent to the freeway as a visual buffer and transition to the urban areas (although with some limited potential development opportunities)

#### Area 3

- potential for only a handful of additional dwellings, so densities very low in nature (similar to Country Living ) envisaged
- dwelling locations need to be outside of land use buffer distances, and take into account environmental factors (including land slope, stormwater management and waste water management requirements)
- some potential scope for small scale tourism related activities such as bed and breakfast accommodation to take advantage of attractive views and proximity to town centre and Murray River.
- large scale tourism uses such as motels, function centres are not appropriate given servicing, access and infrastructure limitations.



## Infrastructure Requirements

A high level analysis of the infrastructure improvements required to accommodate the development potential of the structure planned areas was undertaken and determined the following improvements were required:

Services	Upgrades
<b>Water &amp; Wastewater</b>	<ul style="list-style-type: none"> <li>New sewer and water infrastructure to be included within any new developments. Borne by the developers.</li> <li>Future WTP capacity upgrade will be required for additional dwellings – up to 38ML per day (from 30ML per day)</li> <li>Main augmentation required within network</li> <li>Additional boosting, storage and high pressure control required above 68m contour level</li> <li>Upgrades to WWTP already being planned with forecast capacity able to accommodate additional dwellings</li> <li>MBR.P24 Pump Station (on Thomas Street) will need to be upgraded along with the sewer pump station on Old Swanport Road.</li> <li>Additional sewer mains and possibly booster pump stations will be required to transfer flows from the developed areas to the identified mains route</li> </ul>
<b>Electricity</b>	<ul style="list-style-type: none"> <li>Augmentation charges will be applied to new developments to cater for the SA Power Network (SAPN) new infrastructure and upgrades to existing infrastructures. Indicative augmentation charge equates to approximately \$1,230/allotment.</li> <li>In addition, for electrical reticulation/ street lighting for new developments, a nominal cost of approximately \$5,000/allotment would apply.</li> </ul>
<b>Telecommunication &amp; Gas</b>	<ul style="list-style-type: none"> <li>Provisional conduits to be installed by the developers for all new development at a nominal cost in the order of \$2,000/allotment.</li> </ul>
<b>Stormwater Drainage</b>	<ul style="list-style-type: none"> <li>Areas 1A &amp; 1B – Existing infrastructure to be upgraded to cater for the new developments.</li> <li>Area 1C - - new infrastructure in association with new developments will flow into the existing infrastructure (no upgrades to existing necessary).</li> <li>Areas 2A &amp; 2B - new infrastructure in association with new developments will flow into the existing infrastructure (no upgrades of existing necessary).</li> </ul> <p>(refer to Appendix 6 to identify location of Areas 1A, 1B, 1C, 2A, 2B)</p>
<b>Roads</b>	<ul style="list-style-type: none"> <li>Upgrades required for existing road network within identified growth areas to bring them to a residential design standard. This varies according to infrastructure in place within existing roads (such as kerbing, footpaths, street trees etc)</li> <li>Intersection upgrades required for: <ul style="list-style-type: none"> <li>Cromwell Road / Adelaide Road / Lincoln Road</li> <li>Bremmer Road / Adelaide Road / Agricultural Drive</li> <li>Woodlands Road / Maurice Road</li> </ul> </li> </ul>
<b>Education</b>	<ul style="list-style-type: none"> <li>additional primary and secondary school identified at Gifford Hill Village Centre</li> <li>no additional tertiary education facilities required (sufficient capacity at existing TAFE)</li> </ul>
<b>Health Services</b>	<ul style="list-style-type: none"> <li>additional hospital (or expansion of existing) required – likely to be provided by the private sector</li> <li>GP and dentist facilities to be accommodated within future identified centres</li> </ul>



Services	Upgrades
<b>Aged Care</b>	<ul style="list-style-type: none"> <li>212 additional beds modelled in 2012 Murray Bridge Structure Plan – can be accommodated within new growth areas (including expansion of existing Retirement Village)</li> </ul>
<b>Open Space and Recreation</b>	<ul style="list-style-type: none"> <li>additional playing fields, tennis courts and ovals to be provided within the identified District level open space areas within the Structure Plan</li> </ul>

### Infrastructure Funding Analysis

A financial analysis has been carried out of the implications for the Rural City of Murray Bridge from the subdivision of the land within the study areas. Information regarding costs Council would incur and revenues it is likely to generate in future in connection with development of these areas is necessarily 'broad brush' at this time and reliant on various assumptions (more information on the assumptions can be found within Section 8.1 and Appendix 4).

On average in the long-run each new allotment will generate a favourable income statement reported impact for RCMB of the order of \$194. When all of the areas are subdivided this would result in an improvement in Council's reported operating result of approximately \$737,000 pa.

The net present value (NPV) of inflows to Council over forecast outflows from the development over a 50 year time period (and allowing for subsequent asset renewal) is of the order of \$4.6 million. If economies of scale were generated, then this favourable NPV would increase to \$15.8 million. In other words (and all other things being equal) Council would be able to provide additional benefits to existing residents and ratepayers in the form of improved service levels and/or lower rates and charges as a result of the proposed development.

It is likely that cash inflow for Council associated with the development of the study areas will exceed cash outflow in most years. Accumulated net cash inflow though will not exceed associated cash outflow needs in the early years as Council will need to spend approximately \$4.75 million at a relatively early stage in upgrading its existing road network. Council would be able to finance these net outlays either from other internal sources or through external borrowings if need be. Council has ready access to borrowings and currently enjoys low levels of net debt.

On the basis of available evidence it is likely to be hard to convince a developer (or the State) of the financial justification for any discretionary developer contributions (e.g. the need for a negotiated precinct agreement under which the developer pays monies (directly or through a levy on allotments) to fund specified works and projects carried out by Council). Developers will also be responsible for provision of water supply, sewerage and electricity supply infrastructure within the new subdivisions. This infrastructure may upon the release of the subdivisions become the assets of entities other than Council. These entities will also likely require developers to contribute to upgrades of their existing networks to service the subdivisions.

A number of other current and potential future options that may facilitate the provision of infrastructure have been considered in terms of the positives and negatives and a brief commentary provided below. These options include:

- General Rates
- Separate Rates and rate rebates (under Local Government Act, 1999)
- Land Management Agreements (under Development Act 1993)
- Development Deed / Infrastructure Agreements



- Joint Venture Agreements
- Government Grants
- Borrowing (through Local Government Finance Authority)
- Open Space Contributions (under the Development Act 1993)
- Utility Developer Augmentation Charges
- Development Restrictions (through Development Plan)
- Precinct Declarations (Urban Renewal Act 1995)
- State infrastructure Coordinator (proposed concept not yet supported by Government)
- Infrastructure Charges (in place interstate but no political support in SA)

Given that there are a range of positives and negatives to all of the various options listed above, it is likely that a range of the options are considered into the future for any future projects. The suitability of each option will need to be targeted to the scale and nature of the specific project and the parties involved.

In order for future development to be timely, efficient, coordinated and economic, there is potential for council to be more proactive and have the following non statutory roles:

- Development Coordinator – dedicated position to work with land owners to get them working together as consortiums to redevelop their sites or form partnerships with or sell amalgamated parcels to developers
- establish a standardised / template Development Agreement Contract for land owners to adopt
- putting local or interested developers in contact with a register of land owners interested in selling or Joint Venturing future development of their sites

### **Recommended Policy Changes**

To support the implementation of the recommended Structure Plan for the Study Areas, the following changes are recommended to the Development Plan policies for the study areas:

- Residential Areas – Study Areas 1 and 2  
Apply the existing Residential Zone to these locations, albeit with some additional policy support which increases private open space requirements over the existing zone and limitations on certain uses and densities of development adjacent the SEAGas pipeline route. A suite of policies are also necessary to support the key elements of the structure plan such as the need for a permeable street network (prevent culs-de-sac and limiting future development options), establishment of linear open space corridors along drainage lines and providing density incentives for development that supports a coordinated and integrated development approach.
- Residential Area – Study Area 3  
Convert to a Country Living Zone with policies which limit allotment sizes to a minimum of 4000m<sup>2</sup>, whilst also providing guidance for placement and design of dwellings having regard to environmental considerations (stormwater and wastewater) and the visual prominence of this location. The policies should also provide support for small scale tourism activities such as Bed and Breakfasts (but not larger scale facilities).
- Freeway Buffer Area  
Change to a Rural Living Zone, with a specific Freeway Interface Policy area with policy support that includes minimum setbacks for buildings from the freeway, protection of existing native vegetation and a minimum allotment size of 2 hectares.



- **Industry Areas**  
Maintain proposed industry areas within the General Industry Zone, except for a portion of Light Industry Zone at the existing Deferred Urban zoned area of land identified within the Structure Plan as industry between Maurice Road and Woodlands Road (Area 2).
- **Mobilong Prison and Expansion Area**  
Maintain within the current Community Zone.
- **Whites Hill Escarpment**  
Rezone to an Open Space Zone with policies that highlight the importance of this location as a significant backdrop to the township's urban areas and therefore maintains the open and strong landscape character. The policies should focus recreational uses to passive uses only and prevent formal recreation activities.
- **Adelaide Road Light Industry Zone**  
Rezone to a Commercial Zone to better reflect the range of uses currently in this location.
- **General Policies**  
Adopt the Noise and Air Emissions Overlay for areas beside the rail corridor and freeway, the Affordable Housing Overlay for new residential areas and update the Bushfire Protection Areas to reflect the new extent of urban zoning.





# 1. INTRODUCTION

## 1.1 Report Background

Strategic planning for Greater Adelaide and Murray Bridge for the next 30 years anticipates population growth for the Murray Bridge Township. This is reflected within both the 30 Year Plan for Greater Adelaide and the Rural City of Murray Bridge's Structure Plan.

It is therefore important that there is consideration about how and where this growth is accommodated in Murray Bridge. It is important that:

- Sufficient and appropriately located land is identified and set aside for future development
- The necessary infrastructure is available to service the growth areas,
- The land provides for a diverse range of housing types, employment and community needs, and
- That future development proceeds in a coordinated and efficient manner.

Council has prepared a Strategic Directions Report in 2013 that has been endorsed by the Minister for Planning. The Report:

- Highlights future planning considerations
- Broadly describes the necessary amendments to zoning required to accommodate future planning needs for Murray Bridge
- Identifies where future residential development may occur, and
- Recommends that a Residential Growth Areas Development Plan Amendment (DPA) be undertaken to facilitate this future growth.

However, before the DPA can commence, the Department for Planning, Transport & Infrastructure (DPTI) has indicated that the Council should undertake further strategic investigations if Council wishes to rezone more land for residential development. These further investigations must demonstrate to DPTI that there is an insufficient supply of zoned land available for the next 15 years, that essential infrastructure can be provided to service the residential growth areas, and identify how the land can be developed in a coordinated manner.

This report has been prepared by consultants Jensen Planning + Design (in association with MLEI Consulting Engineers and JAC Comrie Pty Ltd) for the Rural City of Murray Bridge to address these issues posed by DPTI, and to provide Council with further information regarding infrastructure funding, development plan policy approaches, and ways in which future development can proceed in a coordinated, sustainable and economic manner.

## 1.2 Report Objectives

This report will establish a base set of investigations which will support a future Statement of Intent for a DPA and inform further investigations to be undertaken as part of the future DPA for the possible growth areas (called the Study Area – See Section 1.3).

This report seeks to:

- Quantify the residential land supply and demand in Murray Bridge in support for additional residential zoned land





- Identify existing and required infrastructure based on the recommended extent of additional growth areas
- Identify a preferred funding mechanism for the provision of infrastructure
- Prepare concept plans for the identified study areas which can be adapted for use within a future DPA
- Make recommendations as to the desired policy changes, and
- Review the Light Industry Zone situated along Adelaide Road and Maurice Road, considering the future role of this area within the township structure.

### 1.3 Study Areas

Based on the recommendations of the Murray Bridge Structure Plan and following consultation on the Strategic Directions Report, a number of locations for residential growth have been identified by Council. The following three key locations within Murray Bridge are subject to this study:

#### **Area 1**

Land currently zoned Rural Living, Country Living, Rural Landscape Protection, General Industry and Bulky Goods to the south of Adelaide Road and to the north of the Freeway.

#### **Area 2**

Land currently zoned Deferred Urban, Community and General Industry fronting Bremer Road, Greenlands Drive and Maurice Road to the north of Adelaide Road.

#### **Area 3**

Land currently zoned River Murray Fringe and Light Industry fronting portion of Adelaide – Mannum Road, Swanport Road and Hume Reserve Road.

The extent of these locations and their relationship to the remainder of the township and each other is identified within Figure 1.





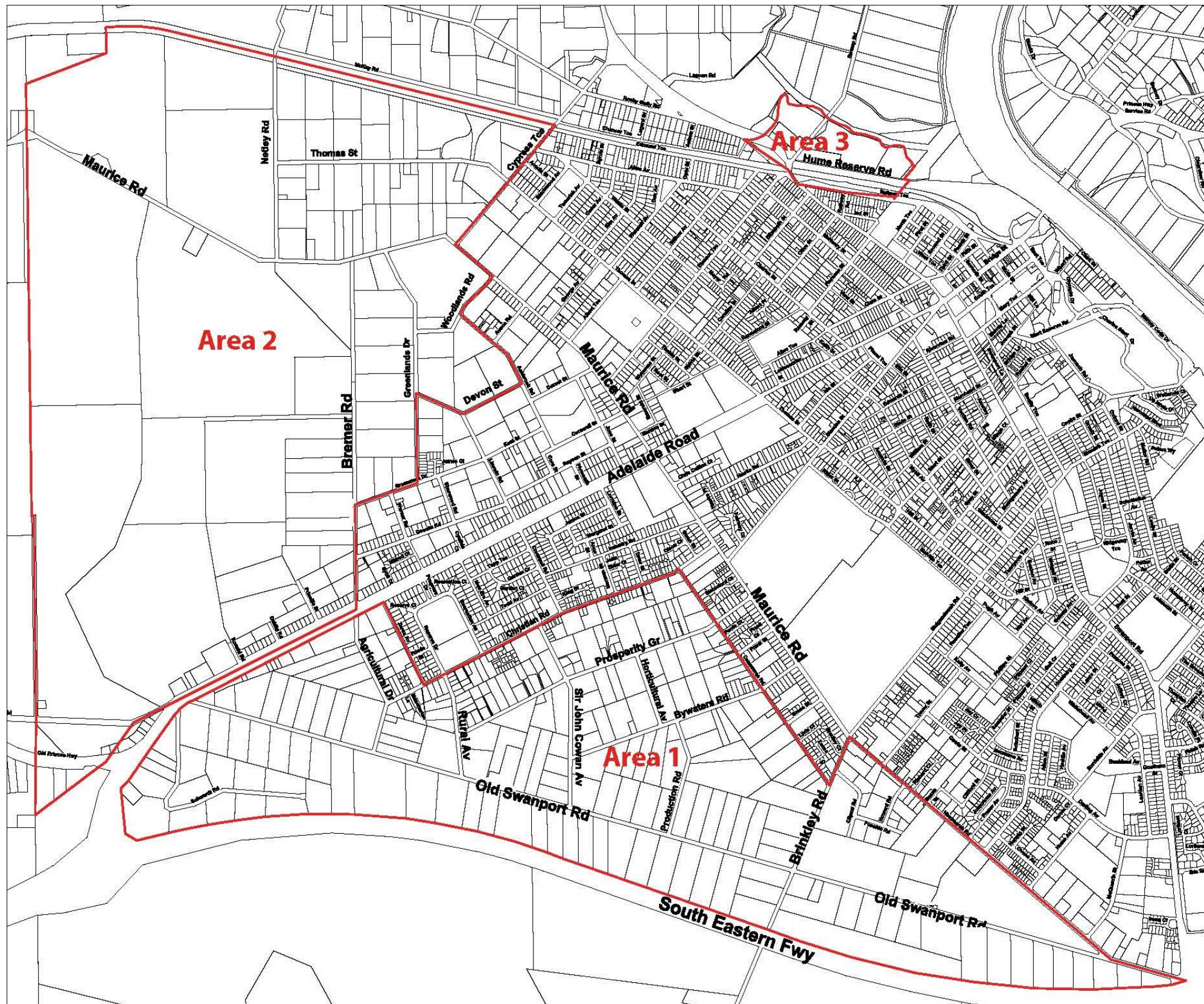


Figure 1: Location and Extent of Study Areas subject to this investigation



## 2. STRATEGIC CONTEXT

Previous investigations undertaken as part of the SA Planning Strategy and Murray Bridge Structure Plan have informed this report. The assumptions they have made about residential growth, and their suggestions for the locations of growth areas and infrastructure requirements have been tested and updated where appropriate.

### 2.1 SA Planning Strategy

The relevant Planning Strategy applicable to the township of Murray Bridge is the 30 Year Plan for Greater Adelaide. Murray Bridge is included within the Adelaide Hills and Murray Bridge Region within the Strategy. The Strategy identifies the following key targets for the region for 2038:

- 29,000 additional people
- 13,000 additional dwellings
- 13,000 additional jobs
- 2010 hectares of residential and employment land (gross land supply) within townships.

The Planning Strategy maintains Murray Bridge as a Regional Activity Centre and identifies that the vast majority of this growth is to occur within the townships of Mount Barker and Murray Bridge, with the locations and extent of areas identified in Figure 2.

Since the preparation of the Planning Strategy in 2009, the areas identified for growth applying to Murray Bridge (Gifford Hill) have been rezoned to residential.

Importantly, the Planning Strategy identifies the desire to investigate the outskirts of the township (covered by Areas 1 and 2) from rural living to urban use, providing support for Council's desire to consider the identified areas for future residential growth areas (as noted in the Murray Bridge Structure Plan).



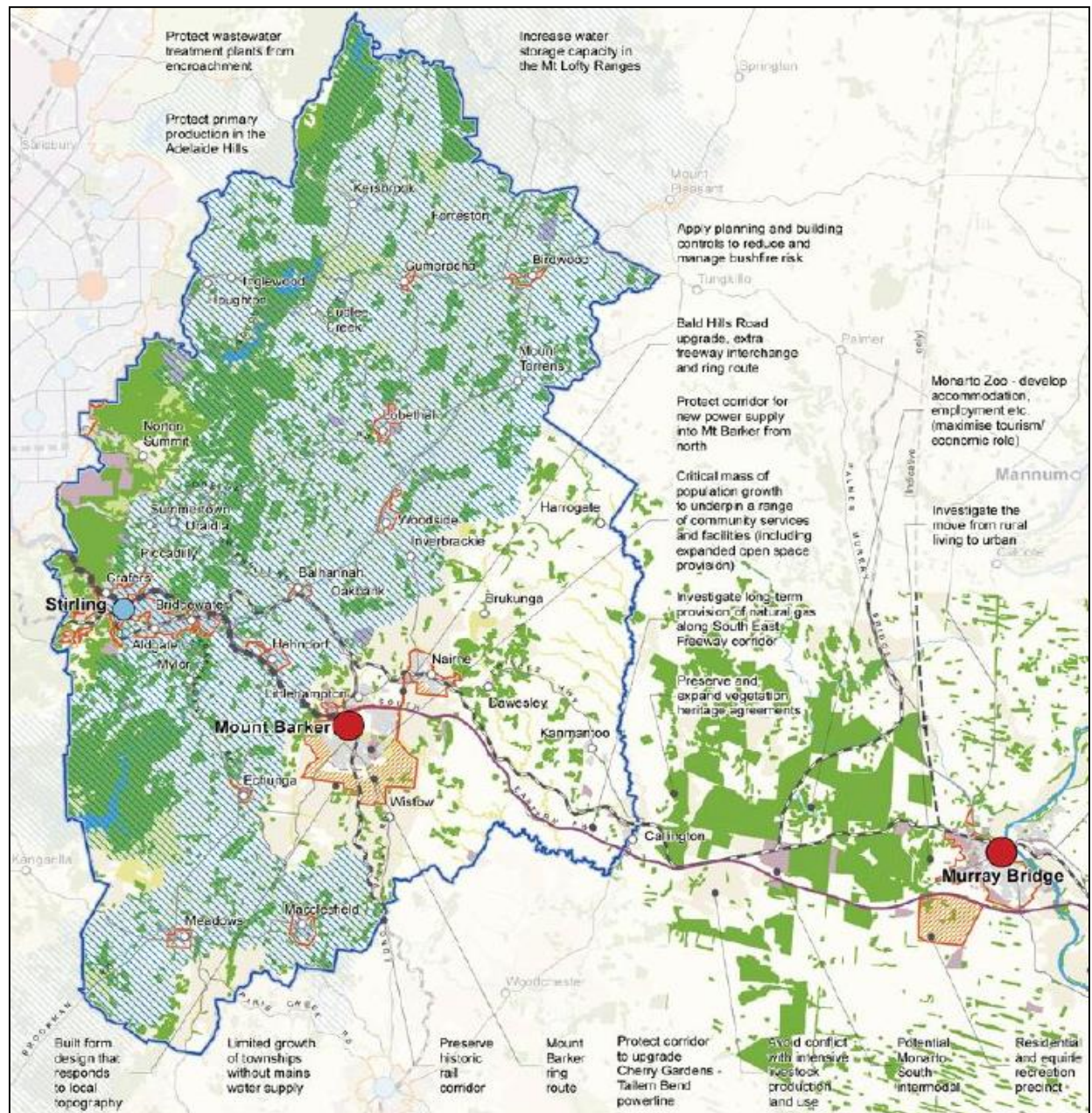


Figure 2: Extract of Map E7 – Adelaide Hills and Murray Bridge Region, 30 Year Plan for Greater Adelaide

## 2.2 Murray Bridge Structure Plan

The Murray Bridge Structure Plan was prepared by the Rural City of Murray Bridge in response to the release of the Planning Strategy. The Structure Plan responds to the targets identified within the Planning Strategy for population, dwelling and employment growth and considers the spatial and infrastructure implications of these targets on the township. The Structure Plan extends beyond the township boundaries and growth areas identified within the 30 Year Plan for Greater Adelaide and is identified within Figure 3.



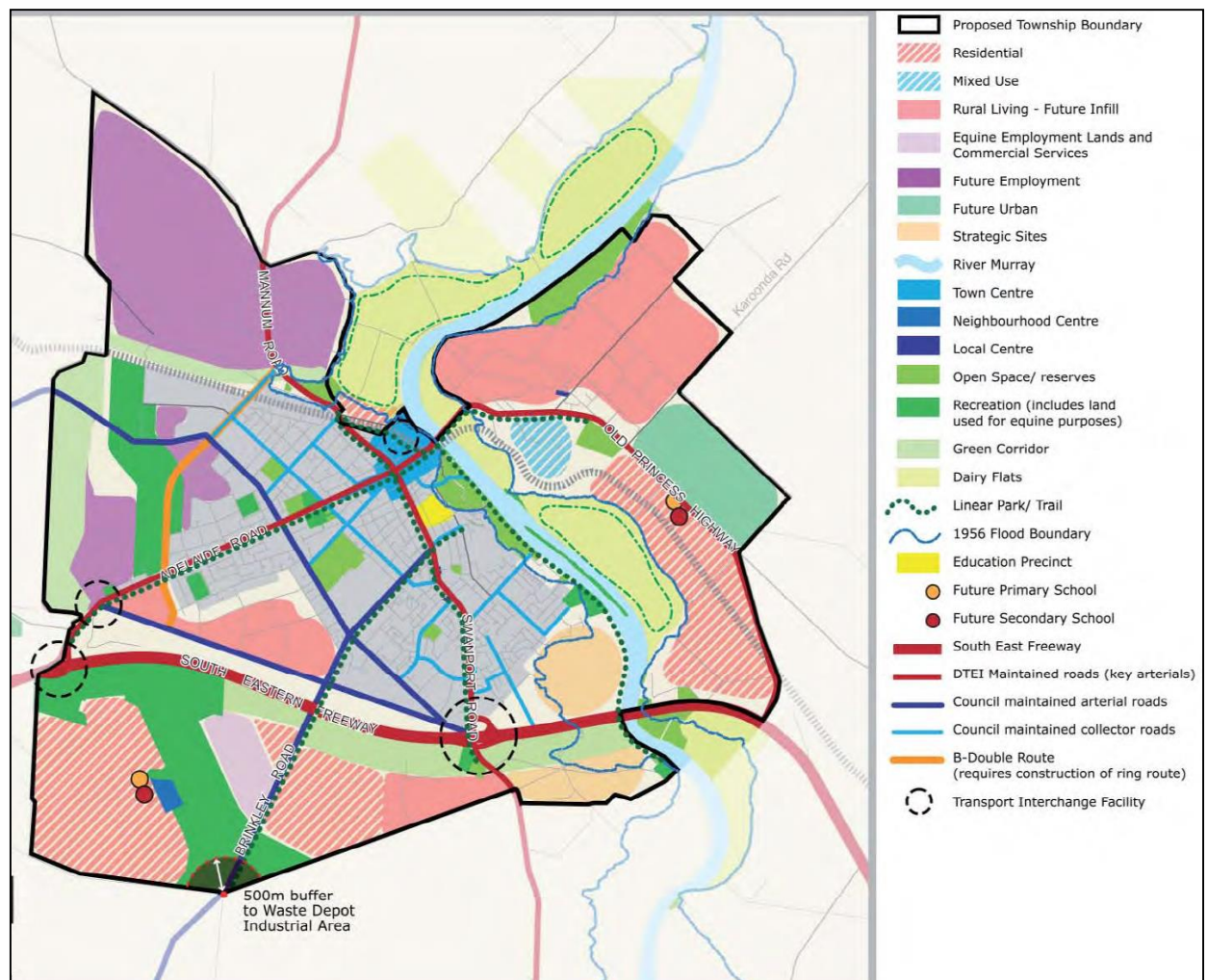


Figure 3: Murray Bridge Structure Plan 2011

The Structure Plan sets aspirational targets for the growth of the Murray Bridge Township until 2038. These targets are slightly higher than those identified for Murray Bridge within the 30 Year Plan for Greater Adelaide and are as follows:

- 18,700 additional people
- 8,400 additional dwellings
- 9,000 additional jobs.

Of particular relevance to the study areas forming part of this investigation, the Structure Plan identifies the following key pieces of infrastructure:

- A new B-double ring route running between Old Swanport Road and Adelaide – Mannum Road via Agricultural Drive and Bremer Road, the effect of which is to by-pass the established parts of the township (including the town centre)
- SEAGas Port Campbell to Adelaide transmission pipeline running along Agricultural Drive, Bremer Road and Netley Road
- Upgrading of water storage and pump station at White Hill (to increase capacity)
- Two potential additional Waste Water Treatment Plants located to the north-west of the township (adjacent industrial area) and at the southern end of the Gifford Hill development.



- Interchange upgrades for the intersections of Old Swanport Road/ Adelaide Road and Old Swanport Road/Swanport Road/South Eastern Freeway
- Three new electricity substations to service the new growth areas.

The Structure Plan suggests the following in relation to the 3 study areas (those areas shown in Figure 1):

**Area 1**

Recommended for retention as rural living area and no change to Rural Landscape Protection Area

**Area 2**

Recommended for a combination of employment lands, recreation corridor (running along the SEAGas pipeline route) and a green corridor along the western hill slopes.

**Area 3**

Recommended for residential growth area (capacity identified for 30 dwellings only).



## 3. LAND DEMAND AND SUPPLY ANALYSIS

### 3.1 Residential Land

#### 3.1.1 Population Growth Targets

Strategic population growth targets are aspirational. They are usually based on projected growth levels taking into account natural growth rate trends (births and deaths) as well as migration patterns. The targets are the benchmarks from which growth planning is based and an adequate supply of appropriately zoned land (which will last for at least 15 years) is considered.

There are a range of population growth targets that have been examined to inform this report. They vary in their assumptions and therefore resultant targets.

#### As per the 30 Year Plan

The 30 Year Plan for Greater Adelaide establishes regional targets for population growth (as detailed above).

- For the Murray Bridge township the regional targets (without Mt Barker's contribution) equate to approximately 13,400 additional people by 2038, equating to an average population growth rate of 1.8% per annum.
- This equates to approximately 6,000 additional dwellings required to house the additional population (assumes 2.22 people per household average).
- This translates into an average dwelling construction rate of 250 dwellings per year.
- Utilising this rate of growth, a 15 year rolling supply of dwellings would equate to 3,750 dwellings needing to be accommodated by appropriately zoned land.

#### As per the Murray Bridge Structure Plan

- This has applied a higher aspirational growth target of 2.3% per annum based on assumptions that growth rates within the Murray Bridge Local Government Area (LGA) have historically been higher than those of the Adelaide Statistical Area average.
- This equates to an additional 18,700 additional people within the Murray Bridge Township, requiring an additional 8,400 dwellings.
- Assumes 2.22 people per household.
- This translates to dwellings being produced at an average rate of 280 dwellings per year and the need for appropriately zoned land to accommodate 4,200 dwellings within a 15 year rolling supply.

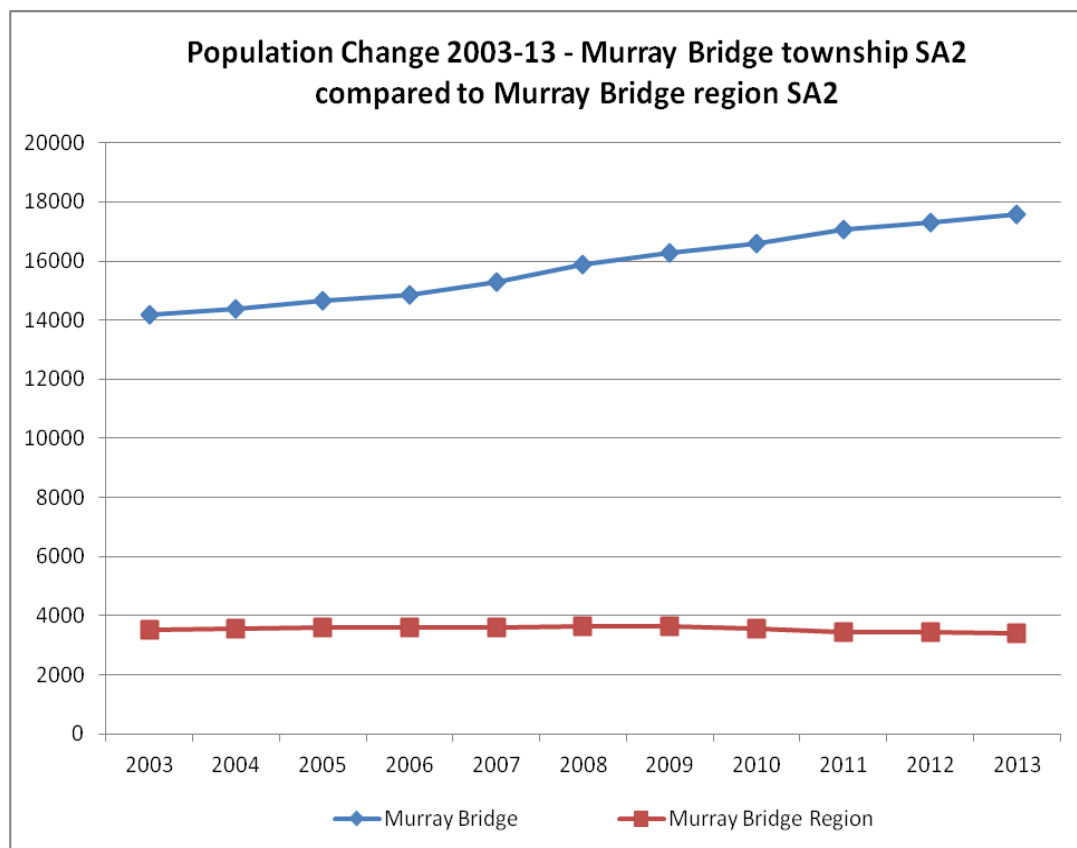
Notwithstanding these targets, population projections have been modelled by the State government up until 2026. These projections are used to guide land supply and demand needs into the future and therefore form the basis from which any future rezoning of land needs to have regard. A range of projections are modelled by the State government representing low, medium and high levels of growth, reflective of changing trends potentially influencing future growth levels. The medium growth projections are typically used to guide rezoning considerations for growth areas. These projections were identified by DPTI in its comments to Council's Strategic Directions Report. These (DPTI) projections are as follows:



- a more subdued average annual population growth rate within the Murray Bridge LGA of approximately 1.36% per annum, which is higher than the SA average of 0.96%.
- this growth rate is derived from assuming a consistent growth rate between 2026 and 2036 (which is beyond the timeframe for which the projections are provided).
- Utilising this average annual population growth rate, an additional 9,160 people will reside within Murray Bridge by 2038 (based on 2008 Estimated Residential Population (ERP) for consistency), requiring an additional 4,128 dwellings.
- This assumes the same 2.22 people per household average
- This equates to an average rate of approximately 140 dwellings per year and the need for appropriately zoned land to accommodate 2,100 dwellings within a 15 year rolling supply.

Unfortunately, a more updated set of projections utilising a more accurate set of data using 2011 census information and trends is currently being finalised and not yet available (the data is anticipated to be released in 2015).

DPTI has provided more accurate data to demonstrate historic growth trends for the past 10 years for the Murray Bridge Township as opposed to the LGA (see Figure 4). This is useful in that it provides a more accurate picture of growth within the township, eliminating external growth or decline factors outside of the township itself.



**Figure 4: Population Change Murray Bridge Township Versus Region 2003 – 2013 (Source, DPTI 2014)**

\*To see extent of Murray Bridge Township Statistical Areas 2 (SA2) see ABS website

[http://www.censusdata.abs.gov.au/census\\_services/getproduct/census/2011/quickstat/407031165?opendocument&navpos=220](http://www.censusdata.abs.gov.au/census_services/getproduct/census/2011/quickstat/407031165?opendocument&navpos=220)

To see extent of Murray Bridge Region Statistical Areas 2 (SA2) see ABS website

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### What are the implication of population change between 2003 – 2014 for this study?

- The data demonstrates that the population growth rate for the Murray Bridge Township has exceeded that of the Murray Bridge LGA<sup>1</sup>.
- It shows that there has been an urbanisation of the region (growth of the urban area rather than the rural/regional environs) with the growth of the township having an average annual growth rate of 2.2%.
- The regional population levels have in fact declined at an annual average rate of -0.3% between 2003 and 2013.
- This trend is anticipated to continue into the foreseeable future, meaning that the Murray Bridge township growth will need to accommodate more of the growth forecast for the LGA.
- It is therefore appropriate to apply an annual growth rate of 1.63% (average of growth over 30 year projection period) to align the township growth to those identified within the DPTI projections, while offsetting the trend decline of population within the region (ie 1.36% plus 0.3% to offset region decline).
- This rate is slightly lower than previously forecast within the 30 Year Plan and the Structure Plan, but aligns with anticipated reductions in growth associated with declines in overseas migration and increases in intrastate migration.

#### 3.1.2 Summary

Table 1 Population Forecasts

	DPTI	Recommended
Population Growth (additional people to 2038)	9,160	11,400
Population Growth Rate (per annum)	1.36%	1.63%
Additional Dwellings (based on 2.2 people per household average)	4,128	5,100
Dwelling Construction Rate (per annum)	140	170
15 Year Rolling Supply of Dwellings	2,100	2550

Utilising the average annual growth rate of 1.63%, an additional 11,400 people will reside within the Murray Bridge Township by 2038, requiring an additional 5,100 dwellings that would need to be produced at a rate of approximately 170 dwellings per annum.

<sup>1</sup> Note: In 2011 the Australian Bureau of Statistics (ABS) introduced a new geography known as the Australian Statistical Geography Standard (ASGS). In many cases the new SA2 boundaries do not exactly match Local Government Area (LGA) boundaries—the Rural City of Murray Bridge is an example of this. As a result, the total estimated resident population of the Murray Bridge Township and Murray Bridge regional SA2s will differ slightly from the LGA population.



## 3.2 Housing Stock

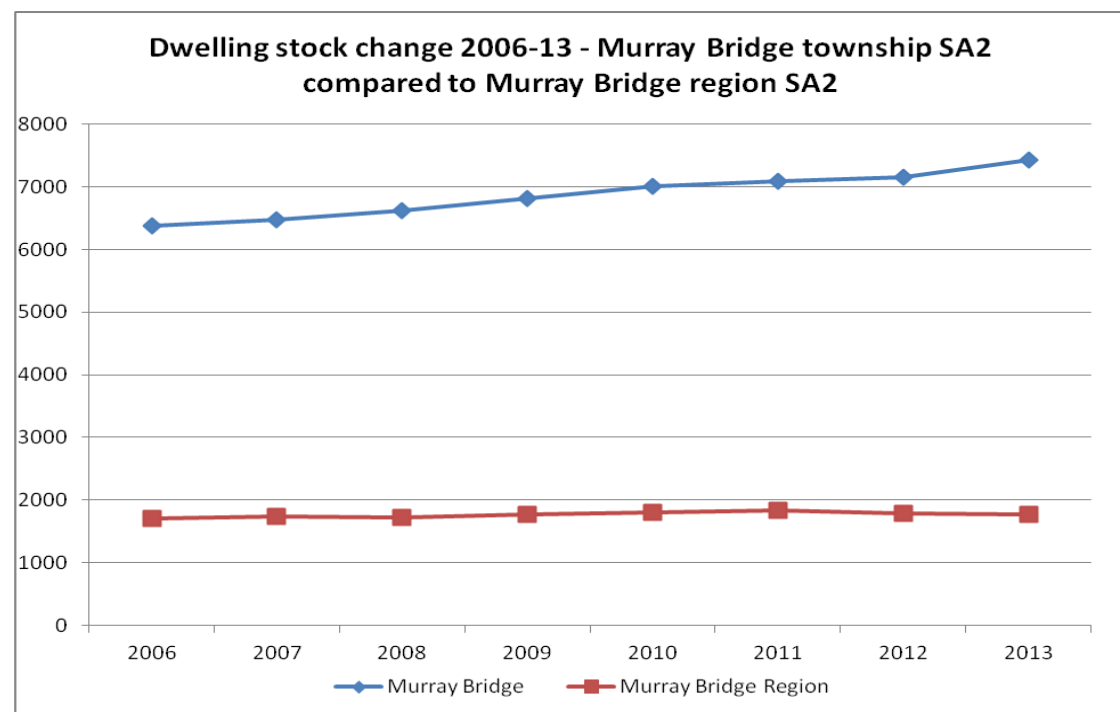
### 3.2.1 Demand and Supply

#### As per Murray Bridge Structure Plan

- The Structure Plan examines the level of demand for housing based on dwelling approvals (ABS Data).
- Over the last 6 years, the annual rate of dwelling approvals within the Murray Bridge LGA has averaged 226 dwellings per annum.
- This period takes into account a significant spike of approvals (such as in 2010), as well as one year of subdued construction as a result of the Global Financial Crisis.

#### As per DPTI Data

- DPTI have provided data from the State Valuation file that records the net additional dwelling stock constructed as opposed to the ABS data which only provides for approvals issued.
- This provides a more accurate reflection on the level of dwelling demand by removing speculative approvals as well as situations where a dwelling is being replaced.
- This data separates the Murray Bridge township from the remainder of the Region
- It shows that the average annual dwelling growth within the township equates to 150 dwellings per year with an above average growth rate in 2013.
- Importantly, the Regional dwelling stock has remained steady over the same period, reflective of limited development potential within rural areas and other townships within the region (See Figure 5 below).



**Figure 5: Dwelling Stock Change 2006-13 Murray Bridge township and region (Source: DPTI, 2014)**

\*To see extent of Murray Bridge Township Statistical Areas 2 (SA2) see ABS website

[http://www.censusdata.abs.gov.au/census\\_services/getproduct/census/2011/quickstat/407031165?opendocument&navpos=220](http://www.censusdata.abs.gov.au/census_services/getproduct/census/2011/quickstat/407031165?opendocument&navpos=220)

\*To see extent of Murray Bridge Region Statistical Areas 2 (SA2) see ABS website

[http://www.censusdata.abs.gov.au/census\\_services/getproduct/census/2011/quickstat/407031166?opendocument&navpos=220](http://www.censusdata.abs.gov.au/census_services/getproduct/census/2011/quickstat/407031166?opendocument&navpos=220)



Based on this demonstrated growth in housing stock a 15 year rolling supply of dwellings would equate to 2250 appropriately zoned allotments.

### 3.2.2 Summary

**Table 2 Household Growth Based on Past Household Construction and Approvals**

	Annual rate of dwelling approvals	Average annual dwelling growth
<b>ABS Dwelling Approvals</b>	226	-
<b>DPTI State Valuation Data</b>	-	150

**Taking into account the preferred forecast population and dwelling targets discussed previously, there would need to be an additional 2,550 dwellings supplied within the 15 year period to achieve the targets (based on the 170 dwellings per year annual average).**

## 3.3 Land Supply

### 3.3.1 Quantum of Land Supply

The 2013 Residential Land Supply Report identifies that there is currently 616.1 hectares of residential zoned land within the Murray Bridge township and a further 888.4 hectares of Rural Living zoned land within and surrounding the township (of which 200 hectares is within Study Area 1).

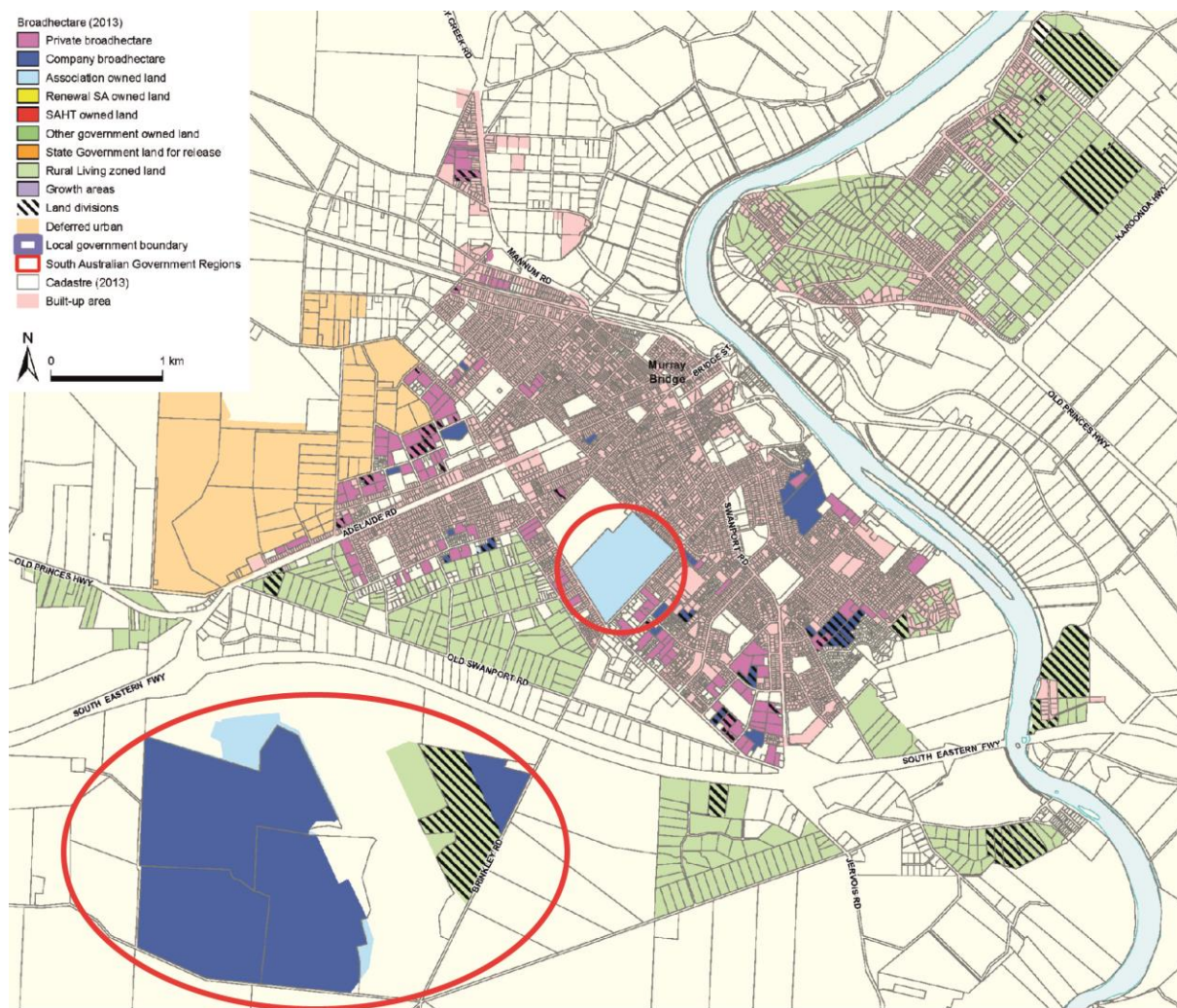
A significant proportion (81%) of the residential zoned land is within the ownership of Companies or Associations as demonstrated within the table below.

	Private	Company	Other Govt.	Association	TOTAL
<b>Residential Zoned Land</b>	118.3	425.8	0	72	616.1 ha
<b>Rural Living Zoned Land</b>	771.9	91.8	2	22.7	888.4 ha

Source: 2013 Residential Land Supply Report, DPTI

Importantly however, a significant proportion of the residential zoned land (approximately 457 hectares or 74% - which includes a combination of company and association ownership) is also within the control of one developer in the Gifford Hill development and associated Newbridge development (racecourse site) which is linked to the progression of Gifford Hill as demonstrated (circled) within Figure 6.





**Figure 6: 2013 Broadhectare Land in Residential Zones (Source 2013 Residential Land Supply Report, DPTI)**

It is noted that 34.6 hectares (5%) of residential zoned land is currently subject to land division creating 416 allotments at a gross density of 12 lots per hectare. The biggest parcel of land subject to this is the Pathways development (AVJennings) which is well progressed within its overall staging.

In determining the net broadhectare land available for redevelopment, the Housing and Employment Land Supply Program 2012 Report identifies the following assumptions:

- Reduction of 50% for land owned by private individuals to account for uncertainty about future land intentions (this land is assumed to be available for development in the short to medium term)
- Reduction of 25 per cent of land in all other ownership classes to account for landowner decisions, environmental constraints, buffer requirements or other policy decisions.

Applying these assumptions to the identified broadhectare land within Murray Bridge:

- There is a total of 432.5 hectares of residential zoned land available for future development
- Of this Gifford Hill and Newbridge comprise 342 hectares.





Current yields for residential land divisions within broadhectare development are achieving 12 dwellings per hectare (as detailed within 2013 Residential Land Supply Report). Assuming the existing yields for residential development continue to be achieved:

- In order to provide for the 2250 allotments that would equate to 15 year supply (based on current 150 allotments per year created) there would be a requirement for 187.5 hectares of residential zoned broadhectare land.
- Similarly, to achieve the desired average annual population growth rate of 1.63% (as discussed above), 2550 allotments would be required for the 15 year period, meaning 212.5 hectares of broadhectare land would be required.
- This means that the current zoned land within the Murray Bridge Township is sufficient to achieve the 15 year supply of zoned land.

### 3.3.2 Importance of ownership and land supply distribution

To minimise future risk to the availability of the rolling supply of land, there should be some diversity in the ownership and control of broadhectare land that is earmarked for future development.

- With a significant proportion of available land at Gifford Hill, the remaining land available (approximately 90 hectares) is only likely to provide for 1080 allotments, well short of the 15 year rolling supply.
- This means that should the Gifford Hill development be further delayed, or not proceed, there is an inadequate amount of other land available to fill this gap, and provide choice and competition within the land market at Murray Bridge.

### 3.3.3 Summary

**Table 3 Land Supply**

<b>Existing Land Supply</b>	616.1 hectares of residential zoned land within the Murray Bridge township
	888.4 hectares of Rural Living zoned land within and surrounding the township (200 hectares is within Study Area 1)
	432.5 hectares of residential zoned land available for future development. Of this Gifford Hill and Newbridge comprise 342 hectares.
<b>Yields</b>	12 dwellings per hectare
<b>Future Requirements</b>	187.5 hectares of residential zoned broad hectare land
	212.5 hectares of broad hectare land
<b>Shortfall/excess including Gifford Hill</b>	Existing excess if including Gifford Hill
<b>Shortfall/excess excluding Gifford Hill</b>	Shortfall if excluding Gifford Hill - the remaining approximate 90 hectares is only likely to provide for 1080 allotments

While the underlying demand for housing can be accommodated by the supply of Residential zoned land within the Murray Bridge township, the fact that a significant proportion of this land lies in the



control of one developer implies a need to source alternative land supply options to prevent monopolising of the market into the future and to mitigate risk in land supply.

### 3.4 Employment Land

#### 3.4.1 Employment Growth Targets

Employment targets identified within the 30 Year Plan for Adelaide applying to the Adelaide Hills and Murray Bridge Region are for the provision of 13,000 additional jobs. The bulk of employment land identified to achieve this targets is within existing industry, retail and commercial areas, with potential growth identified at Monarto South, Gifford Hill and Mount Barker.

The Murray Bridge Structure Plan seeks a target of 9,000 additional jobs, reflective of the higher residential population target. This target however applies more broadly to the LGA and therefore includes growth in tourism, agricultural, Monarto and other townships.

These targets are aspirational and subject to numerous influences. The scope of this project is not seeking to question or revise these targets, but rather consider them in the context of employment land demand and supply.

#### 3.4.2 Demand and Supply

##### Background

Given that a portion of Study Area 2 was identified for future employment lands by the Murray Bridge Structure Plan, it is appropriate to consider the employment land demand and supply to ensure potential removal of this land for employment purposes does not compromise appropriate land supply for employment purposes for the township and region generally.

The Housing and Employment Land Supply Program Report 2010, Greater Adelaide (HELSP Report) indicated that Greater Adelaide had a good supply of well-located, priced and serviced industrial land. However at the time (2010) there was strong economic growth and demand for industrial land and properties.

Murray Bridge is included with the Adelaide Hills to form a region for the HELSP Report. This region is expected to make only a minor contribution to the overall Greater Adelaide region and represents less than 5% of the total demand across Greater Adelaide. In 2010 it was estimated that 134 hectares of industrial land would be required in the Adelaide Hills and Murray Bridge region for the next 30 years. This was revised up to 160 hectares in the revised HELSP report in 2012. The 15 year demand was estimated at being 81 hectares and the one-year demand at 5 hectares.

These estimates are based on the forecast jobs growth. Employment growth in Australia has slowed since the Global Financial Crisis, but remains relatively strong, increasing by 7.3 per cent nationally over the five years to May 2013. Based on the employment forecasts and projections published in the October 2012 Mid Year Economic and Fiscal Outlook, total employment is projected to grow at a similar pace over the five years to November 2017, (7.1 per cent). However, the distribution of this growth is projected to vary across industries and sectors, occupations, skill levels, states and territories, and regions. The rate of employment growth is projected to be weakest in South Australia (4.9%) and Tasmania (4.9%).



## Land Demand and Supply

- The HELSP Report indicates that there was 96 hectares of developable industrial land available in 2012 within the Murray Bridge and Adelaide Hills Region.
- This is in excess of the amount required for the next 15 years (81 hectares).
- This current oversupply is supported by the current underutilisation and development of existing industrial zoned land, as well as anecdotal evidence received from land owners and real estate managers that concur that the demand for industrial land in Murray Bridge is currently low.
- At the current rate of take up (5 hectares/year) it can be argued that it will take approximately 40 years to exhaust the current supply.

The HELSP Report (2010) indicated that the Rural City of Murray Bridge had the potential to rezone approximately 800 additional hectares for industrial. This analysis was further refined in Council's Structure Plan (2012) that confirms that there is in excess of 1000 hectares of land available for industrial rezoning in the North West and west of the Murray Bridge Township. This is in addition to the land available at Monarto and Mount Barker.

### 3.4.3 Summary

Given the above, it is clear that there is sufficient industrial land already appropriately zoned to satisfy demand over the next 15 years and there is potential to rezone many times in excess of predicted needs over the life of the 30-Year Plan.

Therefore any decision regarding the future provision of industrial land can be based on the best use of the land rather than the need to satisfy industrial land targets as they are more than adequately catered for elsewhere in the region.



## 4. COMMUNITY ENGAGEMENT

### 4.1 Process

An important step in determining the potential for the study areas to accommodate the future growth of Murray Bridge was getting an understanding of the desires and intentions of the land owners in these locations. The main aims of the engagement process were:

- To *inform* land owners of this study, and of the potential for rezoning of their land to take place in the future (as well as the process and timing involved)
- To *consult and involve* land owners of the area to produce ideas and feedback on thoughts for the future rezoning of land.

A workshop was held for each of the areas being investigated with all landowners in each study area invited to attend their relevant workshop. Workshops were well attended with the following representation:

- Area 1: 72 people (about 25% of land owners)
- Area 2: 40 people (about 34% of land owners)
- Area 3: 15 people (all but three land owners)

Those land owners who were unable to attend the workshops were invited to call Council's Project Manager to discuss the project and their intentions for their land, or make a written submission to Council.

Fourteen written submissions were received and the consultant team also spoke to some land owners in clarifying written submissions or discussing their future intentions.

In addition, the consultant team consulted directly with a number of important stakeholders with an interest in these areas (as major employers, adjacent land users and owners / operators of infrastructure) and within the township generally to get their views on how the study areas should be developed. A list of stakeholders consulted is provided within Appendix 1.

### 4.2 Key Themes

Following a presentation outlining population growth and expansion within Murray Bridge, the current zoning, and the Murray Bridge Structure plan, land owners discussed in groups their opinions and concerns for the future rezoning of the area and the types of development land owners would like to see. Key themes raised by landowners are summarised below (noting that these are summarised and individual commentary is not documented in this report):

- General frustration about the limitation of existing zoning in allowing development opportunities, with the majority of land owners supportive of residential zoning for the areas. This differed slightly between Areas 1 and 2 and Area 3, with the majority of land owners within Area 3 not seeking to achieve conventional residential densities and yields, but rather dwellings on larger allotments (2000 – 4000 square metres)
- Future residential development to ensure a spacious character is retained with some concerns about too many small allotments being provided
- Provision for additional retirement village and nursing home accommodation
- Potential for tourism related uses within Area 3 to take advantage of views and proximity to town centre





- Maintain existing industry zones with the need to ensure future industry is compatible with residential development
- It is difficult to maintain the larger allotments (weed control etc) in the Rural Landscape Protection Area. There was some support for some minor additional development opportunities (one additional dwelling per allotment) along the Rural Landscape Protection Area. Some increase in housing may actually result in increased vegetation.
- It is important to generally retain visual buffers in the Rural Landscape Protection Area and these can be addressed through design measures.
- General support for some shops but small in scale to service the local community
- Protection of the hill slopes to the western edge of the township as a natural backdrop and for recreational purposes
- Opposition to the establishment of Bremer Road as a heavy vehicle by-pass route
- Provision of a permeable road network and ensuring roads are not too narrow
- Provide for walkways connecting to parks and the wetlands.

### 4.3 Level of landowner support for future development

- There was general support from the majority of land owners to undertake development, or allow a developer to take on development (including previous approaches to a number of land owners by one developer).
- Many land owners indicated a willingness to work with neighbours to get a coordinated outcome if necessary
- There were concerns and scepticism about the timing and provision of infrastructure, which was seen as a barrier to developing land.



## 5. OPPORTUNITIES AND CONSTRAINTS

### 5.1 Areas 1 and 2

#### 5.1.1 Opportunities

##### **Contiguity with Existing Urban Areas**

Both Areas 1 and 2 are situated on the edges of the existing urban form of the township and present as logical extensions to the township.

The locations provide opportunities to connect into existing available infrastructure networks (even if augmentation or some extension is required) and accessibility to existing services and facilities, including open space areas and parks such as at Dorset Street and Christian Reserve. The proximity of these areas to the towns centre also enables for there to be some connectivity to existing resident communities and accessibility to employment, such as at the town centre, Mobilong Prison, Thomas Foods Abattoir, commercial activities along Adelaide Road, industry areas to the north (along Maurice Road) and east (along Hindmarsh Road) and at Monarto.

##### **Land Form**

The land form in these locations is such that it facilitates residential development in an orderly manner.

While there is some undulation across the entire area, there are clear natural drainage lines which can be utilised to provide for drainage within future development, as well as incorporating linear open spaces that provide for connections to neighbouring areas as well as creating a pleasant amenity.

There has already been some planning and installation of drainage basins within Area 1 as part of Council's Stormwater Management and Reuse Scheme which enables connection to planned storage capacity to the south of the freeway (within the Gifford Hill master planned area).

Land to the west of Bremer Road has a gradual rise leading up to the Whites Hill Escarpment. This incline is gradual and does not impose limitations on residential development, but rather adds interest and a point of difference to the remainder of the adjoining residential areas.

##### **Existing Road Network**

The two areas are set within an established road network which provides for easy connections to the surrounding areas and key destinations. In addition, the existing road network, particularly within Area 1, provides a permeable network within which future urban development can be facilitated.

This establishes a pattern to a future road network and assists in the planning for new roadways within this existing grid system.

##### **Heavy Vehicle Route**

The 2012 Murray Bridge Structure Plan identified a future heavy vehicle bypass route which ran along Agriculture Avenue and Bremer Road, connecting Old Swanport Road to Maurice Road. Investigations undertaken and advice received by Council engineering staff during the study have revealed that this previously identified Heavy Vehicle By-pass route may no longer be implemented into the future (although this has not formally been endorsed by Council). Rather, the existing heavy vehicle route



which runs along Swanport Road, will potentially be redirected to the existing Over Dimensional Vehicle Route which takes in Hindmarsh Road and Maurice Road.

This means that the Bremer Road corridor may no longer be required for frequent heavy vehicle use. This means that the land surrounding this corridor has the potential to be more attractive and appropriate for residential development. This is because there will not be amenity issues with heavy vehicle movements on this location and the desire for employment based land uses in this location to take advantage of access to this route may no longer be necessary.

Given the current uncertainty around the future of this bypass route location, the Structure Plan will need to consider either option eventuating.

### 5.1.2 Constraints

A number of constraints were identified for this area within the Structure Plan in 2012. Some of these have been further investigated and considered as to whether they would restrict residential development within this area.

#### **Boral Quarry**

The Boral Quarry to the west of the Murray Bridge township requires a noise separation buffer of 3km where blasting is required (according to EPA Separation Distance Guidelines). Part of this buffer area falls within Area 2, principally comprising the existing Industry Zone, Mobilong Prison and future prison expansion area.

A small portion of Deferred Urban land to the south of the prison expansion area is also within this buffer, however given the Whites Hill Escarpment lies between the quarry and this area of land, the impacts of noise from the quarry are not considered to be of significance to justify the application of the buffer to this location.

A number of industrial uses have established within the existing General Industry Zone along Maurice Road that, while arguably still underutilised, require some degree of protection from sensitive land uses that could compromise their long term operations (and that of the existing established zone). The interface with existing industry areas needs to be designed to take into account the potential impacts of possible development within the General Industry Zone with potential future development being considered within Area 2.

#### **Hill Slopes and Vegetation**

The natural land form in Area 2 includes the Whites Hill Escarpment along the western edge of the area. This forms a natural vegetated backdrop to the township that is of value for retention. The bulk of the upper slopes of this area is owned by the state (control of Department for Environment, Water and Natural Resources) and has been identified as being set aside for conservation purposes.

It is also noted that this area is identified within the Council's Open Space and Recreation Strategy as potential trails, including for mountain biking.

#### **Mobilong Prison Facility**

The Mobilong Prison is located within Area 2. A Precinct Planning Report was prepared in 2007 jointly between the Rural City of Murray Bridge and the State Government in order to plan for a significant expansion into the Mobilong Prison facility. This expansions included two new facilities on the southern



side of Maurice Road as well as the retention of the existing Prison complex. The extent of this land is covered by the Community Zone within Area 2.

The scheme proposed at the time has not since progressed, and the future expansion of the facility remains uncertain at this point in time. However, discussions with the Department for Correctional Services has confirmed that incremental expansion is likely into the future and the timing of development on the southern side of Maurice Road remains unknown. The land should be set aside as part of the Structure Plan to retain this option into the future.

There are no legislated or recommended buffer requirements to the facility and the Department for Correctional Services did not indicate a desire for any specific land use or design restrictions adjacent to the prison facility. The Prison currently partners with businesses in the provision of services and skills training to inmates. However, this does not require specific clustering of activities or uses adjacent the prison. In any event, the existing General Industry Zone in this location would facilitate such synergies into the future.

### **Bremer Road Cemetery**

The existing Bremer Road cemetery is a well-established facility in this location and will remain a long term use in this location that is not likely to change and needs to be reflected in the structure plans. It is noted however that there would not be any specific interface limitations for residential development to the site.

### **SEAGas Port Campell to Adelaide Transmission Pipeline**

The SEAGas pipeline runs through Area 2 along Bremer Road, through the prison expansion land and along Netley Road. The pipeline is a critical piece of gas transmission infrastructure connecting Adelaide to Port Campbell. As such, any future development of Area 2 should not compromise the pipeline's integrity and ability to be serviced / maintained.

SEAGas have confirmed that within Area 2, the pipeline has been constructed to a T1 – Residential standard, meaning that surrounding urban uses and development have been assumed into the future.

The pipeline is licensed and activities adjacent the pipeline are required to adhere to Australian Standard 2885. A notification area of 640 metres adjacent the pipeline is required. However, this does not imply that development cannot occur well within this notification area. Further clarification of development potential adjacent the pipeline with SEAGas has confirmed that residential development adjacent Bremer Road is still possible.

However, there are limitations imposed by the pipeline in relation to high density residential development and sensitive use developments. This includes multistorey buildings, schools, child care centre, hospitals, aged care facilities (including retirement villages) as the pipeline construction has not been designed to assume these uses within the notification area.

Unless a specific Safety Management Study is prepared in collaboration with SEAGas, such uses and facilities should be avoided within the notification area.

### **Visual Buffer to Freeway**

A portion of Area 1 abuts the South Eastern Freeway to the south of the township. There are currently limitations on development opportunities in this location principally on the basis of achieving an appropriate visual buffer between the freeway and development. There are merits to maintaining a



buffer between development on this land and the freeway, not only for visual separation purposes, but also for acoustic purposes, particularly for residential development.

Notwithstanding this, the residents felt strongly that such a buffer can be accommodated on the land parcels in this location, yet still allow some forms of development to occur on the northern portions of the land. An examination of the size of the land parcels and their current uses indicates that this area is essentially an extension to the existing Rural Living activities that occur on the northern side of Old Swanport Road, albeit with some remaining agricultural uses remaining in place for some allotments.

It remains appropriate that this area continues to act as a transition between the freeway and the suggested residential areas to the north. However, there is sufficient area within the allotments to accommodate a visual buffer (in the form of landscaping and increased setbacks) along the edge of the freeway, taking in the remnant native vegetation in place within portions of this area, and also provide for some limited additional development opportunities in a manner that maintains a semi-rural setting that is present in this location.

### **Existing Rural Living Land Supply**

One of the reasons used within the 2012 Structure Plan against conversion of the Rural Living zoned land within Area 1 was that it accommodated a large area available to fulfil the rural living market. However, upon further examination of the extent of rural living land around the Murray Bridge Township, there appears to be significant other locations in which such demand could be accommodated. In total there are 888 hectares of Rural Living zoned land in this location, of which only 200 hectares consists of the Area 1 for this study. In addition, we are aware that Council is seeking to provide additional Rural Living land through the rezoning on the southern side of the freeway, incorporating the Swanport area.

This area was identified within the 2012 Structure Plan as an additional area for Rural Living purposes and would accommodate any loss in available land area to fulfil demand for rural living land in this location as a result of the loss of Area 1 for residential development.

Further, an examination of the actual use of land within this area indicates that the vast majority of allotments are essentially dwellings on large allotments, with the remainder of the land generally maintained in a vacant state and former horticultural uses abandoned with glasshouses falling into disrepair.

### **Fragmented Land Ownership**

The fragmented nature of land ownership and arrangement of allotments within Area 2 and Area 1 is a constraint on the efficient delivery of residential development, however is not considered to completely restrict residential development from occurring in an orderly manner. It does however point to a need for clear policy direction and guidance as to how further development of this location should occur to achieve a functional road network, connected developments and coordinated outcomes. The fragmented land ownership also points to greater uncertainty in the timing of development, and the staging of areas being developed. In many respects this issue is no different to the existing fragmented land parcels that remain within the Residential Zone on the edges of the township.

## **5.2 Area 3**

### *5.2.1 Opportunities*

The land owners within Area 3 were quite positive about the potential for this location and were frustrated by the restrictive zoning over the land which is considered to significantly limit development opportunities.



The location of Area 3 makes it attractive for development as it has extensive views out over the Murray River flood plains (former dairy flats) and to the River itself. The area is also directly adjacent to the town centre and there are pedestrian connections through the adjacent railway precinct land (via Hume Reserve) along the River to the town centre and Sturt Reserve.

This makes the area suitable for a tourism function along with some additional residential development, noting that there are some old buildings on some of the land parcels in this location which can contribute to tourism appeal.

It was suggested by some land owners that the area could form part of a larger integrated tourism precinct together with the Rail way Precinct and the former dairy flats, opening up opportunities for larger scale tourism development incorporating accommodation, functions and entertainment. This bold vision relies on opportunities beyond the scope of Area 3 being investigated (and the land owners) and without realistic proposals confirmed, is perhaps over-reaching the potential for this location due to some of the constraints facing the area (discussed below).

### 5.2.2 Constraints

Whilst there are some opportunities for Area 3 associated with its location relative to the town centre, the location of this area to some other land uses also present as significant constraints which need to be factored into balancing development potential.

#### **Proximity to Thomas Foods International Abattoir and Viterro Silos**

The proximity of the Thomas Foods Abattoir facility to the north-west of Area 3 impacts on the development potential of a small portion of the western edge of Area 3. This is due to the desired EPA buffer guidelines from such facilities of 500 metres. Besides this, the historic odour issues associated with this facility provide a stigma over this area, despite significant improvements recently due to improved operational arrangements within the facility. This has the potential to impact on the attractiveness of tourism activities in this location.

The Thomas Foods facility is a major employer for the township and therefore it is important that development within Area 3 does not further compromise its ability to function without further limitations.

The Viterro Silos and the adjacent rail line are also situated within the southern edge of Area 3 and also impose limitations on the development potential of this southern portion of Area 3 for residential development. Viterro have confirmed that the facility is generally operated during daylight hours (ie not a 24/7 facility) with peak usage around the harvesting period which occurs in November and December. While there are no intentions to further develop that facility, it is expected to remain in operation into the foreseeable future and this use therefore needs to be factored into future development opportunities.

#### **Other Potential Land Uses on former Dairy Flats**

It has been identified during the study that both Council and the government are considering a range of different land use options for the land to the north of Area 3 (known as the former dairy flats). The Land Use Study and Development Plan Review for the Lower Murray Flood Plain Report prepared by the Regional Development Australia identified a number of land use opportunities for locations along the river frontage. Primary production activities were particularly encouraged as most suitable in these locations particularly supporting the dairy industry, beef farming and horticultural uses, together with value added complementary activities. Tourism uses were also identified as suitable within targeted locations and scales.





Should the former dairy flats to the north of Area 3 be returned to dairy farming or other forms of primary production, it is necessary to ensure the impacts of these uses are considered within Area 3. As such significant further intensification of Area 3 may present problems for the effective future use of this land (recognising that there are already sensitive residential land uses established within Area 3 which may already limit significant intensification of primary production activities on the dairy flats).

### **Rail Line**

The rail line running through Area 3 forms part of the key interstate freight route servicing Adelaide and has on average 15 services a day running through this location. ARTC indicates that services are likely to double by 2020 and forecast to triple by 2050. This has implications in terms of a desire to limit crossing points to the rail line, as well as impacts of noise and vibration from train services on adjacent properties, particularly if they are sensitive land uses, such as residential development.

### **Road Network**

The road network servicing Area 3 comprises Swamp Road, which is a formed road up until it crosses the drainage channel bridge, and Hume Reserve Road, a cul-de-sac that is not sealed and also functions as the only access to Hume Reserve and a manoeuvring area for the heavy vehicles servicing the Silos, which is not ideal when being mixed with residential traffic. All access to Area 3 is currently via the Swamp Road crossing of the rail line accessed from Mannum Road.

It is unlikely that any future crossings of the rail line at this location will be supported and feasible to service future development.

### **Topography and Water Run Off**

The topography of Area 3 is what adds to its uniqueness given its elevated position above the adjacent former dairy flats. However, this also means that there are some areas of steeper slopes throughout Area 3 that make development of buildings more difficult, as well as servicing requirements within relevant standards which call for minimum slopes of 1 in 10.

The undulating nature of the land contains natural drainage valleys to the adjacent water course. Any future development of the area needs to work with the sloping land and minimise the need to significantly alter current land forms.

The proximity of the site to water courses adjacent the river, and the fact that land slopes directly into these channels, means there is a need to ensure that the quality of water run-off does not result in the contamination of water bodies. This implies that future development needs to be positioned in a way to allow for water run-off to be managed and ensure appropriate waste water systems achieve the relevant standards.

### **Sewer**

The area is currently not serviced by sewer infrastructure and the limited yield for development makes an extension of such sewer infrastructure cost prohibitive and unlikely into the future.

### **Aboriginal Heritage**

Council is party to an Aboriginal Heritage Agreement with the Ngarrindjeri People. This agreement covers a portion of the land within Area 3 (general east of the former dairy building) which is identified as “managed area” within the Agreement. This requires that any future development in this location is



undertaken in a manner consistent with the cultural and heritage interests of the Ngarrindjeri people as outlined within an indigenous management plan for the land.

It should be noted that no engagement with the Ngarrindjeri people has been undertaken as part of this study. Rather it is appropriate for Council to engage directly with the Ngarrindjeri people as part of the DPA investigations to inform clearer policy outcomes for the area of land within Area 3 affected by the Agreement.

## 6. STRUCTURE PLAN RECOMMENDATIONS

The Structure Plans for Area 1, 2 and 3 are high level concepts of how future development should occur. The next step would be to undertake a more detailed analysis of each location within the road network to determine the most optimised road layout, taking into account land ownership equity and possible staging of developments. This more detailed assessment that should occur in close consultation with land owners, but has the potential to provide greater guidance and clarity for land owners and developers into the future.

The assumptions and calculations informing the Structure Plan recommendations are detailed in Appendix 5.

### 6.1 Areas 1 and 2

The Structure Plan of Areas 1 and 2 is contained within Figure 7.





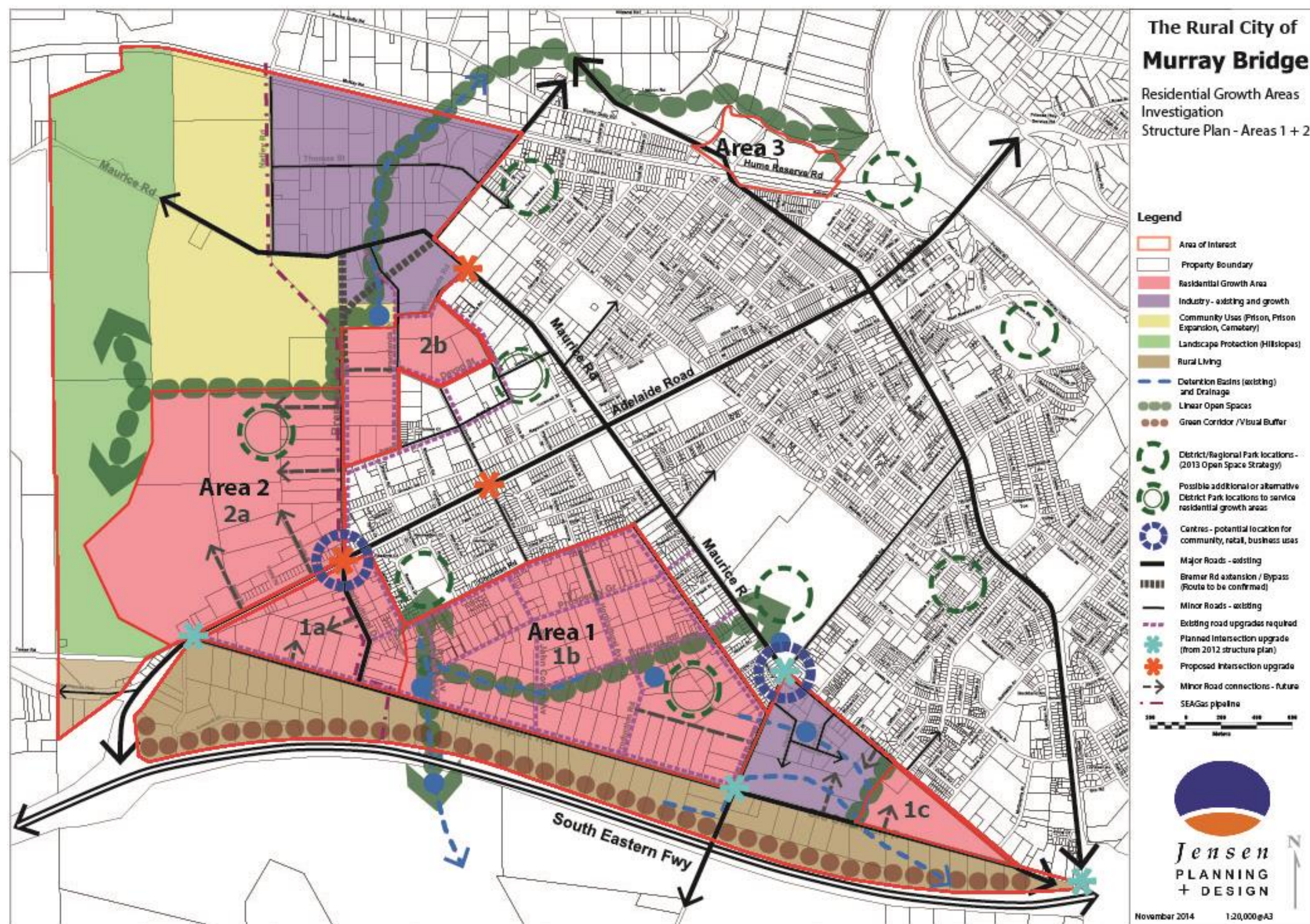


Figure 7: Area 1 and 2 Structure Plan



A number of key structural elements inform the extent of land available for future residential development. These are:

- The desire to maintain the Whites Hill Escarpment as a backdrop to the township and a conservation and recreation area
- The need to accommodate the Mobilong Prison facility and the potential expansion area previously identified within the Precinct Planning Report in 2007
- The desire to retain and consolidate the existing General Industry Zone areas along Maurice Road and Hindmarsh / Brinkley Road.

### **Residential Development Opportunities**

Beyond these elements which limit the extent of development, there is scope for residential development to be established utilising existing road connections. This includes a section of land within Area 1 currently set aside for Bulky Goods retailing, but which has failed to be attractive to the market. This area has been identified as potential residential development in alignment with discussions with the land owners, and in the knowledge that there is currently an oversupply of industrial land in the township and proposals to provide for Bulky Goods retailing in other locations along Adelaide Road where it is more attractive.

### **Density, Style and Character**

A general sentiment expressed during community engagement was that high density, small allotments and zero side setbacks should be strongly avoided. The average density should be around 700m<sup>2</sup>, and this should be predominantly detached housing.

Notwithstanding the general suburban feel of detached housing, there should be a variety in housing types and allotment sizes which reflects the diversity in the existing and future Murray Bridge communities.

Future development should still retain a sense of space, vegetation and openness that is consistent with rural and regional townships. There was much discussion about the increasing suburbanisation of Mt Barker, and a desire for Murray Bridge to develop in a way that is more open in character. The character and style will be influenced by future development plan policy, developer cost/profitability issues, and also the trends in building styles and materiality at the time of development.

### **Industry**

An area south of Maurice Road between Woodlands road and Bremer Road has been recommended as appropriate for expansion of the industrial activities. This location is sandwiched between the adjacent industrial uses, the Maurice Road heavy vehicle route, the adjacent prison expansion area and the existing stormwater detention basin situated along Bremer Road / Greenlands Drive. This is likely to reduce the attractiveness of this area to residential development as a result of a reduced amenity. A form of industrial use that is compatible with adjacent residential areas is more appropriate in this location.

### **Buffer**

The area between Old Swanport Road and the freeway remains an important buffer and transition to urban areas of the township and therefore should be retained as a rural living / landscape protection area, albeit with some scope for limited additional development.



## Open space corridors

Open space corridors are recommended generally along the existing drainage lines and infrastructure connected to the Stormwater Management and Reuse Scheme. Importantly, these corridors provide for opportunities in connecting to Gifford Hill, Maurice Road and the proposed Newbridge recreation and Golf Course expansion development, as well as connecting the River Area (along the Lavender Federation Trail) through to the Whites Hill Escarpment. The corridors also provide opportunities to buffer residential areas from the correctional facilities precinct.

These also provide opportunities to connect to district scale open space areas and facilities, with the potential alternative locations to the south of the Prison expansion precinct and adjacent Brinkley Road (in lieu of the Newbridge development location should that not proceed).

## Road Connections

Additional road connections are designated for Area 2 and portions of Area 1 where an existing framework of roads is not present. Importantly, the suggested connections for Area 2 take into account the existing retirement village to be accommodated within the network. The internal road layout in this location can remain flexible and has not been suggested within the structure plan.

## Small and Medium Scale Centres

Indicative locations for possible small and medium scale centres for a range of community, retail and business uses have been identified at more prominent junctions along Adelaide Road and Maurice / Hindmarsh Road (noting this is approximately the location of the neighbourhood centre proposed within the Newbridge development). It is anticipated these centres would seek to service the day-to-day and weekly needs of the growth area populations and not undermine the primacy of the existing town centre.

## 6.2 Area 3

The Structure Plan for Area 3 is contained within Figure 8.





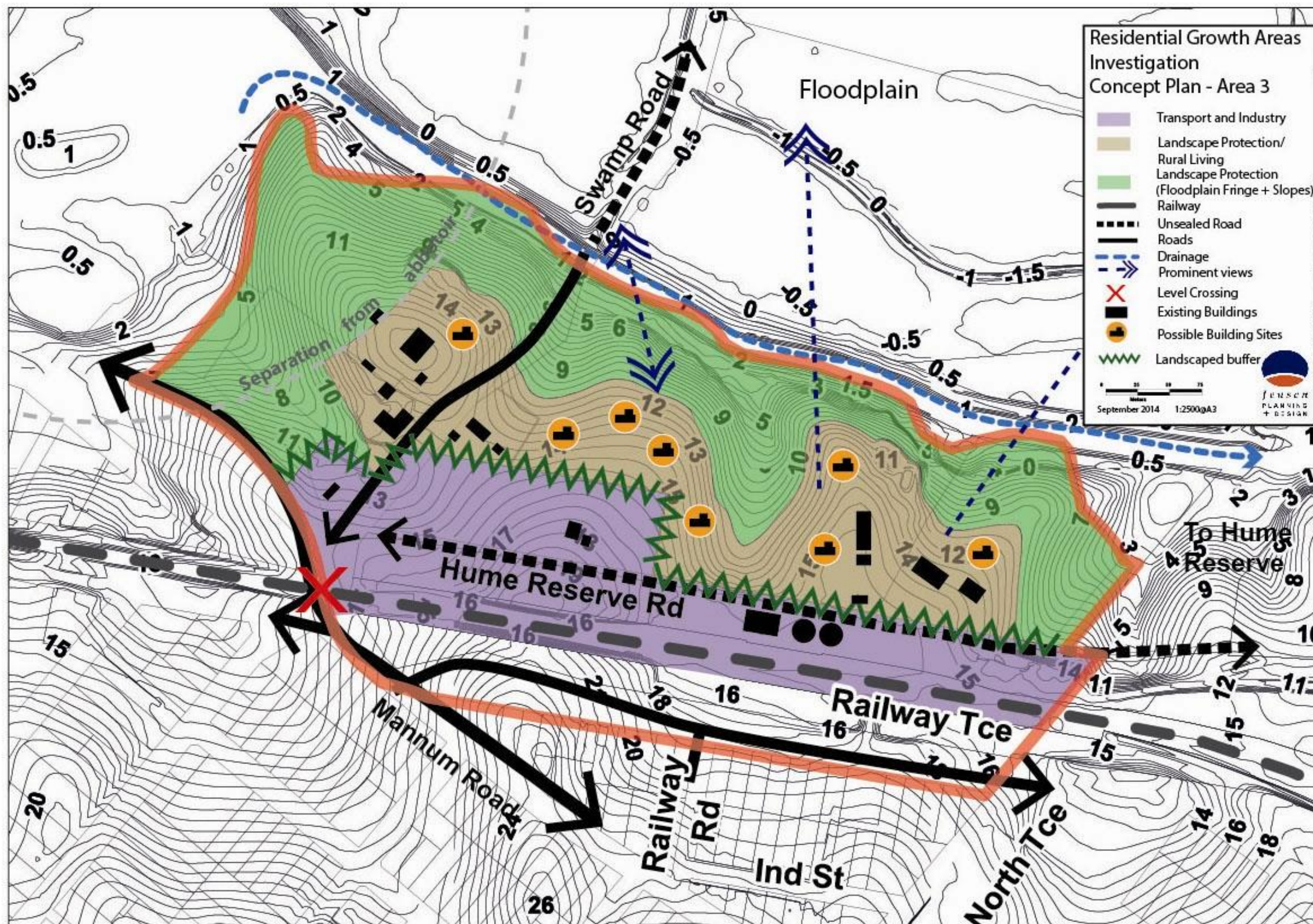


Figure 8: Area 3 Structure Plan



The development potential for this area is limited due to the significant constraints identified. The yield identified in the Structure Plan for 30 dwellings is considered to be excessive for this location and beyond its capacity given the limitations imposed by slopes, lack of sewer infrastructure, interface with the rail corridor and bulk handling facility (Silos) and the desired buffers to the Thomas Foods Abattoir.

This is recognised by most land owners who also appreciate some sense of open character and attractiveness afforded by views not being blocked out.

It is recommended that the development potential for Area 3 be limited to a handful of additional dwellings and allotments located above the steeper slopes at the base of the land adjacent the water course.

### **Character**

It is expected that this would be similar to a Country Living arrangement in terms of allotment sizes and desired building and landscape character.

### **Location of future development**

The location of the potential dwelling sites is suggestive. Their locations should take into account environmental considerations in their justification, including ability to be adequately serviced with a wastewater system that achieves all relevant SA Health requirements (in its location and irrigation area requirements).

### **Small scale tourism**

There is also support for small scale tourism related activities, such as bed and breakfast accommodation, to take advantage of the attractive views from this location, its connection to the Lavender Federation Walking Trail, and the potential redevelopment / upgrade of the adjacent Railway Precinct, as well as the proximity to the town centre. The scale of tourism facilities should respond to the access and servicing limitations for this land and avoid any large scale facilities, such as motels, function centre and the like.



## 7. INFRASTRUCTURE REQUIREMENTS

A review of both 'hard' (physical) and 'soft' (human services) infrastructure such as roads, stormwater, sewer, water, power, open space, recreational facilities and community facilities is detailed below.

*In order to more comprehensively understand and align infrastructure requirements with potential residential growth and associated funding/costing issues, the Study Areas 1, 2 and 3 have been further divided into sub areas 1A, 1B and 1C and 2A and 2B. These sub areas are shown in Appendix 6*

Further supporting detail relevant to the hard infrastructure calculations are included in Appendix 2.

### 7.1 Current Provision of Physical Infrastructure

#### 7.1.1 Water

SA Water has an existing water trunk main that runs from the White Hill water storage tank along Adelaide Road, between Areas 1 and 2 and up to an existing filtration plant located in Area 2. There are separate existing water supply mains within the local roads network (refer Figure 9). A significant part of the study area does not have direct connection to mains water infrastructure, particularly within Area 2. The Murray Bridge Structure Plan identified a limited capacity within the existing mains water infrastructure with a need to increase storage capacity at White Hill upon the creation of an additional 1000 allotments.

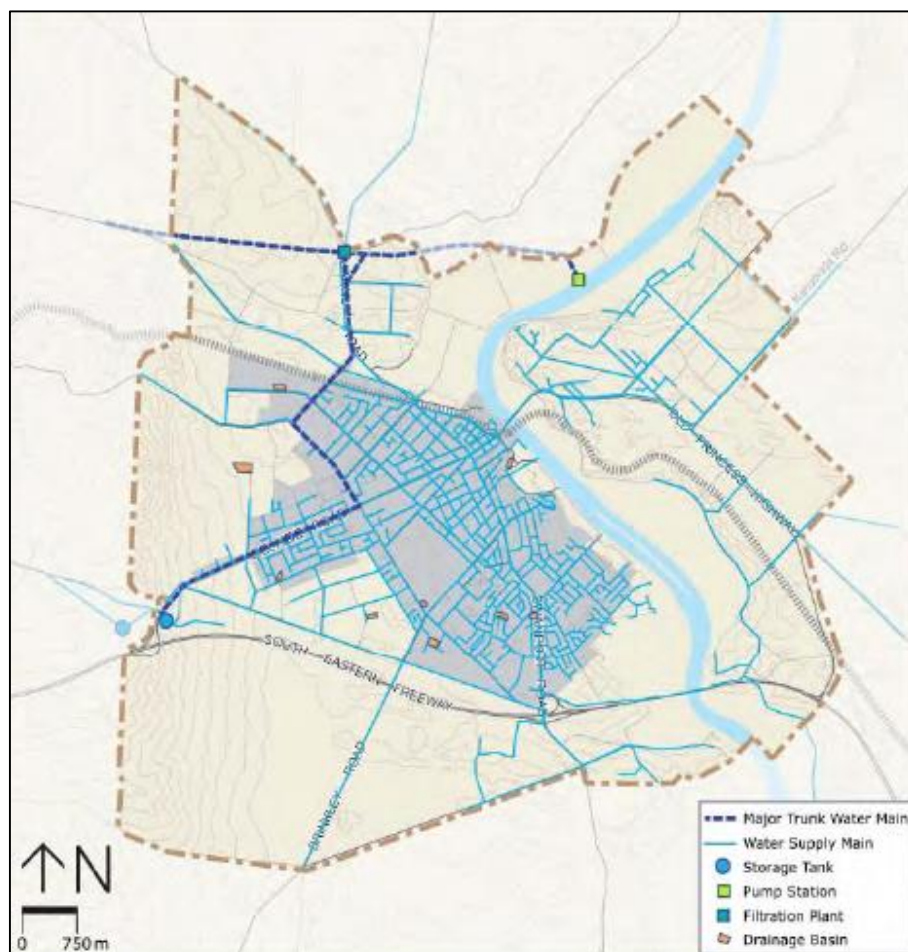


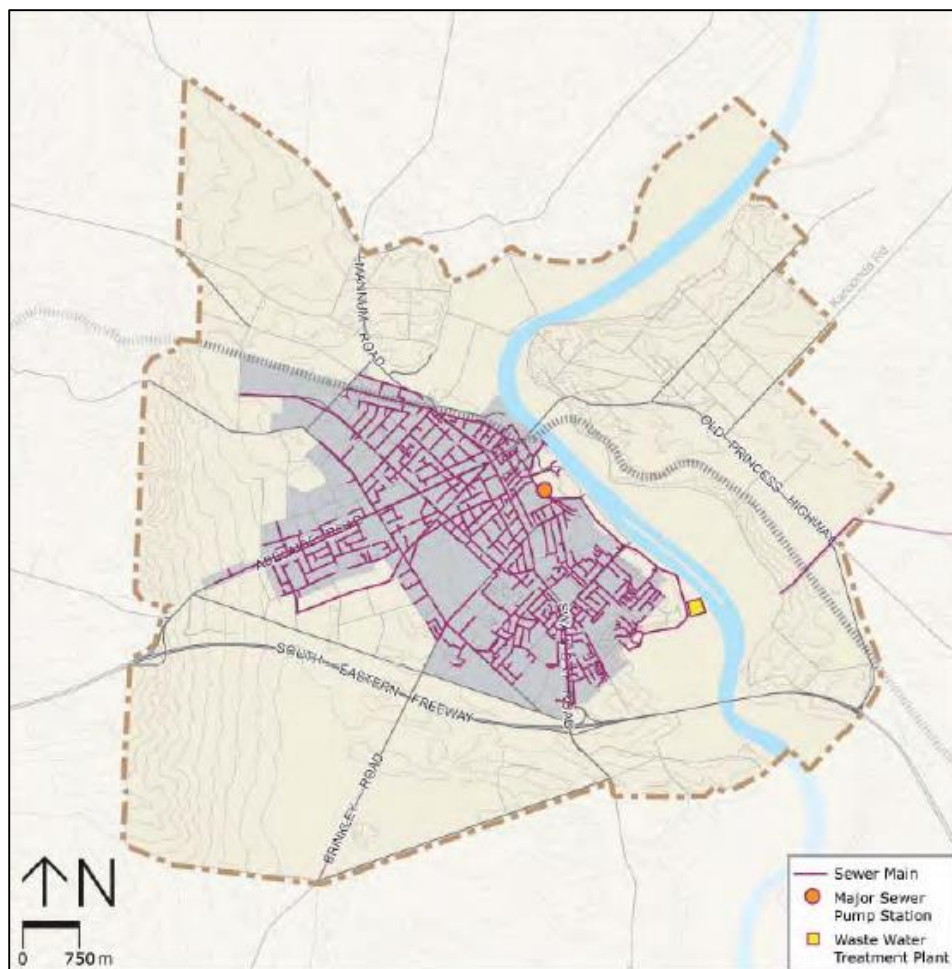
Figure 9: Existing water network (from Murray Bridge Structure Plan)



### 7.1.2 Wastewater

The Murray Bridge Township has an existing wastewater treatment plant (WWTP), located southeast of the town. The existing pumping station is located north of the town centre. There are existing wastewater networks within the local roads, feeding to the pump station. However, the network does not service the three identified Areas. These areas are currently being serviced by individual allotment septic tanks (refer Figure 10).

The existing WWTP has limited capacity for additional growth (an additional 300 dwellings was estimated within the Murray Bridge Structure Plan). We are aware that SA Water is currently investigating an upgrade to the existing WWTP which will cater for future growth anticipated within the next 15 years.



**Figure 10:** Existing wastewater network (from Murray Bridge Structure Plan)

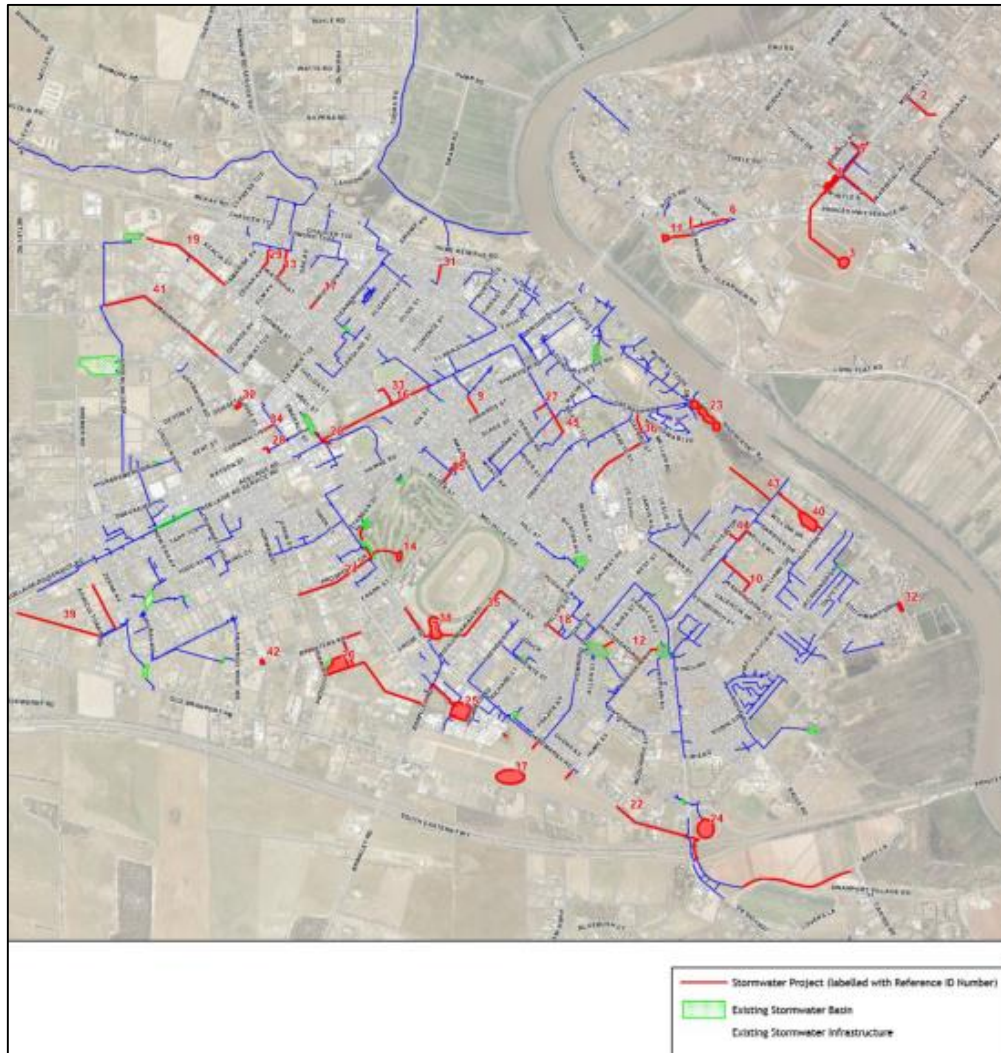
### 7.1.3 Stormwater Infrastructure

It has been identified in the Murray Bridge Stormwater Asset Management Plan (Draft, 2014) that the existing stormwater infrastructure within the township has variable capacity. The Stormwater Management Reuse Scheme is expected to yield up to 740ML per year. This yield will help to reduce the City's reliance on the Murray River and decrease its potable water demand by up to 172 mega litres per year. Along with this, the scheme will also help to improve the water quality of the Murray River and improve the efficiency of councils existing stormwater drainage system.





A number of infrastructure projects to harvest, treat, store, distribute and reuse stormwater will be implemented up until June 2016. This project will allow harvested storm water to be used for irrigation within parks and sport fields while improving flood protection for the area which has been a significant issue for Murray Bridge in the past. It is understood that the Murray Bridge Council has had a separate stormwater review undertaken by Southfront in 2013. The investigation delivered a strategy plan, which outlined actions to improve the existing infrastructure. The proposed improvements covered Areas 1 and 2, includes a new pipe network and stormwater basins (refer Figure 11).



**Figure 11:** Existing Stormwater Network and Proposed Improvements (from Southfront Drainage Strategy Review)

#### 7.1.4 Telecommunications

Currently the majority of the township is reticulated with copper cable network. This existing network can be easily upgraded to handle additional demand from future growth. The Murray Bridge Structure Plan indicates that the upgrade can handle up to a population of 30,000 people.

#### 7.1.5 Gas

Currently there are two gas transmission lines through the township - The River Pipeline and the Port Campbell to Adelaide Pipeline. The River Pipeline is operated by APA (these are shown in Figure 12

below). The Port Campbell to Adelaide Pipeline is operated by South East Australia Gas Pty Ltd (SEAGas).

### 7.1.6 Electricity

According to the Murray Bridge Structure Plan, there is an existing Envestra transmission main servicing the township, which has a capacity for an additional 2000 dwellings before a second transmission line is required.

In addition there are currently two substations, located at Murray Bridge North and Murray Bridge South, along with a 33KV overhead feeder loop servicing the township. The existing infrastructure is adequately servicing the township; however two new substations together with a new 33KV connecting loop and the upgrade of the existing 33KV lines will be required to cater for the Gifford Hill Estate and town expansion (refer Figure 12).

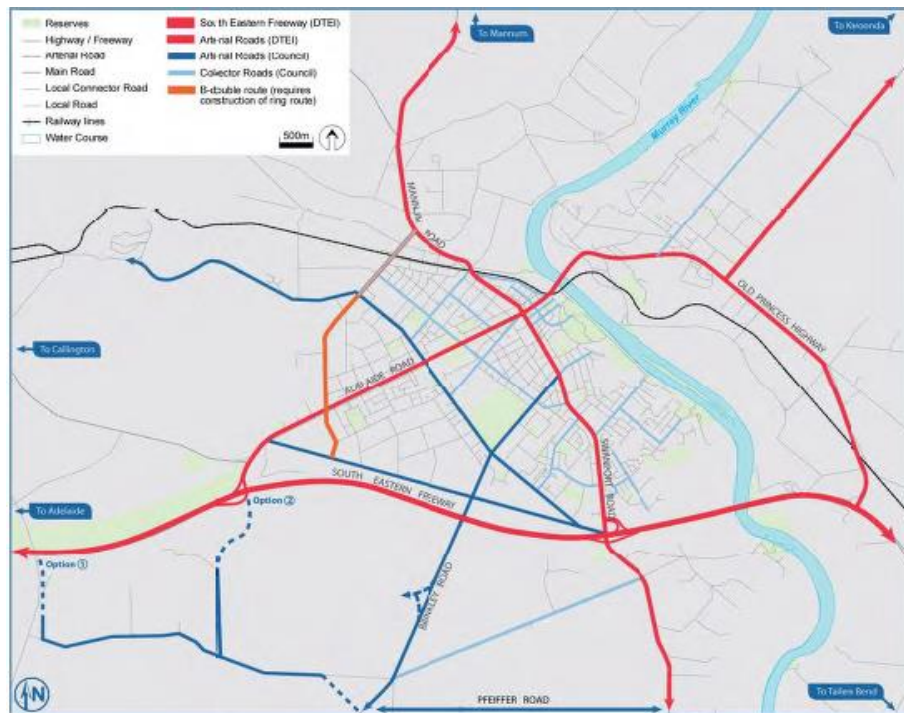


Figure 12: Existing Telecommunication/Gas network (from Murray Bridge Structure Plan)

### 7.1.7 Roads Infrastructure

The three identified areas are bound by DPTI arterial roads, Council arterial and local roads. The DPTI arterial roads are the South Eastern Freeway, Adelaide Road and Mannum Road. The Council arterial road is Old Swanport Road, Brinkley Road and Maurice Road.

In 2013 Council completed a draft Integrated Transport and Traffic Management Plan. This report aimed at providing a focus on the road network requirements for the Murray Bridge Township. The report provided an input to the development of the Murray Bridge Structure Plan (refer Figure 13).



**Figure 13:** Current and Proposed Road Hierarchy (from Murray Bridge Structure Plan)

A significant portion of Area 2 comprises an existing street grid network. However the quality of the road infrastructure in these areas is highly varied and while the roads have largely adequate road pavement widths and quality, much of the existing roads do not have other street design elements suitable for a residential design standard (such as consistency in kerbs, lighting, footpaths, kerb ramps etc).

## 7.2 Current Provision of Human Services Infrastructure

### Schools and Tertiary Education

There are currently 5 Primary Schools and 2 High Schools within Murray Bridge (noting one is currently a Reception to Year 12 School – Unity College). These schools currently have enrolments of between 71 and 537 students (Unity College being the larger school). It is noted that the Murraylands Christian College – Murray Bridge will, over the next few years, expand their services to include Junior High School years.

Currently there are 65% of primary school aged children enrolled in government primary schools and 80% of secondary school aged children enrolled in government secondary schools. This high school enrolment figure is significantly higher than typical new and developing areas and is perhaps reflective of the limited choice of high schools within the township.

A small proportion of Murray Bridge residents are enrolled within University Courses, with only a small facility operated by Flinders University operating at the hospital site. This reflects a desire for university students to move to Adelaide to attend university.

There is one TAFE campus within Murray Bridge offering a limited range of courses.





## Health Services

Murray Bridge is currently serviced by one public hospital which offers 47 beds. In addition, there are approximately 16 General Practitioners and 7 dental facilities within the township.

There are currently 2 aged care facilities in Murray Bridge, being the Lerwin Nursing Home and Resthaven providing 153 beds, with numerous other care facilities providing services to people in their own homes. There are also 4 retirement villages of various sizes within the township.

## Recreational Facilities

Murray Bridge currently contains 17 district parks / reserves (including Sturt Reserve and some open space corridors along the River edge). Active recreation facilities include:

- 5 ovals (3 of which are in township urban areas)
- 22 tennis courts of which 8 are outside of urban areas
- 2 playing fields
- 6 lawn bowls greens (two clubs)

These facilities cover the range of sporting activities expected within a town of the size of Murray Bridge including AFL, cricket, soccer, rugby, tennis, netball and lawn bowls.

## 7.3 Future Physical Infrastructure Upgrades

The infrastructure network improvements identified on the following pages are subject to detailed investigations and infrastructure negotiations. They have been determined based on high level assessment and broad scale assumptions. The specific infrastructure recommendations may change as a consequence of more detailed assessment within future processes.

### 7.3.1 Water & Wastewater

The following discussion regarding water supply and wastewater collection has been prepared in consultation with SA Water. The advice provided has required the establishment of a number of assumptions regarding the future development of the areas subject to the study. These assumptions have included lot yields (aligned to those identified for the purpose of costing future infrastructure requirements, as well as potential staging and progression of the development of these areas. This has included the development of Area 1C first, followed by Areas 1B and 2B, followed by Areas 1A and 2A. It is noted that the actual staging of future developments may be different, depending on the manner in which the areas are rezoned (whether in entirety or in stages) and which parcels are developed first.

### Water Supply

The township water usage is supplied from the Murray Bridge Water Treatment Plant (WTP). It is likely that the proposed full extent of the identified areas will exceed the capacity of the existing WTP. Therefore to service the entire development an upgrade of the existing WTP plant will be required so that its capacity is increased from 30ML per day up to 38ML per day.

An extensive expansion and augmentation to the existing distribution network will be required to cater for the development of the areas. The exact nature of the upgrades will be dependent on the final road layouts, spatial distribution of allotment densities and eventual staging of where development occurs.



Figure 14 below demonstrates an example of how the future expanded network may be developed. This requires the following lengths of pipework to be established:

Nominal Pipe Diameter	Length (m)
DN150	2,129
DN200	11,714
DN250	3,025

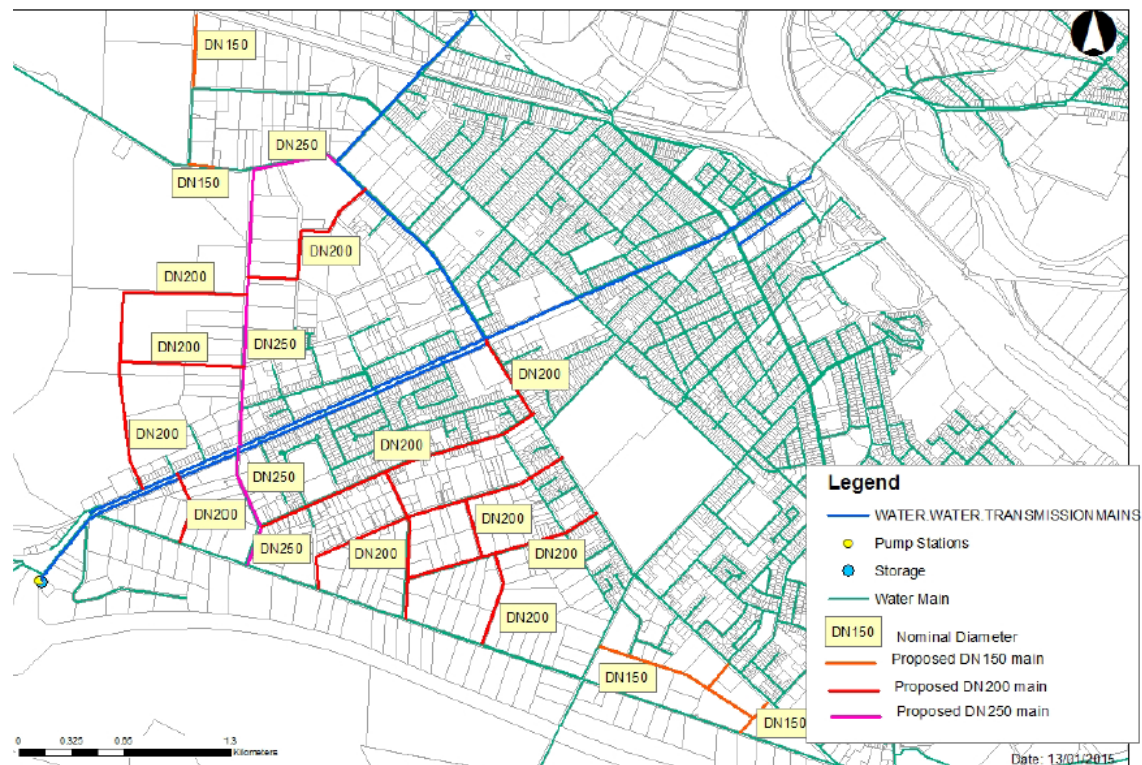


Figure 14: Potential Future Mains Water Network (Source SA Water)

There may also be additional boosting, storage and high pressure control requirements in the servicing of any residential development above the 68m contour which effects the western portion of Area 2, implying that this area is likely to be developed at a later stage.

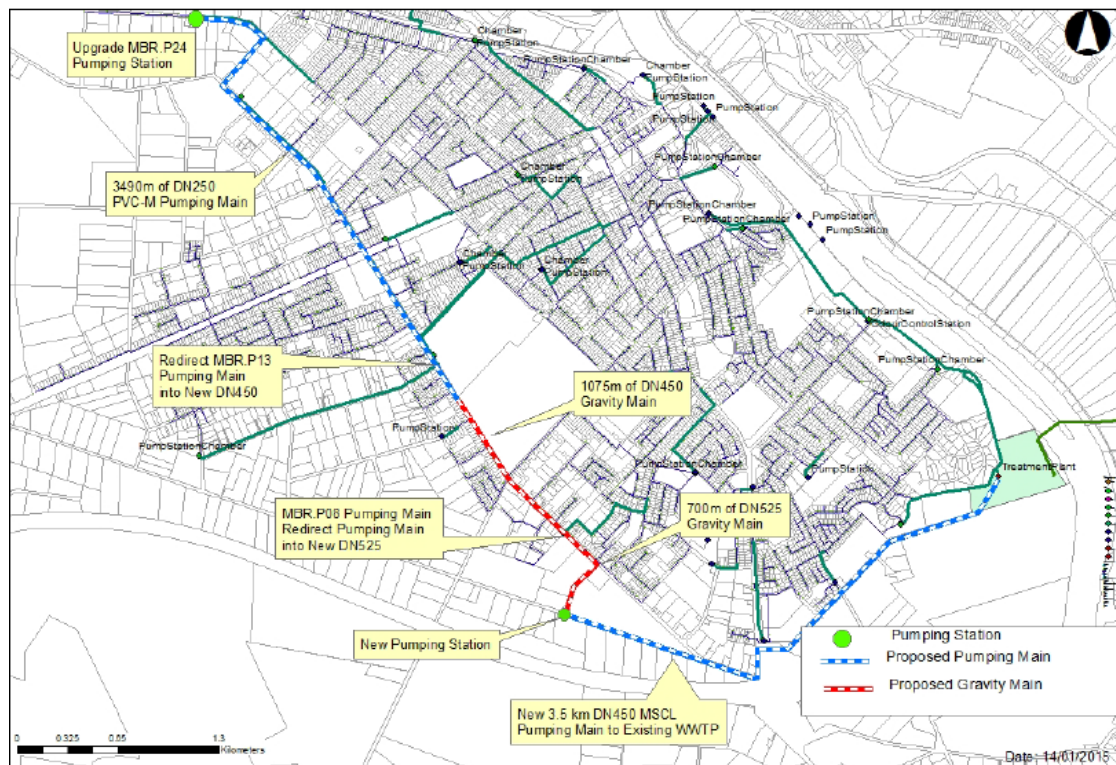
## Waste Water

The Murray Bridge Township is serviced by the Murray Bridge Waste Water Treatment Plant (WWTP). This plant already has capacity constraints and work is currently being carried out by SA Water to determine the necessary upgrades which will allow the additional capacity required to cater for the additional allotments identified within the yields established for Areas 1 and 2. The rate of development in association with the proposed areas will impact on, and possibly accelerate, the staging of any WWTP upgrades.

To service the proposed development it is expected that extensive extensions and augmentation of the existing sewer collection network will be required. The nature and extent of those upgrades will be dependent on proposed future developments, including spatial distribution of allotment densities, staging configurations and timing of the developments. SA Water have confirmed however that the MBR.P24 Pump Station (on Thomas Street) will need to be upgraded along with the sewer pump station on Old Swanport Road. Additional sewer mains and possibly booster pump stations will be required to transfer flows from the developed areas to the mains identified in Figure 15 below. The estimated lengths of pipeworks are as follows:



Nominal Pipe Diameter	Length (m)
DN250 Pumping Main	3,490
DN450 Pumping Main	3,500
DN240 Gravity Main	1,075



**Figure 15: Proposed Wastewater Mains Improvements (Source SA Water)**

Developers would need to contribute to the upgrade works required to service their development. SA Water may require network upgrades for operational / future purposes, and would contribute towards such upgrades as part of future works (similar to approach at Mount Barker township). At this point in time, not augmentation charge areas are being considered, however this may be considered upon confirmation of the rezoning of these areas and potential future land division proposals.

### 7.3.2 Stormwater Infrastructure

Through discussions with The City of Murray Bridge (Council) it has been identified that a water harvesting scheme is proposed to reduce reliance on mains and river water for irrigation. In summary this scheme through new infrastructure is to allow for harvesting of stormwater from existing detention basins and directing it to a raw water storage Lagoon at Gifford Hill on the southern side of the freeway. Water is then to be drawn from this lagoon and treated prior to being pumped through further new infrastructure for distribution to the existing tank supply at the Murray Bridge Golf Course and to the existing irrigation main system.

This together with the improvements identified in Southfront's review have been considered in determining what, if any, proposed stormwater infrastructure is required for the new development areas. Through further discussions with Council's engineer the following has been adopted with the proposed stormwater infrastructure requirements:



- Stages 1A & 1B – New drainage infrastructure is to be directed into the existing system which is to be upgraded to convey the additional flow to the existing basin at the intersection of Rural Avenue and Old Swanport Road.
- Stage 1C - new drainage and outlet detention basin is to be constructed with any future development of this area for residential purposes. While a basin is identified as proposed within Southfront's recommended improvements, Council has advised that the timing of construction of this basin is still unknown and therefore cannot be assumed to be in place before any development in this location occurs.
- Stages 2A & 2B - No augmentation works required. New drainage infrastructure from future development is to flow to the existing Basin in Greenlands Drive. Stormwater retention would need to be accommodated within the redeveloped Areas 2A and 2B (detailed further within assumptions below).

#### Assumptions:

- the majority of the new development area allotments will be graded with fall towards the road with an allowance for 30% falling to the rear. These rear falling allotments will be drained to a rear of lot drainage system whilst those falling to the front will drain to the road.
- flows within the road will initially be directed to a proposed pit and pipe drainage system via kerb and channel whilst bypass flows will continue downstream as surface flows. Flows within the roads and the piped drainage systems will be directed to the Council nominated existing detention basin for each Stage. Surface flows are also proposed to be conveyed through the proposed open space corridors upstream of the basins via formed inverts/ swales.
- the proposed open space corridors also present opportunities for further detention and or water harvesting basins (internal basins) and these have been considered as part of the proposed stormwater system within developments.
- proposed construction is assumed to be by excavation with material to be respread on site.
- proposed water harvesting distribution main is to traverse through the Stage 1 areas. Through prior agreement with Council, there is potential to draw from this as a further source of irrigation for park areas.
- stormwater design is to be in accordance with the Rural City of Murray Bridge Engineering Guidelines (MB Engineering Guidelines) and the following further criteria and assumptions:
  - development area runoff based on MB Engineering Guidelines Table 4.1 for average lot size of 700m<sup>2</sup> and use of the rational method
  - time of concentration for stage catchments based on 100m of overland flow at time of 15 minutes to first pit then remainder to basin in pipe at 1% slope. Pipe travel times in accordance with Figure 4.09 of the Queensland Urban Drainage Manual
  - pipes sized to convey the 1 in 5 year flow with full flow capacity at 1% pipe slope and assumed pipe flow velocity of 2.5 m/s
  - proposed drainage to manage the 1 in 100 year event to the basins.

Refer **Appendix 2** for stormwater calculations

Additional detention /retention basin sizing for development within these areas is based on maximum flow depth of 1m (to negate fencing) for the 1 in 100 year event with volume to allow for minimum drainage within 3.5 days as per MB Engineering Guidelines. In addition a reduced sized outlet has been used to reduce site discharge to the downstream drainage. Flow analysis using the computer program Drains has been completed to model the basins using design parameters of soil type 2.5, Antecedent moisture content=2.5, initial storages - paved=1mm and Grassed=5mm which have been taken from the City of Onkaparinga Stormwater Management Design Guide (draft). These are based on



the combined basin sizing for each Stage of which could be apportioned to basins of smaller size spaced throughout the park areas.

The resultant basin sizings and outlet pipe size reductions are presented in the table below with model data and results included in **Appendix 2**:

Stage	Combined Basin Volume (m <sup>3</sup> )	Catchment Outlet Size (mm)	Basin Outlet Size (mm)
1A	4813	900	525
1B	31593	1500	1050
1C	1740	600	375
2A	34729	1500	1200
2B	3919	900	600

The resultant combined basin sizings for stages 2A and 1B were considered to be too large to fit within the available open space areas and these were limited to 10,000m<sup>3</sup> and 20,000m<sup>3</sup> respectively. Costs for the proposed internal drainage infrastructure as well as augmentation works would be borne by the developer.

### 7.3.3 Telecommunication, Gas and Electricity

Any developments to occur within the three identified sites will include the provisions of service conduits, to be installed in "common service trenches". The developers would deal directly with the service authorities for any application for new infrastructure.

With regards to the Structure Plan, it has identified that two new substations together with a new 33KV connecting loop and the upgrade of the existing 33KV lines will be required to cater for the Gifford Hill Estate and town expansion.

SA Power Network (SAPN) has advised that an augmentation charge will be applied to any new development that occurs within the three identified sites. This augmentation fee will be used by SAPN to cover the required infrastructure upgrades.

### 7.3.4 Road Infrastructure

The Murray Bridge Structure Plan and Murray Bridge Integrated Traffic and Transport Plan have identified improvements to the existing road infrastructure and public transport systems to cater for the expected increase in growth to the city. It was also recommended that the existing Bicycle Plan be reviewed to confirm adequacy for current cyclist requirements and Australian Standards.

The potential upgrades that are of relevance on the three identified sites include the following:

- the transport interchange facilities at the intersections of Old Swanport Road/ Adelaide Road and Old Swanport Road/Swanport Road/South Eastern Freeway.
- roundabouts at the Old Swanport/Brinkley and Maurice Road/Brinkley Road/Mulgundowah intersections (already covered by Gifford Hill infrastructure agreement).
- realignment of the existing Old Swanport Road / Adelaide Road intersection



These improvements have been considered with review of the proposed road infrastructure upgrades for the new developments.

The new development areas are proposed to utilise the existing road network and to include further internal road systems that link to existing roads. It is also proposed to extend the existing Bremmer Road northwards to intersect with the existing Maurice Road as part of the Structure Plan (or alternatively this may be realigned as part of the pre-defined bypass route connecting to Adelaide – Mannum Road).

All roads associated with the anticipated development, including any required upgrades to existing roads have been assumed (for costing purposes) to be to the Murray Bridge Engineering Guidelines Access Road standard (refer Appendix 4 for profile). This is to include sufficient pavement width for the City of Murray Bridge's (Council) refuse vehicle to manoeuvre, kerb lining, footpaths, asphalt surfacing, lighting as well as pit and pipe stormwater drainage.

Further upgrades are also proposed to existing roads forming external boundaries to the development areas (external roads) in accordance with the MB Engineering Guidelines. These are to be limited to kerb lining, verge and footpath construction to road edge adjacent the new development replacement of existing pavement removed in the process (refer Appendix 4 for kerb construction detail). The exception is the Adelaide Road service road which for the unsealed section is proposed to undergo a pavement reconstruction and for the spray seal section is proposed to undergo an asphalt overlay. Kerbing is also proposed to both sides.

Therefore, the following existing roads will require upgrades (of various extents) as a result of the development of the study areas:

- Agricultural Drive
- Rural Avenue
- Prosperity Grove
- Sir John Cowan Drive
- Bywaters Road
- Production Road
- Commerce Road
- Christian Road
- Bremer Road
- Grassmere Drive
- Greenlands Drive
- Lincoln Road
- Devon Street
- Ashbrook road
- Woodlands Road
- Brinkley Road (western side)
- Adelaide Road service road (unsealed section west of Agricultural Drive)

It is also anticipated that the new development areas could include provision for cyclists and linkages of these areas to the surrounding network could be considered with the review of the existing Bicycle Plan. This could also include links to the bike lane recommended for Adelaide Road east of the Old Swanport Road intersection in accordance with the Murray Bridge Integrated Traffic and Transport Plan. Similarly the footpaths within the proposed road network of the new development areas could link with the proposed green corridor areas with further linkage to the surrounding existing pedestrian footpath network.



The proposed transport interchange at the Old Swanport Road / Adelaide Road intersection could provide a pedestrian link to the adjacent proposed Stage 2A as well as a pedestrian crossing of Adelaide Road to proposed Stage 1A to encourage residents to utilise public transport.

As the new development will result in increased urbanisation of the surrounding area, a speed limit review of existing roads could be warranted due to the expected increase in foot traffic. The DPTI are the authorising body responsible for setting speed limits on South Australian Roads, therefore any changes would be subject to DPTI approval.

For the purpose of costings for future infrastructure, it has been assumed that all road infrastructure costs associated with the development of new roads within the development areas will be borne by the developers.

Existing street lighting infrastructure has not been included in the costing of upgrades. This is due to cost of proposed street lighting infrastructure to be carried out and to be done in accordance with SAPN tariff arrangement with Council.

It is assumed that new development area drainage would be managed internally and any drainage upgrades to external roads would only convey flows from the road or further upstream of the development areas. Therefore it is assumed that drainage upgrade costs for the external road works would not be borne by the developer.

Given that the Structure Plan for Area 3 identifies limited additional residential development, it is not considered that this development would result in any specific need for road infrastructure improvements in their own right. It is noted that the Hume Reserve Road condition is currently very poor for the function it serves as access and loading point for the Viterro Silos (which requires heavy vehicles to use it) and the Hume Reserve. Its upgrade however is warranted as much if not more for these alternate functions than to service the limited future residential development suggested within the Structure Plan. For this reason, it has not been included in the costs to Council (the upgrade would be budgeted within other upgrade / maintenance costs that apply generally within the Council area).

### **Existing Intersection Upgrades**

Generated traffic from the development areas is to use the broader existing road network including the major arterial roads serving Murray Bridge.

A high level operational review has been conducted to assess the expected increase in traffic at existing major road intersections to confirm if upgrades would be required. This assessment has also reviewed the proposed Bremmer Road / Maurice Road intersection. For the purposes of this investigation these upgrades have been limited to signalisation. This assessment is based on an assumed trip distribution that considers trips directed to the expected extents of employment areas (commercial, industrial) such as to the north-west of the township (existing and future industry / employment land area), the Town Centre and Adelaide Road.

Further assumptions are as follows:

- Generated traffic is based on 10 trips per allotment/day.
- Signalization is required for intersection approaches with determined traffic increase of 5 or more vehicles per minute. This is based on the daily traffic assumed to be averaged over 12 hours to account for the expected morning and evening traffic peaks.





- For Stage 2A further site access to be provided to existing Adelaide Road both at the intersection with old Swanport Road and midway between same and intersection with Bremmer Road to the East.

Furthermore it is anticipated that trips to the future Gifford Hill development to the southern side of freeway will be generated by the new development areas. In accordance with the Murray Bridge Integrated Traffic and Transport Plan, the existing Brinkley Road is recommended to serve as the main access from the Murray Bridge town centre and it is therefore assumed that the new development traffic would travel via the existing Brinkley Road / Old Swanport Road intersection. As this has been identified for future upgrade as part of the infrastructure agreements for Gifford Hill and would be carrying traffic other than from the new development areas this intersection has been excluded from the upgrade assessment.

Details of this assessment are provided in Appendix 2 with summary of intersections determined to require signalisation presented below:

- Cromwell Road / Adelaide Road / Lincoln Road
- Bremmer Road / Adelaide Road / Agricultural Drive
- Woodlands Road / Maurice Road

It is noted that the determined increase in traffic to the Lincoln Road and Agricultural Drive approaches did not warrant signalisation however was required to cater for the remaining approaches.

It is also noted that the recommendation for signalisation does not include review of the queuing effects on intersection approaches other than those carrying traffic from the new development areas. These would have to be considered with any implemented improvements as part of more detailed modelling.

Further detailed traffic modelling would also be required to confirm if any operational deficiencies would result on the surrounding road network from the new development generated traffic.

Costs associated with upgrades to existing roads and intersections due to the new development areas will be attributable by the developers.

### 7.3.5 Summary of Physical Infrastructure Upgrades

Services	Upgrades
<b>Water &amp; Wastewater</b>	<p>New sewer and water infrastructure to be included within any new developments. Borne by the developers.</p> <p>Future WTP capacity upgrade will be required for additional dwellings – up to 38ML per day (from 30ML per day)</p> <p>Main augmentation required within network</p> <p>Additional boosting, storage and high pressure control required above 68m contour level</p> <p>Upgrades to WWTP already being planned with forecast capacity able to accommodate additional dwellings</p> <p>MBR.P24 Pump Station (on Thomas Street) will need to be upgraded along with the sewer pump station on Old Swanport Road.</p> <p>Additional sewer mains and possibly booster pump stations will be required to transfer flows from the developed areas to the identified mains route</p>
<b>Electricity</b>	<p>Augmentation charges will be applied to new developments to cater for the SA Power Network (SAPN) new infrastructure and upgrades to</p>



Services	Upgrades
	<p>existing infrastructures. From discussion with SAPN, an indicative augmentation charge is calculated at \$154 /kva for 8 kva/allotment (increase over threshold). Hence it equates to approximately \$1,230/allotment.</p> <p>In addition, for electrical reticulation/ street lighting for new developments, a nominal cost of approximately \$5,000/allotment would apply.</p>
<b>Telecommunication &amp; Gas</b>	Provisional conduits to be installed by the developers for all new development at a nominal cost in the order of \$2,000/allotment.
<b>Stormwater Drainage</b>	<p>Areas 1A &amp; 1B – Existing infrastructure to be upgraded to cater for the new developments.</p> <p>Area 1C - - new infrastructure in association with new developments will flow into the existing infrastructure (no upgrades to existing necessary).</p> <p>Areas 2A &amp; 2B - new infrastructure in association with new developments will flow into the existing infrastructure.</p>
<b>Roads</b>	<p>Upgrades (to varying levels) required for existing road network within identified growth areas to bring them to a residential design standard.</p> <p>Intersection upgrades required for:</p> <ul style="list-style-type: none"> <li>• Cromwell Road / Adelaide Road / Lincoln Road</li> <li>• Bremmer Road / Adelaide Road / Agricultural Drive</li> <li>• Woodlands Road / Maurice Road</li> </ul>

## 7.4 Future Human Services Infrastructure Upgrades

### Schools and Tertiary Education

The modelling undertaken as part of the Structure Plan concluded that increases in student numbers would be in the range of 2,200 primary school students and 1,700 secondary school students. Given that population forecasts are likely to be lower than predicted within the Structure Plan, a lesser number of students can be expected as a result of the identified growth areas over the equivalent 30 year period.

The enrolments for the existing schools are low and provide capacity to cater for the majority of expected demands in school placements from the growth areas. One additional primary and secondary school would be required to accommodate the growth anticipated, and these have been identified within the Gifford Hill development.

Anticipated demand for tertiary education facilities is limited with capacity at the TAFE facility able to accommodate likely growth in demand. There is not likely to be sufficient demand to require a dedicated university facility within Murray Bridge.

### Health Services

Given the ageing nature of our population, it is likely that the future growth areas will create additional health services demands within the township. The Structure Plan identified an anticipated demand for a 30 year period, based on State averages, of an additional 181 hospital beds, 42 GPs and 19 dentists.



While these figures are likely to be higher than the growth now anticipated within this study, it demonstrates that additional capacity is required at the hospital. This will need to be provided either as a major expansion of the existing facility, or a second facility, potentially provided by the private sector (as is government policy).

The growth within the other health professional services will need to be accommodated within existing and planned activity centres, being the most suitable location for such services. It is noted that neighbourhood centres are proposed both at Gifford Hill (as identified within the Structure Plan) and within Newbridge (according to the Newbridge Master Plan), which are accessible to the identified growth areas. There is also scope to increase the services available within the suggested activity centre along Adelaide Road.

### **Aged Care**

The demand for aged care is likely to evolve not only as a result of growth, but with government policy and funding models trending towards provision of different models of care facilities and ageing in place services. The 212 beds modelled within the Structure Plan is likely to be above that forecast for the future growth of the township. Nevertheless, it is likely that additional capacity will be required to be accommodated within the township through either expansion of existing facilities, or additional facilities. Given aged care facilities require large land parcels, there is likely to be limited scope for additional facilities to establish within the existing built-up areas of the township. There is scope for the growth areas to accommodate such facilities, and the identified growth areas would be ideal given their proximity to services and facilities.

It is noted that the future Newbridge development identifies a potential retirement village within its master plan, and there is potential scope for the further expansion of the Murray Heights Lutheran Village within Area 2. The nature of land within the study areas also opens up an opportunity for a new facility to be established.

### **Recreational Facilities**

The projected growth identified within the Structure Plan, as well as the Open Space and Recreation Research Study conducted in 2010, confirms that there will be additional demand for recreation and open space facilities within the township. This includes the following additional facilities:

- Regional quality athletics track
- 5 ovals
- 5 cricket pitches (could be integrated into ovals)
- 5 playing fields (for soccer)
- 2 additional bowling clubs (or doubling of greens)
- 20 tennis courts (which can be shared with netball).

The Structure Plan identifies these additional facilities within Gifford Hill and the southern growth area (which is positioned to the east of Brinkley Road on the southern side of the freeway). It is appropriate for the open space areas within the study area (Areas 1 and 2) incorporate provision of some of the active recreation facilities including ovals, playing fields and tennis courts that were previously identified as appropriate for the southern growth area (as Areas 1 and 2 will effectively replace the southern growth area identified within the Murray Bridge Structure Plan (2012)). These facilities would, in accordance with Council's Open Space and Recreation Strategy, be located within District level open spaces identified within the Growth area Structure Plan, with other neighbourhood and local level open spaces limited to passive recreation spaces and playgrounds.



## 8. INFRASTRUCTURE FUNDING ANALYSIS

This section considers Council costs and revenues relevant to future residential development in the study areas, potential developer contributions, and Council's role in facilitating orderly, coordinated, and timely development.

### 8.1 Direct Funding Option for Rural City of Murray Bridge

A financial analysis has been carried out of the implications for the Rural City of Murray Bridge (RCMB) from the subdivision of the land under consideration (Areas 1A, 1B, 1C, 2A & 2B as shown in Appendix 6).

The conclusions of this research are discussed below. Further details regarding the approach used and assumptions employed are set out in Appendix 4.

Information regarding costs RCMB would incur and revenues it is likely to generate in future in connection with development of these areas is necessarily 'broad brush' at this time and reliant on various assumptions..

#### 8.1.1 Council Costs and Revenue

The results of the financial analysis suggest that RCMB is likely to be able to fund all of its associated initial and ongoing outlay obligations and reasonable preferences associated with the development of the areas from the associated additional income generated. This income would arise from its existing revenue raising arrangements (rates, user charges and other ongoing existing revenue sources). This additional revenue would flow as a consequence of the additional properties created and the associated increase in population. In other words all additional RCMB costs could be met without any negative financial impact on existing residents and property owners or the need to seek to negotiate additional financial contributions from developers.

The sites collectively are likely to be capable of production of approximately 3,800 residential allotments (refer to Appendix 5 for break down of these estimated yields). Stormwater drainage, roads, footpaths and kerbing with a value of approximately \$53.5M (outlined within Appendix 3) are likely to be required to be provided by the developers of the land at time of subdivision and then transferred to RCMB at no cost. These assets will then be recorded in Council's accounts and their consumption over time recognised as an annual depreciation expense.

Council will need to replace these assets upon expiration of their useful lives. Nevertheless in economic terms there is a big difference in long-run costs (in net present value or equivalent annualised value terms) if the asset owner was gifted the first generation of long-lived assets rather than had to finance their initial acquisition.

Clearly subdivision of the sites would happen incrementally over time in accord with market demand. It is not possible to say with any certainty which areas may be sub-divided first. Financially though this doesn't particularly matter for Council. There is no reason to think RCMB would incur significantly higher costs from the development of some areas relative to others.

Council will need to incur some expenditure upgrading its existing road network as a result of this growth. This will involve effectively improving some roads adjoining the growth areas from a 'rural' to an 'urban' standard and extending Bremer Road.



It is reasonable to assume that increases in costs associated with providing services to the allotments produced and their occupiers will track reasonably consistently with increases in rates and other revenue associated with the developments. In fact on average increases in full long-run expenses (for any given subdivision) could be expected to lag increases in revenue (rate revenue will be generated from allotments in the year following their creation and servicing costs will be lower before houses are built upon them and occupied).

**Set out below is an indicative estimate of long run operating revenue and operating expenses (2014 values) associated with an allotment in a fully developed subdivision in the areas under consideration.**

Operating Revenue per allotment per annum:

- Rate revenue \$1,897
- Other revenue \$1,056 (it is noted that the majority of Council's current 'other income' is from grants and user charges. There is an assumption that these will increase on a pro-rata basis with an increase in properties and population. By far the largest component is the 'General Purpose Financial Assistance Grant'. This grant from the Commonwealth is guaranteed and can reasonably be assumed to increase on a pro-rata basis).
- Less current rate revenue forgone from properties that are subdivided (\$114).

**Total: \$2,839**

Operating expenses per allotment per annum:

- Depreciation of additional infrastructure \$306
- Other operating expenses \$2,339.

**Total: \$2,645**

On average in the long-run each new allotment will generate a favourable income statement reported impact for RCMB of the order of \$194. When all of the areas are subdivided this would result in an improvement in Council's reported operating result of \$737,000 pa.

The assumptions on which the above analysis has been based are conservative. For example:

- (a). The Council currently serves a population of approximately 20,000 residents and 11,700 properties. No allowance has been made in the above analysis for any economies of scale that would be realised from servicing additional properties and supporting a larger community (other than assuming additional plant and buildings and associated depreciation expenses would increase at a rate of 50% of the existing per rateable property quantum). A pro-rata increase in other operating costs (eg employees, materials, contractor payments etc) has been assumed. Many of Council's current costs are relatively fixed (or at least not fully variable) and need not rise directly in proportion to an increase in the number of RCMB's rateable properties or residential population. A still conservative assumption that operating costs would increase by only 80% of current levels on a pro-rata basis would see the estimated net operating result impact per new allotment improve by \$468pa from \$194 to \$662.
- (b). Operating expenses set out above do not take into account the fact that economic costs for Council of funding asset renewal will be substantially less than the accumulated depreciation (in fact only 33% of the annual additional depreciation of \$306pa shown above<sup>2</sup>. This is

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<sup>2</sup> See item 11. In the Appendix 4.





because of the time value of money, i.e. Council can earn a rate of return on revenue generated to offset the depreciation expense until it is needed to finance asset renewal outlays.

- (c). Increases in additional operating expenses associated with growth are likely to lag increases in revenue generated.

The net present value (NPV) of inflows to Council over forecast outflows from the development over a 50 year time period (and allowing for subsequent asset renewal) based on the information above (utilising the most conservative assumptions and further assumptions specified at item 10. of Appendix 4) is of the order of \$4.6M. If economies of scale were generated as per a) above then this favourable NPV would increase to \$15.8M. **In other words (and all other things being equal) RCMB would be able to provide additional benefits to existing residents and ratepayers in the form of improved service levels and/or lower rates and charges as a result of the proposed development.** (Preferably any such initiatives should not be acted upon until Council was confident that there was evidence to support the reliability of the assumptions that underpin this assessment.)

It is likely that cash inflow for Council associated with the development of the areas under consideration will exceed cash outflow in most years. Accumulated net cash inflow though will not exceed associated cash outflow needs in the early years as the Rural City of Murray Bridge will need to spend approximately \$4.75M at a relatively early stage in upgrading its existing road network. The Rural City of Murray Bridge would be able to finance these net outlays either from other internal sources or through external borrowings if need be. Council has ready access to borrowings and currently enjoys low levels of net debt.

## 8.2 Developer Contributions

On the basis of available evidence it is likely to be hard to convince a developer (or the State) of the financial justification for any discretionary developer contributions (e.g. the need for a negotiated precinct agreement under which the developer pays monies (directly or through a levy on allotments) to fund specified works and projects carried out by Council).

Ultimately though if Council wished to pursue such a course of action it may be successful as the outcome may also depend on a range of other factors (including what may have been negotiated elsewhere). Any such arrangement must ultimately increase the price of new allotments and or reduce the value of land that is under consideration for subdivision.

Developers will also be responsible for provision of water supply, sewerage and electricity supply infrastructure within the new subdivisions. This infrastructure will upon the release of the subdivisions become the assets of entities other than RCMB. These entities may also require developers to contribute to upgrades of their existing networks to service the subdivisions.

*The cost of any such upgrades and its impact on the viability of the development of the subdivisions has not been considered as part of this study.*

As already highlighted, the financial analysis presented in this report is necessary based on broad brush assumptions. A more detailed financial analysis should be carried out in future when better information is available and before decisions are made that could commit RCMB to significant expenditure. Nevertheless based on the currently available information there seems no reason why from a financial perspective that Council should not welcome the potential subdivision of the areas under consideration.



### 8.3 Other Infrastructure Provision Options & Incentives

A number of other current and future options for the provision of infrastructure have been considered in terms of the positives and negatives and a brief commentary provided below. It should be pointed out that these options have been considered within the existing legislative framework, noting that the Planning Reforms Recommendations included potential changes to address this specific issue and may result in a new legislative framework for Council to consider.

#### Existing Mechanisms

##### General Rates

Funding of infrastructure costs associated with the development of the growth areas occurs through general rate revenue (over time).

Pros	Cons
<ul style="list-style-type: none"> <li>Analysis indicates that increases in rate revenue from additional properties is sufficient to offset costs associated with servicing additional allotments in the long term</li> </ul>	<ul style="list-style-type: none"> <li>Does not cover all costs upfront which will require some borrowings (but such loans could be serviced and repaid over time from additional revenue generated)</li> <li>Costs of infrastructure spread through entire community and not just those benefiting from it</li> </ul>

##### Separate Rates and rates rebates (under Local Government Act, 1999)

Section 154 of the Local Government Act 1999 permits Councils to raise a separate rate on properties, which may benefit from a project or undertaking. Rates can be localised to effected areas or purposes (such as transport infrastructure).

Pros	Cons
<ul style="list-style-type: none"> <li>Within existing legislative framework and also used in other locations where growth areas are planned (such as Mt Barker)</li> <li>It can be applied only to properties that benefit from the purpose of raising the rate, meaning the general community is not directly affected</li> <li>Money raised by these means cannot be put to any other use, securing the finances for its intended purpose</li> <li>The separate rate must cease when the purpose has been completed and paid for, providing assurance for land owners / developers.</li> </ul>	<ul style="list-style-type: none"> <li>Rate does not cover upfront costs associated with infrastructure, meaning some borrowings may still be required.</li> <li>Property owners are likely to react negatively to the imposition of additional rates or charges and particularly if Council cannot demonstrate it is incurring higher long-run net costs associated with the development.</li> <li>Differential rates may be particularly problematic to apply as the 'locality' will effectively become indistinct from other RCMB urban areas that receive similar services.</li> </ul>

##### Land Management Agreement (under Development Act, 1993)

An agreement relating specifically to relating to the ongoing management and development of land, pursuant to Section 57 of the Development Act, 1993. The Agreement is one between a Council or the Minister (as the relevant authority) and the relevant land owner(s). The agreement can be directly linked to a development application (including land division).

Pros	Cons
<ul style="list-style-type: none"> <li>Tool that exists within existing legislative framework and commonly accepted by developers and land owners</li> <li>Council as a party has element of control into the future (it can undertake works on private land previously agreed to if land owner fails to)</li> </ul>	<ul style="list-style-type: none"> <li>Financial contributions must be associated with the development.</li> <li>May be limited by case law in terms of issues that can be covered by the LMA.</li> </ul>



<ul style="list-style-type: none"> <li>• Applies to land in question, meaning arrangements remain in place should owners sell to different party over time</li> <li>• Provides for the transfer of development rights to other land, potentially facilitating infrastructure and open space outcomes where multiple parties are involved and the net benefit is not otherwise evenly distributed.</li> <li>• Can be rescinded and amended over time as necessary with the agreement of all parties.</li> </ul>	<ul style="list-style-type: none"> <li>• An LMA cannot be “forced” upon developer who must willingly agree to enter into one for any specific development.</li> <li>• Furthermore, every person or entity with an ownership of land subject to the LMA needs to agree to enter into it, potentially further complicating its use as a tool where multiple parties are involved.</li> <li>• Requires Council to administer which may be problematic if involves long term arrangements.</li> </ul>
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#### *‘Development Deed’ or Infrastructure Agreement*

A legally binding agreement between a developer and public sector about the supply of funding mechanisms (and timing of delivery) towards the cost of new infrastructure. This mechanism is increasingly being used within the development industry and utility providers to reach agreements for the development of growth areas and the provision of necessary infrastructure to service these locations.

Pros	Cons
<ul style="list-style-type: none"> <li>• The agreement can cover any infrastructure issue and be applicable to provision of root infrastructure beyond the site of the development</li> <li>• Most suitable in scenarios where there is a large development and typically only one developer.</li> </ul>	<ul style="list-style-type: none"> <li>• Cannot be forced on owners - requires two cooperating parties to reach agreement (more if there are multiple owners / developers which adds to complexity in reaching agreement).</li> <li>• Can be costly and complex to prepare and administer for all parties</li> </ul>

#### *Joint Venture Agreements*

Joint Venture Agreements between Council and developers are only really likely to be viable or considered for larger scale projects where there is a direct interest and benefit for Council to be directly involved as a partner.

Pros	Cons
<ul style="list-style-type: none"> <li>• <i>Can provide clarity on timing, responsibilities and funding arrangements for projects and infrastructure delivery</i></li> </ul>	<ul style="list-style-type: none"> <li>• Such an arrangement only has potential applicability where both parties have discretion and wish the other party to undertake certain actions for mutual benefit. Not likely to be applicable in this instance</li> <li>• Ties Council to the development of land (and potentially risk)</li> </ul>

#### *Government Grants*

There is potential for a series of different grants be provided by both the State and Federal Governments, for the provision of infrastructure and services to cater for the residential growth areas. Examples include:

- Planning and Development Fund (State)
- Places for People (State)
- National Stronger Regions Fund (Federal)
- Community Development Grants Programme (Federal)

Pros	Cons
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<ul style="list-style-type: none"> <li>Has the potential to provide upfront funding for specific infrastructure requirements which would otherwise not make development proposals viable.</li> </ul>	<ul style="list-style-type: none"> <li>No clear guarantee of acceptance of bid for forward planning purposes makes it difficult to rely on for project planning</li> <li>Subject to political processes (influences types of projects and / or locations prioritised)</li> <li>Only likely to be provided for larger scale projects and infrastructure needs, unless compelling case of need can be provided.</li> </ul>
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#### *Borrowing (through Local Government Finance Authority)*

Councils have the ability to borrow funds for specific projects through the Local Government Finance Authority, which is a statutory authority established under the Local Government Finance Authority Act, 1983.

Pros	Cons
<ul style="list-style-type: none"> <li>Councils can obtain loan funds at favourable rates.</li> <li>RCMB has capacity to borrow and repay additional loan funds should the need arise.</li> <li>Secure funding as funds guaranteed by State Government</li> </ul>	<ul style="list-style-type: none"> <li>May have implications on recovery of costs distributed to general population rather than targeted to user with benefit. In the case of this area though the financial modelling suggests that revenue generated from development of the affected areas would be sufficient over time to service and repay any associated loans without adverse effect on other ratepayers (so may not be palatable to broader community)</li> </ul>

#### *Open Space Contributions (under the Development Act 1993)*

The Development Act, 1993 allows for the provision of financial contributions in lieu of part, or all of the legislated 12.5% of open space for all land divisions above 20 additional allotments. These payments are made directly to Council. For land divisions under 20 allotments, payment is made into the Planning and Development Fund (at a set rate per allotment) administered by the State Government (see Grants above).

Pros	Cons
<ul style="list-style-type: none"> <li>Could be used in combination with concept plans to fund acquisition of land identified for future open space and the development of reserves.</li> </ul>	<ul style="list-style-type: none"> <li>Requires bids to State Government for use of the Planning and Development Fund, which are not guaranteed to be successful (even if seeking funds provided as a result of land divisions within the Council area)</li> <li>Funds not likely to cover all costs associated with purchasing land and developing reserves</li> <li>Could penalise property owners inequitably depending on how much contribution is required.</li> </ul>

#### *SA Water and SA Power Networks Developer Augmentation Charges*

Utilities currently determine rates for augmentation requirements to infrastructure required as a result of developments. This is particularly the case in new growth areas where infrastructure either is missing or needs to be upgraded to achieve new capacities and design standards.

Pros	Cons
<ul style="list-style-type: none"> <li>Costs of infrastructure are being paid by those that are benefited from it (i.e. developers and those purchasing resultant properties) and not general community</li> </ul>	<ul style="list-style-type: none"> <li>Increases upfront costs for development (potentially making it unviable) without recognising benefits provided to other future beneficiaries of infrastructure</li> <li>Costs likely to be passed directly to land purchasers (increased land costs).</li> </ul>



	<ul style="list-style-type: none"> <li>gold plating of infrastructure unnecessarily increasing costs to developers, with little recourse for developers to argue the requirements being demanded (i.e. no independent assessment of cost charges being suggested by utilities)</li> </ul>
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#### *Development Restrictions (within Development Plan)*

The Development Plan policies can also be used to restrict development opportunities and outcomes until necessary infrastructure or structural development patterns are achieved (e.g. identifying areas that should not be developed until a road intersection is upgraded or stormwater management is addressed). There is also scope to list certain forms of development (such as land division) as non-complying utilising these triggers.

Pros	Cons
<ul style="list-style-type: none"> <li>Prevents pre-mature development from occurring by providing Council with an avenue of refusing development proposals until infrastructure is in place.</li> </ul>	<ul style="list-style-type: none"> <li>May be too big a stick and stifle development from occurring</li> </ul>

#### *Precinct Declarations*

The [Urban Renewal Act, 1995](#) allows the Minister for Housing and Urban Development to declare a precinct and appoint an authority to develop a plan for the precinct.

Pros	Cons
<ul style="list-style-type: none"> <li>provides a coordinated approach that can expedite development</li> <li>Provides for coordinated planning, design and delivery of infrastructure assets</li> <li>Can address multiple land ownership to provide an integrated development approach to the precinct</li> <li>One authority manages implementation of infrastructure delivery</li> </ul>	<ul style="list-style-type: none"> <li>addresses infrastructure planning but no additional charging powers compared to existing council powers, and is therefore of little benefit in addressing the funding issue</li> <li>does not have enforcement powers to compel stakeholders to participate or bin non-contributing parties</li> <li>Precinct declaration and subsequent processes can complicate planning and development of locations for both Council and developers</li> <li>Rates and revenue collected by the Precinct Authority under the Local Government Act are lost to Council.</li> </ul>

### **Possible Future Mechanisms that are under discussion by the Industry or in place Interstate**

#### *State Infrastructure Coordinator*

A proposal has been put together by Kym Burke of Burke Urban and is being advocated to the State Government by the development industry. The proposal involves the establishment of an independent State Infrastructure Coordinator (appointed by Minister) who oversees and finalises negotiated Infrastructure Deeds between Utilities, Councils and developers. The Deeds will:

- detail the 'scope of infrastructure works' required to be carried out
- identify the staging of works where appropriate and possible
- document cost sharing arrangements between all parties (along with role and responsibilities)
- clarify rebating arrangements for those parties that pre-fund works.

Key elements of the proposal that differ from existing Agreements are:





- the Infrastructure Coordinator will review the proposed infrastructure requirements and costings are fit for purpose to maintain cost effectiveness and reduce gold plating – i.e. an independent umpire
- it seeks the establishment of an infrastructure fund from which opportunities for recouping upfront investments in infrastructure provision can be provided to developers (ie the cost of the infrastructure is recovered over its life time and distributed to all who benefit from it).

The proposed scheme has not yet gained any support from the Government, so at this point in time, it remains simply a proposal. However, there are merits to the proposal in relation to having an independent umpire deciding on appropriate infrastructure works and costs (and actively negotiating agreements between parties), as well as recognising that the upfront costs of infrastructure should be borne more equitably to those that also gain future benefit from its delivery.

#### *Infrastructure charges*

Infrastructure charges are applied to development proposals for land division, or changes of use which have implications on infrastructure headworks. The charges can be linked to local, district or regional structure plans (or Planning Strategy) or simply standard charges, or maximum charges subject to local variation. These charges are already mandated and in place within other States in Australia.

The charges are not supported by the development industry, nor both major political parties in SA. They are often cited as directly increasing the costs of development which are in turn passed directly onto purchasers, impacting on affordability.

Pros	Cons
<ul style="list-style-type: none"> <li>• Covers the long term cost of infrastructure provision by utilities and Councils</li> </ul>	<ul style="list-style-type: none"> <li>• Increased charges passed directly onto purchasers of properties, impacting on affordability</li> <li>• Not supported by both political parties and the industry and therefore unlikely to be an option into the foreseeable future</li> </ul>

#### **Range of Options May Be Needed**

Given that there are a range of positives and negatives to all of the various options available to Council, it is likely that a range of the options discussed above are considered into the future for any future projects. The suitability of each option will need to be targeted to the scale and nature of the specific project and the parties involved.

There may be additional formalised mechanisms addressing infrastructure provision and funding upon the implementation of the recommendations arising out of the Planning Reforms released in December 2014.

## **8.4 Development Facilitation and Council Role**

In order for future development to be timely, efficient, coordinated and economic, there is potential for council involvement to include the following non statutory roles:

- Development Coordinator – dedicated position to work with land owners to get them working together as consortiums to redevelop their sites or form partnerships with or sell amalgamated parcels to developers.
- Potential for Council to establish a standardised / template Development Agreement Contract for land owners to adopt (although Council would not be party to it)
- Potential for this role to also include putting local or interested developers in contact with a register of land owners interested in selling or Joint Venturing future development of their sites.



## 9. RECOMMENDED POLICY CHANGES

This section recommends policy changes to the Development Plan around key issues that relate specifically to the development of the growth areas.

### 9.1 New Residential Areas

#### 9.1.1 Areas 1 and 2

The new residential neighbourhoods identified within Areas 1 and 2 on the recommended Structure Plans should, to the greatest extent possible, form seamless extensions to the existing township in terms of their built form and streetscape character.

#### Zone

Therefore, the existing Residential Zone represents a suitable starting point for policy coverage for these areas. The Zone's support for a range of dwelling types is encouraged, including medium density dwellings adjacent centres and areas of public open space. The minimum allotment sizes and frontages are appropriate for the dwelling types and the envisaged character of these areas. Similarly the dwelling setbacks and site coverage within the Residential Zone are also appropriate to the character of the streetscapes envisaged in these areas.

#### Private Open Space

The minimum private open space requirements within the Zone, at 35m<sup>2</sup>, is considered to be low for the forms of housing and lot sizes envisaged in these locations. In this regard, the adoption of the POS requirements for the Southern Policy Area (Gifford Hill) are appropriate given they are similar to those found within the Core policy Library module.

#### Design

However a suite of specific policies for this area needs to be prepared (either as a policy area or as precincts) which address the following specific design issues:

- The corridor of the SEAGas pipeline  
Policies will need to limit medium density dwellings, child care centres, schools and aged care accommodation unless a detailed Risk Management Strategy is prepared and endorsed by SEAGas and DMITRE
- Land division providing for the designated drainage paths and basins, as well as open space corridors identified within the Concept Plans
- Land division providing for an orderly and integrated approach to the layout of roads and allotments and provision of infrastructure, including:
  - Complementing the existing grid road network and maintaining permeability
  - Preventing land divisions that result in "internalised" road layouts and estates that rely on culs-de-sac
  - Ensuring land divisions do not prevent the future division of land in an orderly manner
  - Setting aside the land required for necessary stormwater infrastructure and open space corridors / areas
  - Any required upgrades to local road intersections



- Key water and wastewater plant upgrades are agreed to and funded in order to accommodate water and wastewater requirements of the land division
- Land divisions not be serviced by on-site waste water systems (such as septic tanks).

## Land Division

There will need to be strong policy coverage within the Policy Area / Precinct ensuring a coordinated approach to land division, particularly with regard to the delivery of infrastructure by:

- Land division only proceeding if it is demonstrated that co-ordination exists to ensure infrastructure between development sites facilitates the overall achievement of the relevant Concept Plan – including stormwater and open space.

There is also an opportunity to provide an incentive to make coordinated development options more attractive to land owners and developers within these locations where fragmented land ownership exists. The incentive would need to apply to land divisions (in creating the allotments and road layouts) and therefore would be limited to increasing potential yields through reductions in allotment sizes.

Reductions could align with those offered to affordable housing within the existing Residential Zone, for example:

Detached Dwellings	350m <sup>2</sup>	30% reduction
Semi-detached dwellings	250m <sup>2</sup>	37% reduction
Group Dwellings	300m <sup>2</sup>	15% reduction
Residential Flat Buildings	250m <sup>2</sup> (ave)	17% reduction
Row Dwellings	350m <sup>2</sup>	30% reduction

The incentive should be offered to the following land division scenarios:

- 2 or more allotments being combined as a coordinated development and provided the overall area of land subject to the division is no less than 5000 square metres
- the land division layout is consistent with the concept plan (in terms of road connection locations, open space layout and provision)
- the land division does not involve allotments with battle-axe/hammerhead formations
- the land division facilitates future road connections.

## Concept Plan Maps

More detailed Concept Plan Maps should be prepared for each Area specifying the preferred road layout between the established street grid system in these areas. The Concept Plan Maps should be linked to policies referencing them, and would play an important role in articulating how land divisions should proceed and provide support for identifying what is, and isn't, orderly.

Illustrative master plans (Appendix 7) have been prepared as examples of how a more detailed road layout, open space and land use/medium density housing locations could be established within Areas 1 and 2 (these were used to 'test' the Structure Plan and yields developed). They can be used as a basis for Concept Plans within the Development Plan, although it should be reinstated that they are but one way in which these locations can be developed (and that the Concept Plans should not be overly prescriptive about road layouts to allow flexibility in the development of these areas to respond to market and design trends).

### 9.1.2 Area 3



## Zone

The zoning of the land over Area 3 comprises predominantly River Murray Fringe zoning, with a small area in the south-western portion zoned as Light Industry (covering the existing gas storage facility and a vacant allotment to its west). The existing River Murray Fringe Zone places emphasis on protecting the natural rural character of this area, preserving and improving the water quality of the River Murray and preventing the valley face and surrounds from being marred by development.

It is noted that the zone is part of a Ministerial suite of policies that was applied to the River Murray region, and as such changing the zone may be resisted. However, the application of the zone objectives in this location is questionable. This is due to the visual qualities of this location, where several buildings are already existing and highly visible and where views are dominated by the existing Vittera Silos. This is not to understate the importance of appropriately designed development in this location, given its elevated nature and visibility from surrounding areas. The land is outside of the 1956 Flood Level (the River Murray Flood Zone boundary is at this level).

While the existing Zone envisages some forms of urban development, including residential and tourism development, it prevents any further subdivision of land, except under very limited circumstances.

Recognising the significant constraints in this location, a Residential Zone is not considered appropriate. The potential further development envisaged within this Area is less intensive and aligns more to that envisaged within the Country Living Zone, albeit with a specific "Hume Reserve" Policy Area applying to this location only.

## Objectives

The objectives of the Policy Area would be to clarify the low density and intensive nature of development envisaged within this location (which will be primarily residential), but allow scope for some low intensity small-scale tourism accommodation such as bed and breakfast facilities.

## Allotment Size

Specifically, the policy direction should include:

- Minimum allotment size of 4,000m<sup>2</sup> with an average of 6,000m<sup>2</sup> (Note - this generally provides for flexibility for some allotments to be smaller than the average desired size of 600m<sup>2</sup>, but without all lots ending up at 4000m<sup>2</sup>. The main landowner in Area 3 has a few hectares he wants to subdivide so an average provision could be workable for his subdivision. Whilst it is common for Development Plans to have an average and a minimum, if council preferred just one provision only which was expressed as a minimum, then this should be 6000 m<sup>2</sup>.)

## Buildings

Policy direction should also include:

- Placement of buildings in accordance with a new Concept Plan reflecting the structure plan prepared for this area
- Buildings located and designed to minimise cutting and filling of existing land form and limiting the benching of areas to the dwelling site only
- Buildings designed to prevent large expanses of reflective glass when viewed from the north (flood plains) and incorporate the use of wide eaves and verandahs to provide shadowing
- Use materials and colours that are not highly reflective and blend with vegetated landscape



- Buildings designed to place noise sensitive rooms away from the neighbouring bulk handling facility and rail line.

Buildings (including outbuildings) should be prevented from being established on the lower slopes of the land identified on the Concept Plan. This land should be planted with suitable native vegetation to improve the visual interface with the River flood plain, but also provide for erosion protection.

### Concept Plan

The Concept Plan should include a landscaped vegetated buffer of no less than 15 metres width around the perimeter of the bulk handling facility to block views to the facility from the dwellings, as well as assist in buffering impacts from dust from vehicle movements in this location.

### Waste Water

The policy area should also ensure that new dwellings are not established unless they can be adequately serviced by an appropriate waste water system and adequately control the quality of run-off from all buildings and hardstand areas so as to prevent impacting the water quality within the adjacent river water course.

### Bulk Handling

For the extent of the area covered by the existing rail corridor and Viterra Silos and associated land parcel, a more appropriate zone is required that recognises this long standing use and function in this location. The Bulk Handling Zone is the most appropriate for this land and should be inserted into the Development Plan for this land.

## 9.2 Freeway Buffer Area

The existing area identified between Old Swanport Road and the Freeway is currently zoned Rural Landscape Protection. It places emphasis on maintaining a rural and semi-rural character and preventing unsightly development from views from the freeway. A number of stringent design policies apply to ensure this occurs including a 100 metre setback from the freeway for buildings, single storey buildings only and use of appropriate colours and finishes. There is also a strong policy limitation on further land division in this location, with the 100 hectare minimum lot size requirement effectively preventing any further division of land.

The size of the bulk of land parcels in this location are too small to be viable for rural / primary production uses and the number of dwellings on land in this location supports a more rural living function, notwithstanding the existing rural zoning.

The future use of this location should continue to be rural living in nature, given the arrangement of land and buildings in this location. It is an appropriate transition between the freeway and urban development proposed north of Old Swanport Road. However, there is considered to be scope in the potential development of some of these properties to provide more manageable (smaller) sized lots given that the viability of many of these sites for farming and horticultural purposes is limited.

An assessment of existing allotment sizes in the zone indicates that the vast majority (79%) are between 1.8 and 4 hectares in area with just over half between 1.8 and 2.2 hectares in area. All allotments are already well below the minimum sizes of 100 hectares allocated within the existing zone. Only 3 allotments are larger than 4 hectares. Given the dominant land parcel size is around the 2 hectares size, it is appropriate that future land division aligns to this established predominant land size.





This would mean that approximately 11 additional allotments could be created as a result (subject to ensuring visual buffers and appropriate frontage widths continue to be maintained).

This land parcel size aligns with many of the minimum site areas envisaged within the Precincts within the existing Rural Living Zone within the Council's Development Plan.

## Zone

Therefore, it is recommended that the Rural Landscape Protection Zone in this location be changed to a Rural Living Zone, with a specific "Freeway Interface" Policy Area or Precinct providing more specific policy support for the design issues in this location.

## Objectives

The primary objective of the Policy Area or Precinct should be minimising unsightly development from the freeway, as well as preserving the landscape character of this location, reflective of its transition from the urban area. In order to achieve this, the following policy guidelines should be applied:

- Minimum allotment size of 2 hectares
- Minimum road frontage of 40 metres (unless in the form of a hammerhead allotment)
- Only 1 dwelling per allotment
- Buildings limited to single storey in form
- Setback of buildings from the freeway frontage of 100 metres
- Number of outbuildings per allotment minimised
- Existing native vegetation preserved and not removed as a result of new buildings or use of the land
- Additional landscape screening buffer of 20 metres depth be planted along the freeway frontage and comprise indigenous vegetation planted at a density sufficient to act as a visual screen.

## 9.3 Industry Areas

The industry areas identified within the Structure Plan in Areas 1 and 2 are mostly covered by the existing General Industry Zone. The policies within the existing zone are considered to provide adequate support for the types of land uses appropriate in these locations, along with appropriate design and stormwater management guidelines for the forms of development envisaged to establish in these locations. As such no changes to the General Industry Zone are considered necessary.

## Zone

The existing Deferred Urban zoned area of land identified within the Structure Plan as industry between Maurice Road and Woodlands Road should be rezoned to a Light Industry Zone. This is appropriate to ensure that the land uses established in this location are smaller and less intensive in scale and impact so as not to threaten the amenity of existing and future adjacent residential areas.

## Interface

Policy support for addressing potential amenity impacts at the interface of the industry areas with neighbouring residential development is provided within the Interface Between Land Uses module within the General Section of the Development Plan, and no additional policy support is considered necessary for these locations (other than perhaps updating the module to the latest version available – Version 6).



## 9.4 Mobilong Prison and Correctional Services Expansion Area

The Mobilong Prison and Correctional Services expansion area currently sits within the Community Zone with Precinct 1 Mobilong Correction Facilities. This policy was written specifically to accommodate the current operations and future expansion of the correctional services facilities and continues to remain appropriate for this purpose. No specific changes are considered necessary to accommodate the recommended Structure Plan for this area and its surrounding environs.

## 9.5 Whites Hill Escarpment

The existing extent of land covering the Whites Hill Escarpment is currently zoned as Deferred Urban, along with the areas lower down the slopes. Given that this land plays an important role as a visual backdrop to the township, and has already been identified through a separate NRM engagement process as suitable for conservation and open space, the Deferred Urban zoning of this land is not considered to be appropriate into the future. Notwithstanding the current limitations on land division and the desired cropping and grazing land uses, the zone implies a potential for future urban purposes for this land, which is not appropriate.

### Zone

In considering alternative zone options, regard has been had to both the strategic role of this area into the future and the “fit” of this role within the existing zones within the Development Plan and, in the absence of a suitable zone, those within the SA Planning Policy Library.

The open space and conservation role of this area of land implies a need to apply a zone that prevents urban uses, as well as more intensive horticultural and agricultural land uses which may compromise its conservation function. This is important given that the vast majority of land in this location is covered by remnant native vegetation.

Upon examination of appropriate zones within the Development Plan, there does not appear to be a zone that appropriately fulfils the objectives of conserving the natural and visual attributes of this land. Therefore, in examining the SA Planning Policy Library, the most appropriate zone is considered to be the Open Space Zone. The Open Space zone appropriately reflects the future function of this area as an open space resource with a range of walking, bike and potentially horse trails running through it and connecting to future adjacent residential areas as well as the visual significance of this location. Additional local addition policy should be provided to:

- Highlight the importance of this location as a significant backdrop to the township’s urban areas
- Focus recreational uses to passive uses only and prevent formal recreation activities and facilities from establishing in this location
- Ensure any development maintains the open and strong landscape character of this location
- Ensure buildings are limited in numbers and size and carefully designed and located to minimise disruptions to the natural outlook.

## 9.6 Adelaide Road Light Industry Zone

### 9.6.1 Land Use Assessment

A detailed land use assessment has been undertaken of the land area located within the Light Industry Zone along Adelaide Road and Maurice Road. The mixture of land uses is identified within the Table below and the spatial distribution of land uses is shown within Figure 14.



Current Uses	Number of Properties
Service Trade Premises	26
Residential	22
Warehouse/Store	19
General Industry	19
Other	12
Vacant Land	10
Light industry	9
Bulky Goods	8
Service Industry	5
Petrol Filling Station	1



Figure 14: Spatial distribution of land uses within Light Industry Zone

The diversity and mixture of land uses within the zone demonstrate an ad hoc nature of the establishment of activities in this location over time. The dominance of motor vehicle related activities points to the attractiveness of this location as a result of the amount of passing traffic (being the principal route into town and the town centre from Adelaide). Of interest is the presence of a large number of dwellings, presumably a left over from the previous zoning of land in this location.

There is evidence of a number of bulky goods outlets in this location, despite being discouraged within the zone. The degree of exposure of this location indicates a desire to provide for some retail and commercial uses above and beyond that envisaged within the Light Industry Zone. The types of uses envisaged within the Light Industry Zone, such as stores, warehouses and light industry itself, are not activities that require exposure to passing traffic. Therefore, the suitability of this zone along this section



of Adelaide Road is questionable. This is supported given the generally underutilised and vacant industry zoned land in other parts of the township which can potentially accommodate some of the uses established in this location.

In considering the potential role for this land in the structure of the township, regard has been had to:

- The high exposure nature of the location
- The extent and length of the zone and uses within it
- The interface with residential areas – particularly the fact that the vast majority of the zone comprises the entire urban block (ie roadways to the rear act as buffers to uses), and
- The need to ensure that future development is appropriate in scale and function so as not to undermine the function of the Town Centre as the primary activity centre of the township.

## Zone

In this context it is recommended that the full extent of the Light Industry Zone be rezoned to a Commercial Zone. This zone provides greater flexibility to accommodate bulky goods outlets, consulting rooms and offices, as well as motor vehicle related activities, reflective of many of the activities that have evolved in this location at present.

Feedback from land owners seeking to entice bulky goods retailers has indicated that the existing Bulky Goods Zone on Hindmarsh Road is too far from major transport routes to be attractive to such retailers. Such facilities generally require larger land parcels to accommodate them, and there is limited scope for such facilities within the Regional Town Centre. There are a number of larger land holdings throughout the existing Light Industry Zone that are considered appropriate for Bulky Goods facilities.

However we are aware of Council's intentions to rezone the existing Johnstone Park for a future Bulky Goods Zone and that the process for preparing this DPA has commenced. In light of this, it is not considered necessary to specifically provide policy focussing Bulky Goods (either as a policy area or precinct) anywhere specifically within the zone (such as around the Adelaide Road and Maurice Road junction). Rather the flexibility afforded by the Commercial Zone allows for the market to dictate on the most appropriate uses, without undermining the Bulky Goods hub sought into the future at Johnstone Park.

## Appearance

The appearance of many of the properties along this stretch of Adelaide Road is untidy, underutilised and generally in need of investment. Any future rezoning of this land should include better policy coverage which ensures high quality design outcomes fronting Adelaide Road. This is important given this area forms a gateway into the town from Adelaide. This should include:

- Ensuring the Adelaide Road frontage is appropriately designed with an office or shopfront to any light industry or store/warehouse use
- Fencing is of high quality and avoids the use of high chain mesh fencing forward of building facades
- Landscaping is included within car parking areas, particularly adjacent the street frontage
- Car parking areas are generally located to the rear of buildings, are sealed and appropriately line marked, and
- Signage is consolidated so there is not a proliferation of signage on sites, appropriately scaled to the building to which it relates and limited to promoting the approved use on the land only.





## 9.7 General Policies

### Noise and Air Emissions

It is appropriate that Council considers adopting the Noise and Air Emissions Overlay within the Development Plan, specifically for the land adjacent to the rail corridor within Area 3, but potentially also more broadly where residential development interfaces with the rail corridor or the freeway.

The benefit of applying this overlay is that it provides more policy support in ensuring dwellings in these locations address the potential impacts of noise from the train services and, importantly, enables the *Minister's Code SA 78B for the Construction Requirements for the Control of External Sound* to be applied against the Building Rules Consent.

### Bushfire Protection

There is also a need to change the Bushfire Protection Area for the areas being rezoned to Residential. This specifically includes making the new residential areas a General Bushfire Risk area, but retaining the Whites Hill Escarpment area as a Medium Bushfire Risk area. This is only a mapping change within the Development Plan.

### Affordable Housing

Similarly, the provisions applying to the additional residential areas should seek to accommodate the establishment of affordable housing. Therefore, Council should consider applying the Affordable Housing Overlay to the extent of the additional residential areas proposed within the Structure Plan.



## 10. REFERENCES

- Burke, K, 2014, Infrastructure Implementation Model, LGA Presentation Paper
- Connor Holmes, 2012, Murray Bridge Structure Plan
- DPTI, 2010, Housing and Employment Land Program Report
- DPTI, 2012, Residential Land Supply Report
- DPTI, 2012, Housing and Employment Land Supply Program Report
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- DPTI, 2014, Murray Bridge Population Change and Dwelling Stock Summary
- DPTI, 13 March 2014, Murray Bridge Council Development Plan
- Government of SA, 2009, SA Planning Strategy: 30 Year Plan for Greater Adelaide Volume
- Kungun Ngarrindjeri Yunnan Agreement, 17 March 2008
- QED Pty LTd, 2007, Murray Bridge Urban Growth Plan
- QED Pty LTd, 2007, Mobilong Corrections Precinct Planning Report
- Parsons Brinkerhoff, 2012, Murray Bridge Integrated Transport and Traffic Strategy
- Profile ID, Murray Bridge Community Profile (<http://profile.id.com.au/murray-bridge>)
- RC Murray Bridge, 2013, Sport, Open Space and Recreation Strategy (Volumes 1 – 4)
- RC Murray Bridge, 2013, Strategic Directions Report
- SA EPA, 2013, Guidelines for the Assessment of Noise from Rail Infrastructure
- SEAGas, Guidelines for the Planning and Development of Land in the Vicinity of High Pressure Natural Gas and Liquid Petroleum Pipelines
- URPS, 2013, Land Use Study and Development Plan Review for the Lower Murray Flood Plain



## 11. APPENDICES



## 11.1 Appendix 1 - List of People Consulted

In addition to landowners who attended the workshops for Study Areas 1, 2 and 3, the following people were consulted as part of the investigations informing this Project.

Liz Brierley – Manager Operations, SEAGas

John Chamberlain, Policy and Projects, Department of Planning, Transport and Infrastructure

Bert Rowe, Managing Planner, Department of Planning, Transport and Infrastructure

Chris Zafiropoulos, General Manager Planning, Department of Planning, Transport and Infrastructure

Sally Jenkins, Team Leader Council Policy, Department of Planning, Transport and Infrastructure

Chris Rudd, Team Leader - Population, Land and Housing Analysis Unit, Department of Planning, Transport and Infrastructure

Elsbeth Young, Co-ordinator, Protected Area System, Department of Environment, Water and Natural Resources

Ruth Warren, Property Officer – East-West, Australian Rail Track Corporation

Paul Robinson, Acting Director, Asset Services, Department of Correctional Services

Tony Golder, 95 Old Swanport Road, Murray Bridge

Jack Tansley, Coordinator South East Region, Viterra

Wayne Brown, Environments By Design

Mark Reu, Hume Reserve Road, Murray Bridge

David Mackay, Thomas Foods

James Sexton, Director, Maton Investments

Geof Bone, Burke Urban

Kym Burke, Burke Urban

Saskia Davidson, Swamp Road Murray Bridge

Kelly Spry, multiple land owner

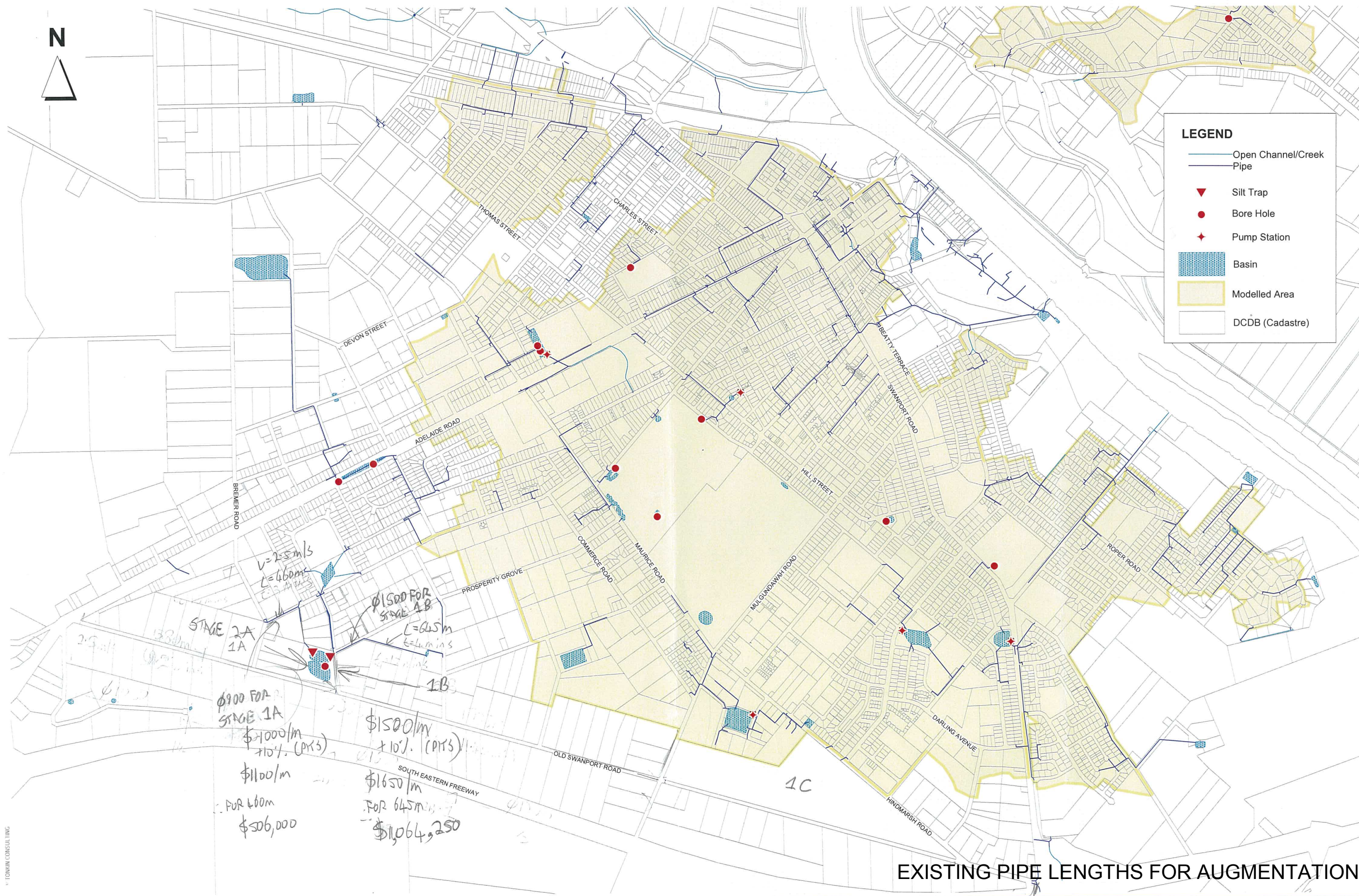




## 11.2 Appendix 2 - Infrastructure Calculations and Assumptions









External Road upgrade lengths

STAGE 1A

Asset_ID	Name	Segment	Segment_Length_m	Kerb_Length_To_Construct
R2700	Adelaide Rd service rd	10 - Old Swanport Rd to 330m west Agricultural Dr	593.366	593.366
R2961	Adelaide Rd service rd	20 - 330m west Agricultural Dr to Agricultural Dr	328.878	328.878
R2390	Adelaide Rd service rd	30 - Agricultural Dr to Zerna Rd	137.502	121.6
R2246	Zerna Av	10 - Christian Rd to Frieda St	142.071	128.67
R2245	Zerna Av	20 - Frieda St to Adelaide Rd	354.963	305.27
R2750	Christian Rd	110 - Rural Av to Zerna Av	109.769	0
R2100	Rural Av	10 - Old Swanport Rd to Prosperity Gr	203.569	203.569
R2099	Rural Av	20 - Prosperity Gr to Christian Rd	309.061	0
R2007	Old Swanport Rd	10 - Adelaide Rd to Agricultural Dr	979.599	979.599
R2008	Old Swanport Rd	20 - Agricultural Dr to Rural Av	456.14	456.14
Total			3614.918	3117.092

STAGE 1B

Asset_ID	Name	Segment	Segment_Length_m	Kerb_Length_To_Construct
R2100	Rural Av	10 - Old Swanport Rd to Prosperity Gr	203.569	190.31
R2099	Rural Av	20 - Prosperity Gr to Christian Rd	309.061	0
R1666	Christian Rd	30 - Commerce Rd to Shannon Ct	88.918	0
R3038	Christian Rd	40 - Shannon Ct to Drew St	106.565	0
R1667	Christian Rd	50 - Drew St to Norman St	141.783	0
R2746	Christian Rd	60 - Norman St to Cromwell Rd	291.668	0
R2747	Christian Rd	70 - Cromwell Rd to Sir John Cowan Av	127.278	0
R2748	Christian Rd	80 - Sir John Cowan Av to unnamed road	251.339	0
R3039	Christian Rd	90 - unnamed road to Recreation Av	65.83	0
R2749	Christian Rd	100 - Recreation Av to Rural Av	219.71	0
R1676	Commerce Rd	10 - Brinkley Rd to Zenca Ct	132.512	132.512
R2753	Commerce Rd	20 - Zenca Ct to Lyric Cl	124.223	124.223
R2754	Commerce Rd	30 - Lyric Cl to Grose St	104.506	104.506
R2755	Commerce Rd	40 - Grose St to Bywaters Rd	208.449	200.52
R1677	Commerce Rd	50 - Bywaters Rd to Frank St	206.45	198.11
R1678	Commerce Rd	60 - Frank St to Ferris Ct	104.789	104.789
R3409	Commerce Rd	70 - Ferris Ct to Prosperity Gr	83.098	83.098
R1675	Commerce Rd	80 - Prosperity Gr to Christian Rd	311.959	311.959
R2791	Brinkley Rd	40 - Commerce Rd to Old Swanport Rd	459.909	446.85
R2009	Old Swanport Rd	30 - Rural Av to Sir John Cowan Av	565.611	565.611
R2010	Old Swanport Rd	40 - Sir John Cowan Av to Production Rd	513.785	513.785
R2766	Old Swanport Rd	50 - Production Rd to Brinkley Rd	645.256	640.35
Total			5266.268	3616.623

STAGE 2A

Asset_ID	Name	Segment	Segment_Length_m	Kerb_Length_To_Construct
R1611	Bremer Rd, Murray Bridge	30 - Grassmere Dr to 573m north Grassmere Dr	572.935	572.935
R1614	Bremer Rd, Murray Bridge	10 - Adelaide Rd to Doecke Rd	231.454	199.63
R2997	Bremer Rd, Murray Bridge	20 - Doecke Rd to Grassmere Dr	258.62	258.62
Total			1063.009	1031.185

STAGE 2B

Asset_ID	Name	Segment	Segment_Length_m	Kerb_Length_To_Construct
R1611	Bremer Rd, Murray Bridge	30 - Grassmere Dr to 573m north Grassmere Dr	572.935	572.935
R1775	Grassmere Dr	10 - Bremer Rd to Warner Rd	181.878	181.878
R2768	Grassmere Dr	20 - Warner Rd to Greenlands Dr	142.783	142.783
R1781	Greenlands Dr	10 - Grassmere Dr to Lincoln Rd	437.802	437.802
R2771	Lincoln Rd	50 - Devon St to Greenlands Dr	248.617	229.9
R2438	Devon St	10 - Ashbrook Rd to Lincoln Rd	322.16	322.16
R1576	Ashbrook Rd	10 - Woodlands Rd to Avoca Rd	218.444	218.444
R1577	Ashbrook Rd	20 - Avoca Rd to Devon St	250.917	250.917
R2238	Woodlands Rd	10 - Greenlands Dr to Ashbrook Rd	264.568	264.568
Total			2640.104	2621.387

BREMER ROAD EXTENSION

Asset_ID	Name	Segment	Segment_Length_m	Kerb_Length_To_Construct
	Bremer Rd Extension	Bremmer Road Cemetery to Maurice Road	646	646

Notes:

1. Street length data obtained from City of Murray Bridge; Bremmer Road extension scaled from Google Earth
2. Kerb Length to construct assumes existing kerbs are to remain

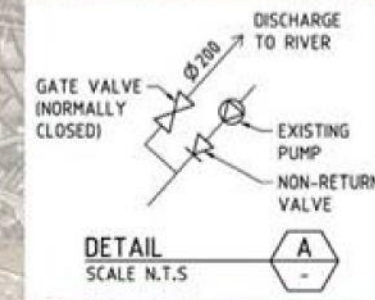






# LEGEND:

- EXISTING IRRIGATION MAIN ( $\geq 80\phi$ )
- PROPOSED DISTRIBUTION MAIN
- FUTURE DISTRIBUTION MAIN
- RESERVE CURRENTLY IRRIGATED FROM IRRIGATION MAIN
- ADDITIONAL RESERVE ADDED TO SCHEME
- RESERVE NOT IRRIGATED UNDER STAGE 1 OF SCHEME
- RESERVE MAY BE ADDED TO SCHEME VIA IRRIGATION EXTENSIONS AT A LATER DATE
- 24 RESERVE NUMBER
- NON RETURN VALVE
- FLOW CONTROL VALVE
- PRESSURE REDUCING VALVE



## NOTES

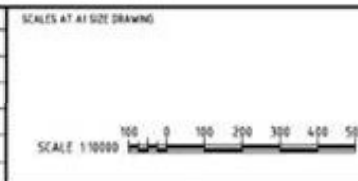
- CLASS 12 DPVC PIPE.
- WHERE SAME PIPE ROUTE AS DISTRIBUTION MAINS, COMMON TRENCH CAN BE UTILIZED, MIN 600 CLEARANCE BETWEEN PIPES ALONG PROSPERITY GROVE AND MIN 300 CLEARANCE BETWEEN PIPES ALONG MAURICE ROAD.
- MINIMUM COVER AS PER WSAA DRAWINGS WAT-1201 FOR SEALED ROADS.
- REINSTATEMENT OF MAINS AS PER SA WATER WSCM DRAWINGS B1, B2 AND B3.
- INCORPORATE ISOLATION VALVE AT EACH INTERSECTION OF PIPELINES.
- ALLOW FOR AIR VALVES ON THE FOLLOWING PIPELINES (CENTRAL AND SCOPE B)
  - 1 x  $\phi 200$
  - 1 x  $\phi 250$
- EASEMENT REQUIRED FOR GOLF COURSE CONNECTION MAIN.

DRAWING FILE LOCATION / NAME  
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REV	DATE	AMENDMENT / REVISION DESCRIPTION
A	06/04/14	CLIENT REVIEW
B	06/08/14	ISSUED FOR PRELIMINARY DESIGN
C	28/08/14	ISSUED FOR HAZOP
D	22/09/14	ISSUED FOR FUNCTIONAL DESIGN

PLOT DATE  
22 Sep 2014

WVR No.	APPROVAL	TITLE	NAME
ADL-001	KW	DRAFTER	N. HANKEY
ADL-002	KW	DRAFTING CHECK	A. FREER
-	KW	DESIGNER	S. CHAN
-	KW	DESIGN CHECK	R. WILSON
-	-	PROJECT MANAGER	M. WESCOMBE
-	-	PROJECT DIRECTOR	G. LUSH



DESIGNER  
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ADELAIDE S.A. 5000  
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SMEC PROJECT No 3005395

CLIENT  
**MURRAY BRIDGE**  
The Rural City of  
MURRAY BRIDGE  
Bridge to Opportunity

PROJECT TITLE	THE RURAL CITY OF MURRAY BRIDGE STORMWATER HARVESTING ECI
STAGE 1 DISTRIBUTION MAINS LAYOUT AND SIZING	
SCALE	1:10000 (A1)
PHASE	PRELIMINARY
PROJECT / DRAWING No.	3005395-DIS-001
REVISION	D

**PRELIMINARY**



## 4.4 Detailed Design

### 4.4.1 Hydrological and Hydraulic Calculations

Drainage is to be designed to accommodate runoff from lots based on current available zoning information or proposed future zonings, where applicable.

The impervious site coverage of residential lots should be based on Table 4.1.

Lot Size (m <sup>2</sup> )	Impervious Site Area (m <sup>2</sup> )	Fraction Impervious (%)
<500		90>
500	300	60
800	360	45
1200	450	37.5
1500	500	33
2000 or greater		30

Table 4.1 Impervious Site Area based on Lot Size

Road reserves are to be assumed 100% impervious for the pavement area and 50% impervious for verge areas.

Rainfall Intensity-Frequency-Duration data for RCMB is included in Appendix 4. For continuous simulation modelling the designer shall seek confirmation from RCMB on the suitability of hydrological data.

For rational method calculations the maximum time of concentration used in urban areas should be 20 minutes unless sufficient evidence is provided to justify a greater time. The minimum time of concentration in an urban area used for calculations is to be 5 minutes.

For hydraulic analysis, the highest value is to be adopted of the top of the outlet pipe, or the 1 in 100 yr ARI flood level for downstream water surface levels.

Where engineering calculations are requested for audit by RCMB they are to be submitted in the following format;

For the Minor Drainage system

- Hydrological calculation summary sheets in the form of the example given in Technical Note 6 of AR & R.
- Hydraulic calculation summary sheets in the form of the example given in Technical Note 9 of AR & R.

## APPENDIX 4 - Rainfall Data

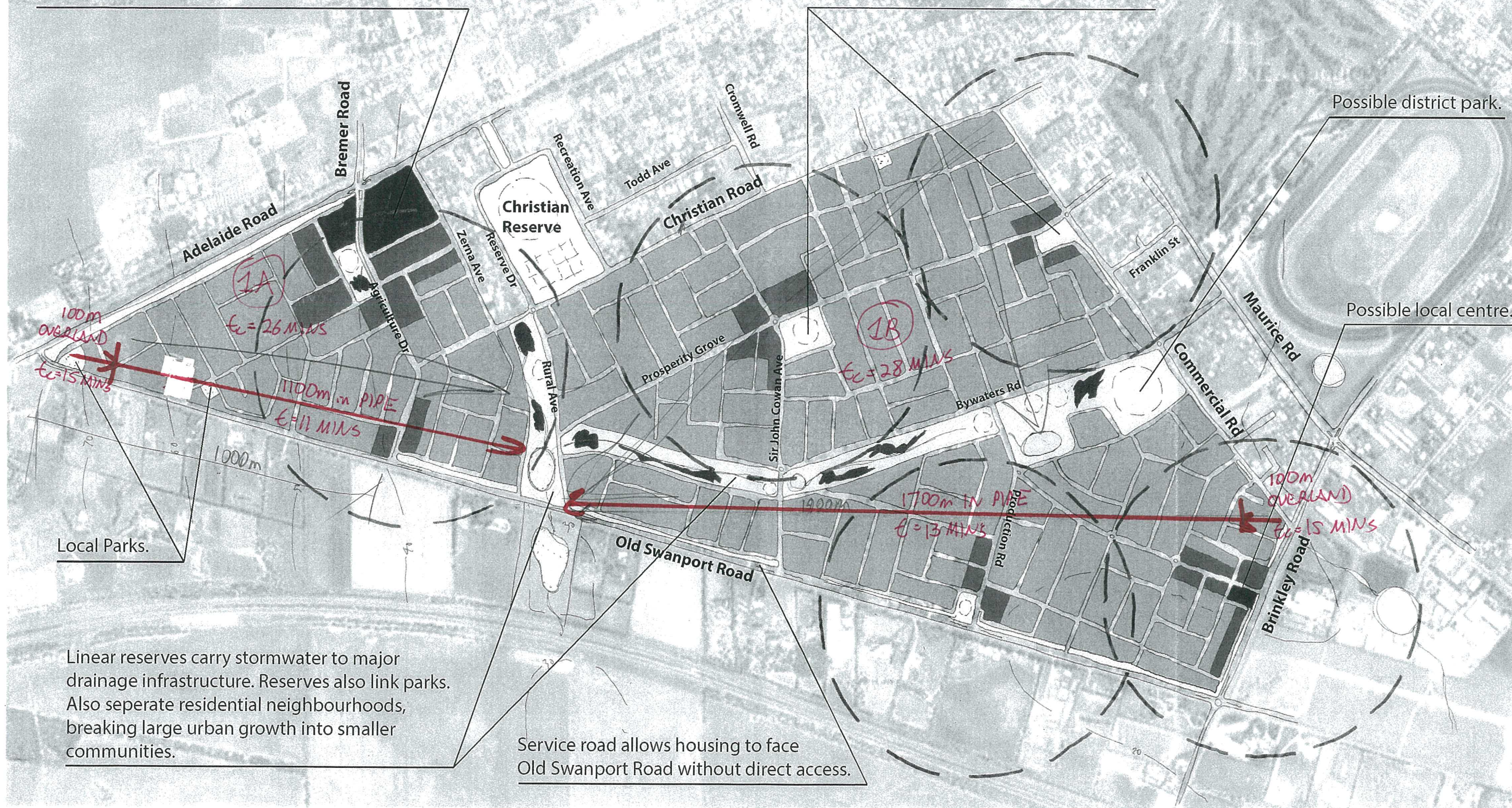
### Rainfall Intensity For Murray Bridge, SA

Duration	Average Recurrence Interval (years)						
	1	2	5	10	20	50	100
5m	41.3	56	79	95	117	150	179
6m	38.5	52	73	88	109	139	165
7m	36.1	48.7	69	83	102	130	155
8m	34.1	46.0	65	78	96	123	145
9m	32.4	43.7	61	74	91	116	137
10m	30.9	41.7	58	70	86	110	131
11m	29.6	39.9	56	67	82	105	124
12m	28.4	38.2	53	64	79	101	119
13m	27.3	36.8	51	62	76	96	114
14m	26.4	35.4	49.5	59	73	93	110
15m	25.5	34.2	47.7	57	70	89	106
16m	24.6	33.1	46.1	55	68	86	102
17m	23.9	32.1	44.7	54	66	83	99
18m	23.2	31.1	43.3	52	64	81	95
19m	22.5	30.3	42.1	50	62	78	92
20m	21.9	29.4	40.9	49	60	76	90
21m	21.4	28.7	39.8	47.7	58	74	87
22m	20.8	27.9	38.8	46.4	57	72	85
23m	20.3	27.3	37.8	45.3	55	70	83
25m	19.4	26	36	43.1	53	67	79
30m	17.5	23.5	32.4	38.7	47.2	60	70
45m	13.8	18.4	25.3	30.1	36.6	46.1	54
1hr	11.5	15.4	21	25	30.3	38.1	44.6
1.5hr	8.67	11.6	15.8	18.7	22.6	28.4	33.3
2hr	7.04	9.38	12.8	15.2	18.3	23	27
3hr	5.24	6.98	9.49	11.2	13.6	17	19.9
6hr	3.16	4.20	5.69	6.72	8.12	10.2	11.9
12hr	1.9	2.53	3.42	4.03	4.86	6.07	7.08
18hr	1.43	1.90	2.56	3.01	3.62	4.51	5.26
24hr	1.17	1.55	2.08	2.44	2.93	3.65	4.24
48hr	0.7	0.92	1.23	1.44	1.72	2.13	2.47
72hr	0.5	0.66	0.87	1.02	1.22	1.50	1.74



Potential for small centre at junction of Adelaide Rd, Bremer Rd and Agricultural Dr. Cluster of local shops, services and housing.

Residential new neighbourhood located on (existing) major street. Neighbourhood or local park at centre as focal point.



DRAFT

# MURRAY BRIDGE RESIDENTIAL GROWTH Areas Investigation Area 1 Illustrative Master Plan

1:5000@A1, 1:10,000@A3 October 2014

(mm)  
1:10 (m)



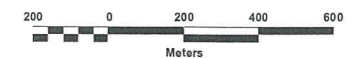


# The Rural City of Murray Bridge

## Residential Growth Areas Investigation Concept Plan - Areas 1 + 2

### Legend

- Area of Interest
- Property Boundary
- Residential Growth Area
- Industry - existing and growth
- Community Uses (Prison, Prison Expansion, Cemetery)
- Landscape Protection (Hillslopes)
- Landscape Protection (Freeway Buffer) / Rural Living
- Detention Basins (existing) and Drainage
- Green Corridors / Linear Open Spaces
- District/Regional Park locations - (2013 Open Space Strategy)
- Possible additional or alternative District Park locations to service residential growth areas
- Centres - potential location for community, retail, business uses
- Major Roads - existing
- Major Roads - proposed (Bremer Road extension)
- Minor Roads - existing
- Minor Roads - future (indicative only - not all minor streets shown)
- Gas pipeline



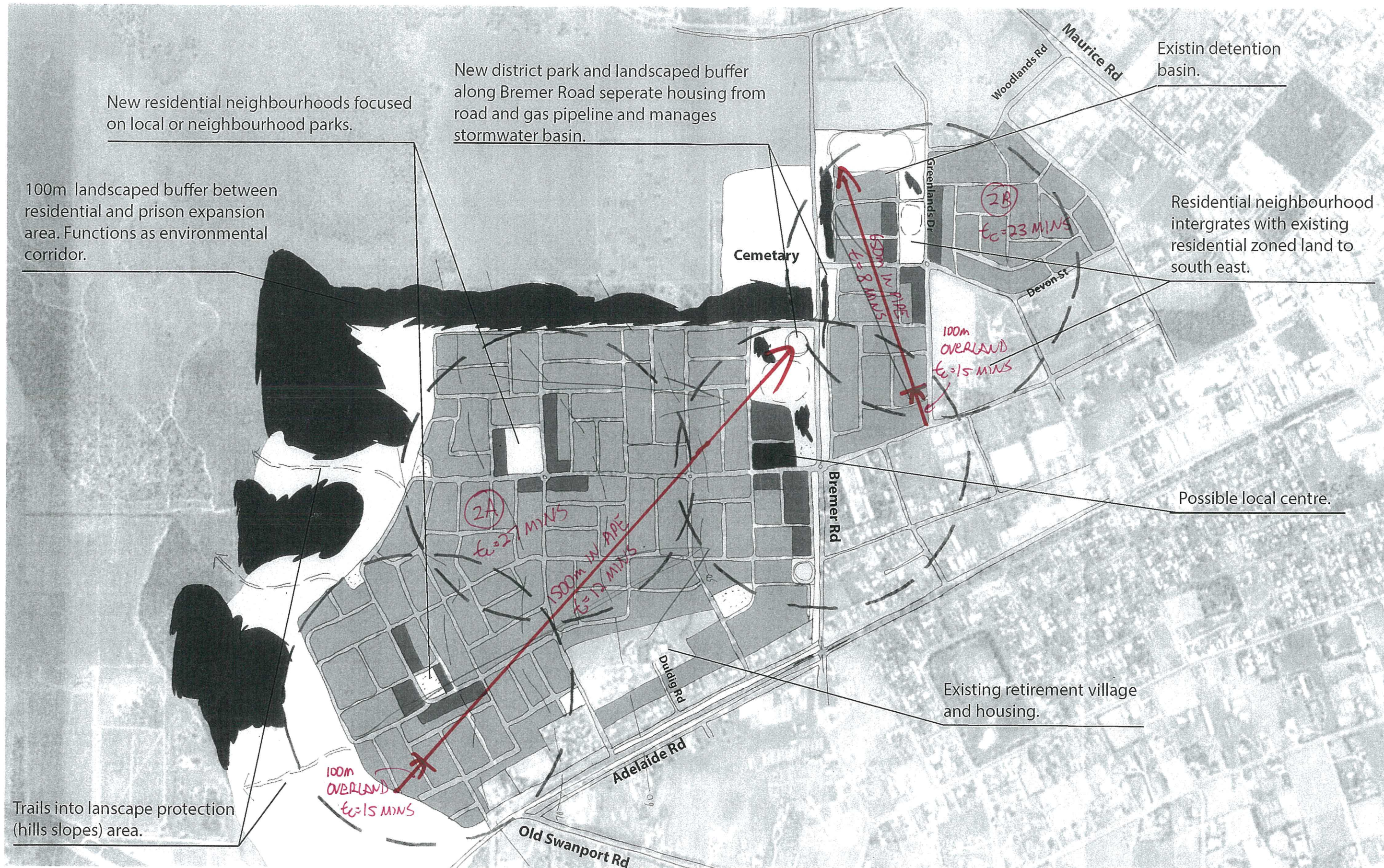
**Jensen**  
PLANNING  
+ DESIGN

September 2014

1:20,000@A3







DRAFT

# MURRAY BRIDGE RESIDENTIAL GROWTH Areas Investigation Area 2 Illustrative Master Plan

1:5000@A1, 1:10,000@A3 October 2014

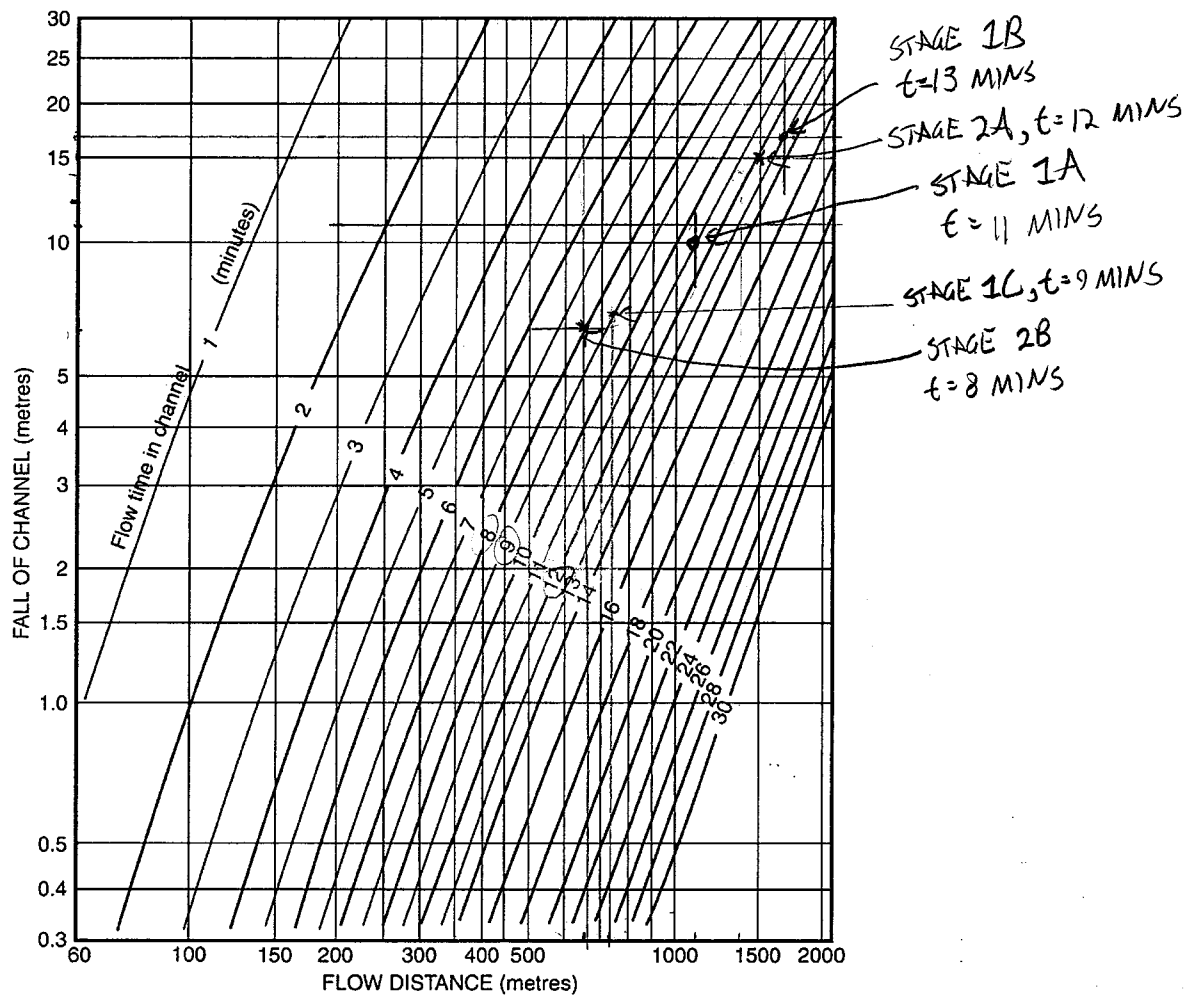




#### 4.06.7 Initial estimate of kerb, pipe and channel flow time

An initial (trial) estimate of flow time can be determined from Figure 4.09. The chart may be used directly to determine approximate travel times along a range of rigid channel types and, with the application of multiplier  $\Delta$  for a range of loose-boundary channel forms.

Once a trial flow rate has been determined, the travel time determined from Figure 4.09 will need to be checked using either Figures 4.10 or 4.11.



Flow travel time in pipes and channels (Source: Argue, 1986)  
Figure 4.09

##### NOTES (Figure 4.09):

1. Flow travel time (approximate) may be obtained directly from this chart for:

- kerb-and-gutter channels
- stormwater pipes
- allotment channels of all types (surface and underground)
- drainage easement channels (surface and underground)

2. Multiplier  $\Delta$ , should be applied to values obtained from the chart as per:

- grassed swales, well maintained and without driveway crossings
- blade-cut earth table drains, well maintained and no driveway crossings
- natural channels

$\Delta = 4$

$\Delta = 2$

$\Delta = 3$



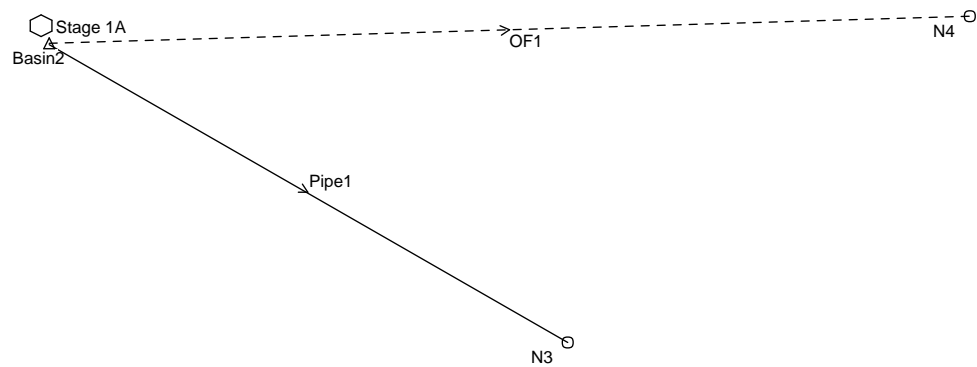
PIPE SIZING CALCULATIONS

Stage Catchment Details

Stage		Area (Ha)	C10	Fy (5)	C5	tc	I (mm/hr)	Q5
1A	Lots	31.29	0.5	0.95	0.475	26	36	1.98
	Roads	5.215	0.9	0.95	0.855			
	Open Space	5.215	0.1	0.95	0.095			
	Combined	41.72	0.5	0.95	0.48			
1B	Lots	106.9425	0.5	0.95	0.475	28	34.2	6.43
	Roads	17.82375	0.9	0.95	0.855			
	Open Space	17.82375	0.1	0.95	0.095			
	Combined	142.59	0.5	0.95	0.48			
1C	Lots	12.555	0.5	0.95	0.475	24	37	0.82
	Roads	2.0925	0.9	0.95	0.855			
	Open Space	2.0925	0.1	0.95	0.095			
	Combined	16.74	0.5	0.95	0.48			
2A	Lots	88.125	0.5	0.95	0.475	27	34.2	7.00
	Roads	35.25	0.9	0.95	0.855			
	Open Space	17.625	0.1	0.95	0.095			
	Combined	141	0.55	0.95	0.52			
2B	Lots	27.2925	0.5	0.95	0.475	23	37.8	1.81
	Roads	4.54875	0.9	0.95	0.855			
	Open Space	4.54875	0.1	0.95	0.095			
	Combined	36.39	0.5	0.95	0.48			

Pipe Sizing

Q (max) <sup>3</sup> (m /s)	Pipe dia (mm) (mm)	
0.13	300	
0.23	375	
0.38	450	
0.55	525	
0.84	600	Stage 1C
1.5	750	
2.4	900	Stage 1A & 2B
3.8	1050	
5.4	1200	
5.5	1350	
7.5	1500	Stage 1B & 2A
9.5	1650	
12.4	1800	



BASIN SIZING - TYPICAL DRAINS MODEL LAYOUT

**DRAINS MODEL DATA - STAGE 1A**

PIT / NODE DETAILS

PIT / NODE DETAILS		Version 11																
Name	Type	Family	Size	Ponding Volume (cu.m)	Pressure Change Coeff. Ku	Surface Elev (m)	Max Pond Depth (m)	Base Inflow (cu.m/s)	Blocking Factor	x	y	Bolt-down lid	id	Part Full Shock Loss	Inflow Hydrograph			
N3	Node					0.9		0		483.565	-237.616		7					
N4	Node							0		523.495	-205.208		10					

DETENTION BASIN DETAILS

Name	Elev	Surf. Area	Init Vol. (cu	Outlet Type	K	Dia(mm)	Centre RL	Pit Family	Pit Type	x	y	HED	Crest RL	Crest Length	id
Basin2	0	5000	0	Culvert		0.5					432	-208	No		4
	1	5000													

SUB-CATCHMENT DETAILS

Name	Pit or Node	Total Area (ha)	Paved Area %	Grass Area %	Supp Area %	Paved Time (min)	Grass Time (min)	Supp Time (min)	Paved Length (m)	Grass Length (m)	Supp Length (m)	Paved Slope(%)	Grass Slope %	Supp Slope %	Paved Rough	Grass Rough	Supp Rough	Lag Time or Factor	Gutter Length (m)	Gutter Slope %	Gutter FlowFactor	Rainfall Multiplier
Stage 1A	Basin2	41.72	50	50	0	26	31	0											0			1

PIPE DETAILS

Name	From	To	Length (m)	U/S IL (m)	D/S IL (m)	Slope (%)	Type	Dia (mm)	I.D. (mm)	Rough	Pipe Is	No. Pipes	Chg From	At Chg	Chg (m)	RI (m)	Chg (m)	RL (m)	etc (m)		
Pipe1	Basin2	N3	10	0	-0.1	1	Concrete, u	525	525	0.3	NewFixed	1	Basin2		0						

DETAILS of SERVICES CROSSING PIPES

Pipe	Chg (m)	Bottom Elev (m)	Height of S (m)	Chg (m)	Bottom Elev (m)	Height of S (m)	Chg (m)	Bottom Elev (m)	Height of S (m)	etc
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CHANNEL DETAILS

Name	From	To	Type	Length (m)	U/S IL (m)	D/S IL (m)	Slope (%)	Base Width (m)	L.B. Slope (1:?)	R.B. Slope (1:?)	Manning n	Depth (m)	Roofed					
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OVERFLOW ROUTE DETAILS

Name	From	To	Travel Time (min)	Spill Level (m)	Crest Length (m)	Weir Coeff. C	Cross Section	Safe Depth Major Stori (m)	SafeDepth Minor Stori (m)	Safe DxV (sq.m/sec)	Bed Slope (%)	D/S Area Contributing %	id	U/S IL	D/S IL	Length (m)		
OF1	Basin2	N4	0.1	1	5	2	Overflow a	0.05	0	0.6	1	0	9					



## DRAINS MODEL FLOW RESULTS - STAGE 1A

DRAINS results prepared 01 November, 2014 from Version 2013.12

PIT / NODE DETAILS		Version 8					
Name	Max HGL	Max Pond HGL	Max Surf Flow (cu.m/s)	Max Pond Volume (cu.m)	Min Freeboard (m)	Overflow (cu.m/s)	Constraint
N3	0.29		0				

SUB-CATCHMENT DETAILS							
Name	Max Flow Q (cu.m/s)	Paved Max Q (cu.m/s)	Grassed Max Q (cu.m/s)	Paved Tc (min)	Grassed Tc (min)	Supp. Tc (min)	Due to Storm
Stage 1A	0.557	0.557	0	26	31		0 AR&R 100 year, 72 hours storm, average 1.6 mm/h, Zone 6

Outflow Volumes for Total Catchment (20.9 impervious + 20.9 pervious = 41.7 total ha)

Storm	Total Rainfall (cu.m)	Total Runoff (cu.m)	Impervious Runoff (cu.m)	Pervious Runoff (cu.m)	Runoff %
AR&R 100	47811.13	23692.92	23692.92	0.00	0.0%

PIPE DETAILS					
Name	Max Q (cu.m/s)	Max V (m/s)	Max U/S HGL (m)	Max D/S HGL (m)	Due to Storm
Pipe1	0.474	2.73	0.392	0.296	AR&R 100 year, 72 hours storm, average 1.6 mm/h, Zone 6

CHANNEL DETAILS			
Name	Max Q (cu.m/s)	Max V (m/s)	Due to Storm

OVERFLOW ROUTE DETAILS							
Name	Max Q U/S	Max Q D/S	Safe Q	Max D	Max DxV	Max Width	Max V
OF1	0	0	0.288	0	0	0	0

DETENTION BASIN DETAILS					
Name	Max WL	Max Vol	Max Q Total	Max Q Low Level	Max Q High Level
Basin2	0.96	4813.3	0.474	0.474	0

CONTINUITY CHECK for AR&R 100 year, 72 hours storm, average 1.6 mm/h, Zone 6

Node	Inflow (cu.m)	Outflow (cu.m)	Storage (cu.m)	Ch Difference %
Basin2	23692.92	23505.3	191.17	0
N3	23505.3	23505.3	0	0
N4	0	0	0	0

Run Log for BASIN run at 12:57:22 on 1/11/2014

Flows were safe in all overflow routes.

**DRAINS MODEL DATA - STAGE 1B**

PIT / NODE DETAILS

Name	Type	Family	Size	Ponding Volume (cu.m)	Pressure Change Coeff. Ku	Surface Elev (m)	Max Pond Depth (m)	Base Inflow (cu.m/s)	Blocking Factor	x	y	Bolt-down lid	Part Full Shock Loss	Inflow Hydrograph
N3	Node					0.9		0		483.565	-237.616		7	
N4	Node							0		523.495	-205.208		10	

DETENTION BASIN DETAILS

Name	Elev	Surf. Area	Init Vol. (cu	Outlet Type	K	Dia(mm)	Centre RL	Pit Family	Pit Type	x	y	HED	Crest RL	Crest Length	id
Basin2	0	32250	0	Culvert	0.5					432	-208	No			4
	1	32250													

SUB-CATCHMENT DETAILS

Name	Pit or Node	Total Area (ha)	Paved Area %	Grass Area %	Supp Area %	Paved Time (min)	Grass Time (min)	Supp Time (min)	Paved Length (m)	Grass Length (m)	Supp Length (m)	Paved Slope(%)	Grass Slope %	Supp Slope %	Paved Rough	Grass Rough	Supp Rough	Lag Time or Factor	Gutter Length (m)	Gutter Slope %	Gutter FlowFactor	Rainfall Multiplier
Stage 1B	Basin2	142.59	50	50	0	28	33	0											0			1

PIPE DETAILS

Name	From	To	Length (m)	U/S IL (m)	D/S IL (m)	Slope (%)	Type	Dia (mm)	I.D. (mm)	Rough	Pipe Is	No. Pipes	Chg From	At Chg	Chg (m)	RI (m)	Chg (m)	RL (m)	etc (m)
Pipe1	Basin2	N3	10	0	-0.1	1	Concrete, u	1050	1070	0.3	NewFixed	1	Basin2		0				

DETAILS of SERVICES CROSSING PIPES

Pipe	Chg (m)	Bottom Elev (m)	Height of S (m)	Chg (m)	Bottom Elev (m)	Height of S (m)	Chg (m)	Bottom Elev (m)	Height of S etc (m)
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CHANNEL DETAILS

Name	From	To	Type	Length (m)	U/S IL (m)	D/S IL (m)	Slope (%)	Base Width (m)	L.B. Slope (1:?)	R.B. Slope (1:?)	Manning n	Depth (m)	Roofed
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OVERFLOW ROUTE DETAILS

Name	From	To	Travel Time (min)	Spill Level (m)	Crest Length (m)	Weir Coeff. C	Cross Section	Safe Depth Major Stori (m)	SafeDepth Minor Stori (m)	Safe DxV (sq.m/sec)	Bed Slope (%)	D/S Area Contributing %	id
OF1	Basin2	N4	0.1	1	5	2	Overflow a	0.05	0	0.6	1	0	9

## DRAINS MODEL FLOW RESULTS - STAGE 1B

DRAINS results prepared 01 November, 2014 from Version 2013.12

PIT / NODE DETAILS		Version 8					
Name	Max HGL	Max Pond HGL	Max Surf Flow (cu.m/s)	Max Pond Volume (cu.m)	Min Freeboard (m)	Overflow (cu.m/s)	Constraint
N3	0.29		0				

SUB-CATCHMENT DETAILS							
Name	Max Flow Q (cu.m/s)	Paved Max Q (cu.m/s)	Grassed Max Q (cu.m/s)	Paved Tc (min)	Grassed Tc (min)	Supp. Tc (min)	Due to Storm
Stage 1B	2.963	2.963	0	28	33		0 AR&R 100 year, 48 hours storm, average 2.3 mm/h, Zone 6

Outflow Volumes for Total Catchment (71.3 impervious + 71.3 pervious = 143 total ha)

Storm	Total Rainfall (cu.m)	Total Runoff (cu.m)	Impervious Runoff (cu.m)	Pervious Runoff (cu.m)	Runoff %
AR&R 100	158075.3	78324.12	78324.12	0.00	0.0%

PIPE DETAILS					
Name	Max Q (cu.m/s)	Max V (m/s)	Max U/S HGL (m)	Max D/S HGL (m)	Due to Storm
Pipe1	0.946	3.22	0.388	0.29	AR&R 100 year, 48 hours storm, average 2.3 mm/h, Zone 6

CHANNEL DETAILS			
Name	Max Q (cu.m/s)	Max V (m/s)	Due to Storm

OVERFLOW ROUTE DETAILS							
Name	Max Q U/S	Max Q D/S	Safe Q	Max D	Max DxV	Max Width	Max V
OF1	0	0	0.288	0	0	0	0

DETENTION BASIN DETAILS					
Name	Max WL	Max Vol	Max Q Total	Max Q Low Level	Max Q High Level
Basin2	0.98	31592.9	0.946	0.946	0

CONTINUITY CHECK for AR&R 100 year, 48 hours storm, average 2.3 mm/h, Zone 6

Node	Inflow (cu.m)	Outflow (cu.m)	Storage (cu.m)	Ch Difference %
Basin2	78324.12	73462.7	4862.16	0
N3	73462.7	73462.7	0	0
N4	0	0	0	0

Run Log for BASIN run at 12:57:22 on 1/11/2014

Flows were safe in all overflow routes.



**DRAINS MODEL DATA - STAGE 1C**

PIT / NODE DETAILS

PIT / NODE DETAILS		Version 11												
Name	Type	Family	Size	Ponding Volume (cu.m)	Pressure Change Coeff. Ku	Surface Elev (m)	Max Pond Depth (m)	Base Inflow (cu.m/s)	Blocking Factor	x	y	Bolt-down lid	id	Part Full Shock Loss Hydrograph
N3	Node					0.9		0		483.565	-237.616		7	
N4	Node							0		523.495	-205.208		10	

DETENTION BASIN DETAILS

Name	Elev	Surf. Area	Init Vol. (cu	Outlet Type	K	Dia(mm)	Centre RL	Pit Family	Pit Type	x	y	HED	Crest RL	Crest Length	id
Basin2		0	1750	0 Culvert		0.5					432	-208 No			4
		1	1750												

SUB-CATCHMENT DETAILS

Name	Pit or Node	Total Area (ha)	Paved Area %	Grass Area %	Supp Area %	Paved Time (min)	Grass Time (min)	Supp Time (min)	Paved Length (m)	Grass Length (m)	Supp Length (m)	Paved Slope(%)	Grass Slope %	Supp Slope %	Paved Rough	Grass Rough	Supp Rough	Lag Time or Factor	Gutter Length (m)	Gutter Slope %	Gutter FlowFactor	Rainfall Multiplier
Stage 1C	Basin2	16.74	50	50	0	24	29	0											0			1

PIPE DETAILS

Name	From	To	Length (m)	U/S IL (m)	D/S IL (m)	Slope (%)	Type	Dia (mm)	I.D. (mm)	Rough	Pipe Is	No. Pipes	Chg From	At Chg	Chg (m)	RI (m)	Chg (m)	RL (m)	etc (m)
Pipe1	Basin2	N3	10	0	-0.1	1	Concrete, u	375	375	0.3	NewFixed	1	Basin2		0				

DETAILS of SERVICES CROSSING PIPES

Pipe	Chg (m)	Bottom Elev (m)	Height of S (m)	Chg (m)	Bottom Elev (m)	Height of S (m)	Chg (m)	Bottom Elev (m)	Height of S etc (m)
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CHANNEL DETAILS

Name	From	To	Type	Length (m)	U/S IL (m)	D/S IL (m)	Slope (%)	Base Width (m)	L.B. Slope (1:?)	R.B. Slope (1:?)	Manning n	Depth (m)	Roofed
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OVERFLOW ROUTE DETAILS

Name	From	To	Travel Time (min)	Spill Level (m)	Crest Length (m)	Weir Coeff. C	Cross Section	Safe Depth Major Stori (m)	SafeDepth Minor Stori (m)	Safe DxV (sq.m/sec)	Bed Slope (%)	D/S Area Contributing %	id
OF1	Basin2	N4	0.1	1	5	2	Overflow a	0.05	0	0.6	1	0	9

## DRAINS MODEL FLOW RESULTS - STAGE 1C

DRAINS results prepared 07 November, 2014 from Version 2013.12

### PIT / NODE DETAILS

Name	Max HGL	Max Pond HGL	Max Surface Flow Arriving (cu.m/s)	Version 8 Max Pond Volume (cu.m)	Min Freeboard (m)	Overflow (cu.m/s)	Constraint
N3	0.25			0			

### SUB-CATCHMENT DETAILS

Name	Max Flow Q (cu.m/s)	Paved Max Q (cu.m/s)	Grassed Max Q (cu.m/s)	Paved Tc (min)	Grassed Tc (min)	Supp. Tc (min)	Due to Storm
Stage 1C	0.348	0.348		0	24	29	0 AR&R 100 year, 48 hours storm, average 2.3 mm/h, Zone 6

Outflow Volumes for Total Catchment (8.37 impervious + 8.37 pervious = 16.7 total ha)

Storm	Total Rainfall cu.m	Total Runoff cu.m	Impervious Runoff cu.m (Runoff %)	Pervious Runoff cu.m (Runoff %)
AR&R 100 year	18557.96	9195.13	9195.13 (99.1%)	0.00 (0.0%)

### PIPE DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Max U/S HGL (m)	Max D/S HGL (m)	Due to Storm
Pipe1	0.258	2.4	0.41	0.25	AR&R 100 year, 48 hours storm, average 2.3 mm/h, Zone 6

### CHANNEL DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Due to Storm
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### OVERFLOW ROUTE DETAILS

Name	Max Q U/S	Max Q D/S	Safe Q	Max D	Max DxV	Max Width	Max V	Due to Storm
OF1	0	0	0.288	0	0	0	0	

### DETENTION BASIN DETAILS

Name	Max WL	Max Vol	Max Q Total	Max Q Low Level	Max Q High Level
Basin2	0.99	1739.4	0.258	0.258	0

CONTINUITY CHECK for AR&R 100 year, 48 hours storm, average 2.3 mm/h, Zone 6

Node	Inflow (cu.m)	Outflow (cu.m)	Storage Change (cu.m)	Difference %
Basin2	9195.13	9148.64	46.64	0
N3	9148.64	9148.64	0	0
N4	0	0	0	0

Run Log for BASIN run at 09:49:26 on 7/11/2014

Flows were safe in all overflow routes.

**DRAINS MODEL DATA - STAGE 2A**

PIT / NODE DETAILS

Name	Type	Family	Size	Ponding Volume (cu.m)	Pressure Change Coeff. Ku	Surface Elev (m)	Max Pond Depth (m)	Base Inflow (cu.m/s)	Blocking Factor	x	y	Bolt-down id lid	Part Full Shock Loss	Inflow Hydrograph
N3	Node					0.9		0		483.565	-237.616		7	
N4	Node							0		523.495	-205.208		10	

DETENTION BASIN DETAILS

Name	Elev	Surf. Area	Init Vol. (cu	Outlet Type	K	Dia(mm)	Centre RL	Pit Family	Pit Type	x	y	HED	Crest RL	Crest Length	id
Basin2		0 35000	0	Culvert		0.5					432	-208 No			4
		1 35000													

SUB-CATCHMENT DETAILS

Name	Pit or Node	Total Area (ha)	Paved Area %	Grass Area %	Supp Area %	Paved Time (min)	Grass Time (min)	Supp Time (min)	Paved Length (m)	Grass Length (m)	Supp Length (m)	Paved Slope(%)	Grass Slope %	Supp Slope %	Paved Rough	Grass Rough	Supp Rough	Lag Time or Factor	Gutter Length (m)	Gutter Slope %	Gutter FlowFactor	Rainfall Multiplier
Stage 2A	Basin2	141	56	44	0	27	32	0											0			1

PIPE DETAILS

Name	From	To	Length (m)	U/S IL (m)	D/S IL (m)	Slope (%)	Type	Dia (mm)	I.D. (mm)	Rough	Pipe Is	No. Pipes	Chg From	At Chg	Chg (m)	RI (m)	Chg (m)	RL (m)	etc (m)
Pipe1	Basin2	N3		10	0	-0.1	1 Concrete, u	1200	1200	0.3	NewFixed	1	Basin2		0				

DETAILS of SERVICES CROSSING PIPES

Pipe	Chg (m)	Bottom Elev (m)	Height of S (m)	Chg (m)	Bottom Elev (m)	Height of S (m)	Chg (m)	Bottom Elev (m)	Height of S (m)	etc
------	---------	-----------------	-----------------	---------	-----------------	-----------------	---------	-----------------	-----------------	-----

CHANNEL DETAILS

Name	From	To	Type	Length (m)	U/S IL (m)	D/S IL (m)	Slope (%)	Base Width (m)	L.B. Slope (1:?)	R.B. Slope (1:?)	Manning n	Depth (m)	Roofed
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OVERFLOW ROUTE DETAILS

Name	From	To	Travel Time (min)	Spill Level (m)	Crest Length (m)	Weir Coeff. C	Cross Section	Safe Depth Major Stori (m)	SafeDepth Minor Stori (m)	Safe DxV (sq.m/sec)	Bed Slope (%)	D/S Area Contributing %	id
OF1	Basin2	N4	0.1	1	5	2	Overflow a	0.05	0	0.6	1	0	9



## DRAINS MODEL FLOW RESULTS - STAGE 2A

DRAINS results prepared 07 November, 2014 from Version 2013.12

PIT / NODE DETAILS				Version 8			
Name	Max HGL	Max Pond HGL	Max Surface Flow Arriv (cu.m/s)	Max Pond Volume (cu.m)	Min Freeboard (m)	Overflow (cu.m/s)	Constraint
N3	0.3		0				

SUB-CATCHMENT DETAILS							
Name	Max Flow Q (cu.m/s)	Paved Max Q (cu.m/s)	Grassed Max Q (cu.m/s)	Paved Tc (min)	Grassed Tc (min)	Supp. Tc (min)	Due to Storm
Stage 2A	3.281	3.281	0	27	32		0 AR&R 100 year, 48 hours storm, average 2.3 mm/h, Zone 6

Outflow Volumes for Total Catchment (79.0 impervious + 62.0 pervious = 141 total ha)

Storm	Total Rainfall (cu.m)	Total Runoff (cu.m)	Impervious Runoff (cu.m)	Pervious Runoff (cu.m)	Runoff %
AR&R 100	156312.6	86744.84	86744.84	0.00	0.0%

PIPE DETAILS					
Name	Max Q (cu.m/s)	Max V (m/s)	Max U/S HGL (m)	Max D/S HGL (m)	Due to Storm
Pipe1	1.081	3.29	0.399	0.299	AR&R 100 year, 48 hours storm, average 2.3 mm/h, Zone 6

CHANNEL DETAILS			
Name	Max Q (cu.m/s)	Max V (m/s)	Due to Storm

OVERFLOW ROUTE DETAILS								
Name	Max Q U/S	Max Q D/S	Safe Q	Max D	Max DxV	Max Width	Max V	Due to Storm
OF1	0	0	0.288	0	0	0	0	0

DETENTION BASIN DETAILS					
Name	Max WL	Max Vol	Max Q Total	Max Q Low Level	Max Q High Level
Basin2	0.99	34729.4	1.081	1.081	0

CONTINUITY CHECK for AR&R 100 year, 48 hours storm, average 2.3 mm/h, Zone 6

Node	Inflow (cu.m)	Outflow (cu.m)	Storage (cu.m)	Ch Difference %
Basin2	86744.84	81307.42	5438.16	0
N3	81307.42	81307.42	0	0
N4	0	0	0	0

**DRAINS MODEL DATA - STAGE 2B**

PIT / NODE DETAILS

Name	Type	Family	Size	Ponding Volume (cu.m)	Pressure Change Coeff. Ku	Surface Elev (m)	Max Pond Depth (m)	Base Inflow (cu.m/s)	Blocking Factor	x	y	Bolt-down id lid	Part Full Shock Loss	Inflow Hydrograph
N3	Node					0.9		0		483.565	-237.616		7	
N4	Node							0		523.495	-205.208		10	

DETENTION BASIN DETAILS

Name	Elev	Surf. Area	Init Vol. (cu	Outlet Type	K	Dia(mm)	Centre RL	Pit Family	Pit Type	x	y	HED	Crest RL	Crest Length	id
Basin2		0	4000	0 Culvert		0.5					432	-208 No			4
		1	4000												

SUB-CATCHMENT DETAILS

Name	Pit or Node	Total Area (ha)	Paved Area %	Grass Area %	Supp Area %	Paved Time (min)	Grass Time (min)	Supp Time (min)	Paved Length (m)	Grass Length (m)	Supp Length (m)	Paved Slope(%)	Grass Slope %	Supp Slope %	Paved Rough	Grass Rough	Supp Rough	Lag Time or Factor	Gutter Length (m)	Gutter Slope %	Gutter FlowFactor	Rainfall Multiplier
Stage 2B	Basin2	36.39	50	50	0	23	28	0											0			1

PIPE DETAILS

Name	From	To	Length (m)	U/S IL (m)	D/S IL (m)	Slope (%)	Type	Dia (mm)	I.D. (mm)	Rough	Pipe Is	No. Pipes	Chg From	At Chg	Chg (m)	RI (m)	Chg (m)	RL (m)	etc (m)
Pipe1	Basin2	N3		10	0	-0.1	1 Concrete, u	600	600	0.3	NewFixed	1	Basin2		0				

DETAILS of SERVICES CROSSING PIPES

Pipe	Chg (m)	Bottom Elev (m)	Height of S (m)	Chg (m)	Bottom Elev (m)	Height of S (m)	Chg (m)	Bottom Elev (m)	Height of S etc (m)
------	---------	-----------------	-----------------	---------	-----------------	-----------------	---------	-----------------	---------------------

CHANNEL DETAILS

Name	From	To	Type	Length (m)	U/S IL (m)	D/S IL (m)	Slope (%)	Base Width (m)	L.B. Slope (1:?)	R.B. Slope (1:?)	Manning n	Depth (m)	Roofed
------	------	----	------	------------	------------	------------	-----------	----------------	------------------	------------------	-----------	-----------	--------

OVERFLOW ROUTE DETAILS

Name	From	To	Travel Time (min)	Spill Level (m)	Crest Length (m)	Weir Coeff. C	Cross Section	Safe Depth Major Stori (m)	SafeDepth Minor Stori (m)	Safe DxV (sq.m/sec)	Bed Slope (%)	D/S Area Contributing %	id
OF1	Basin2	N4	0.1	1	5	2	Overflow a	0.05	0	0.6	1	0	9

## DRAINS MODEL FLOW RESULTS - STAGE 2B

DRAINS results prepared 01 November, 2014 from Version 2013.12

PIT / NODE DETAILS		Version 8					
Name	Max HGL	Max Pond HGL	Max Surface Flow Arriv	Max Pond Volume	Min Freeboard	Overflow	Constraint
			(cu.m/s)	(cu.m)	(m)	(cu.m/s)	
N3	0.32		0				

SUB-CATCHMENT DETAILS							
Name	Max Flow Q	Paved Max Q	Grassed Max Q	Paved Tc	Grassed Tc	Supp. Tc	Due to Storm
	(cu.m/s)	(cu.m/s)	(cu.m/s)	(min)	(min)	(min)	
Stage 2B	0.756	0.756	0	23	28		0 AR&R 100 year, 48 hours storm, average 2.3 mm/h, Zone 6

Outflow Volumes for Total Catchment (18.2 impervious + 18.2 pervious = 36.4 total ha)

Storm	Total Rainf	Total Runo	Impervious Runoff	Pervious Runoff
	cu.m	cu.m (Runo	cu.m (Runo	cu.m (Runoff %)
AR&R 100	40341.95	19991.20	19991.20	0.00 (0.0%)

PIPE DETAILS					
Name	Max Q	Max V	Max U/S	Max D/S	Due to Storm
	(cu.m/s)	(m/s)	HGL (m)	HGL (m)	
Pipe1	0.615	2.91	0.451	0.32	AR&R 100 year, 48 hours storm, average 2.3 mm/h, Zone 6

CHANNEL DETAILS			
Name	Max Q	Max V	Due to Storm
	(cu.m/s)	(m/s)	

OVERFLOW ROUTE DETAILS							
Name	Max Q U/S	Max Q D/S	Safe Q	Max D	Max DxV	Max Width	Max V
							Due to Storm
OF1	0	0	0.288	0	0	0	0

DETENTION BASIN DETAILS					
Name	Max WL	MaxVol	Max Q	Max Q	Max Q
			Total	Low Level	High Level
Basin2	0.98	3918.6	0.615	0.615	0

CONTINUITY CHECK for AR&R 100 year, 48 hours storm, average 2.3 mm/h, Zone 6

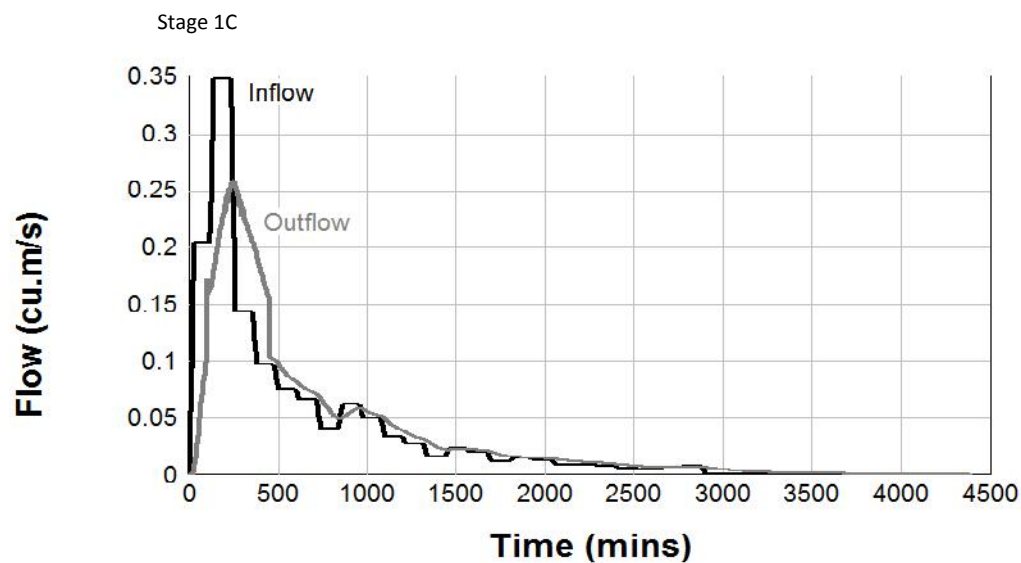
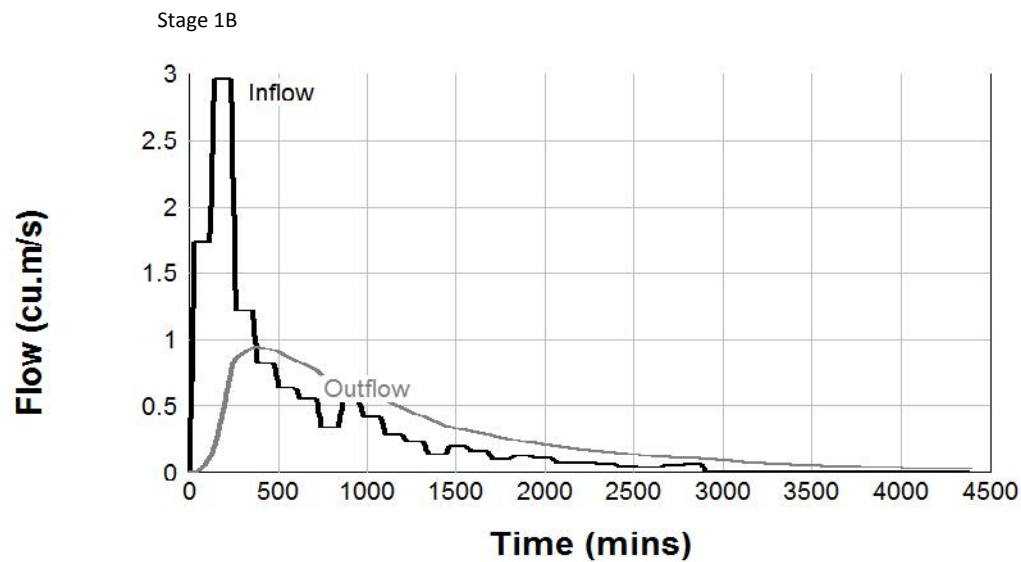
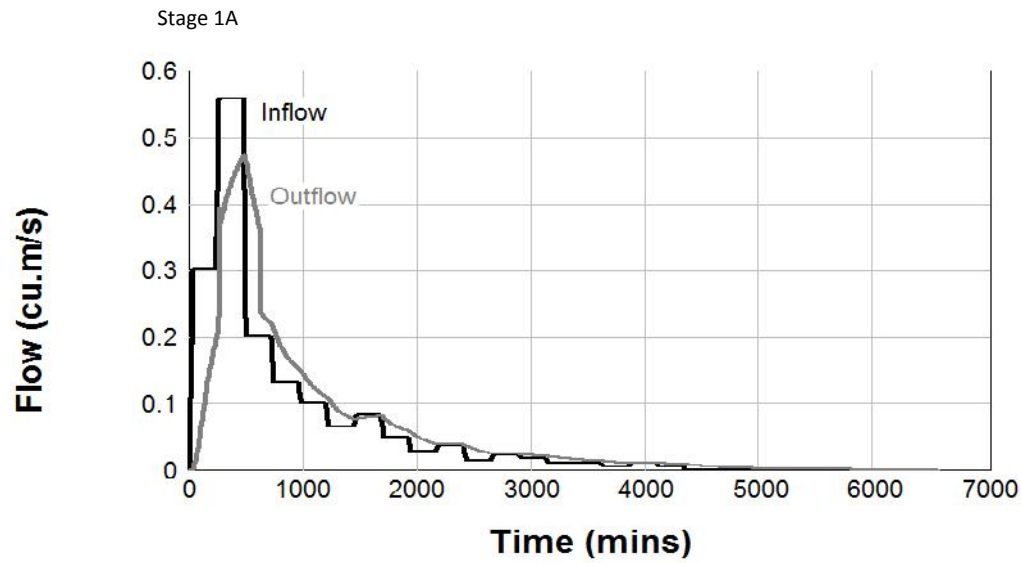
Node	Inflow	Outflow	Storage Ch	Difference
	(cu.m)	(cu.m)	(cu.m)	%
Basin2	19991.2	19813.62	175.11	0
N3	19813.62	19813.62	0	0
N4	0	0	0	0

Run Log for BASIN run at 12:57:22 on 1/11/2014

Flows were safe in all overflow routes.

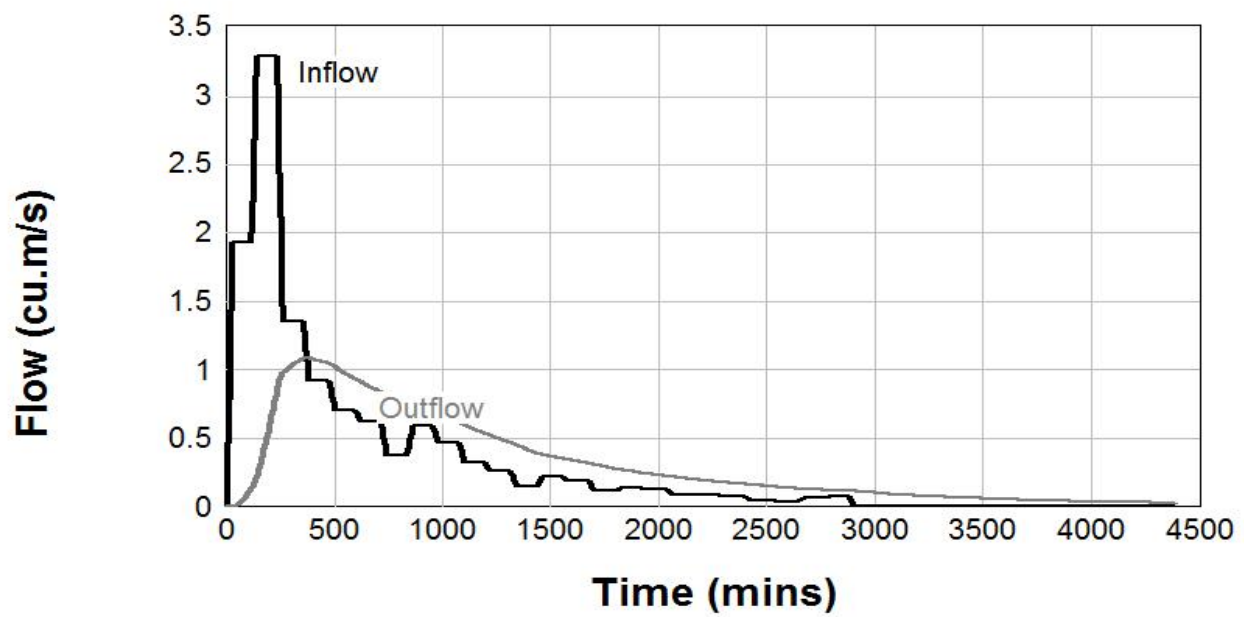


Inflow / Outflow Basin Hydrographs

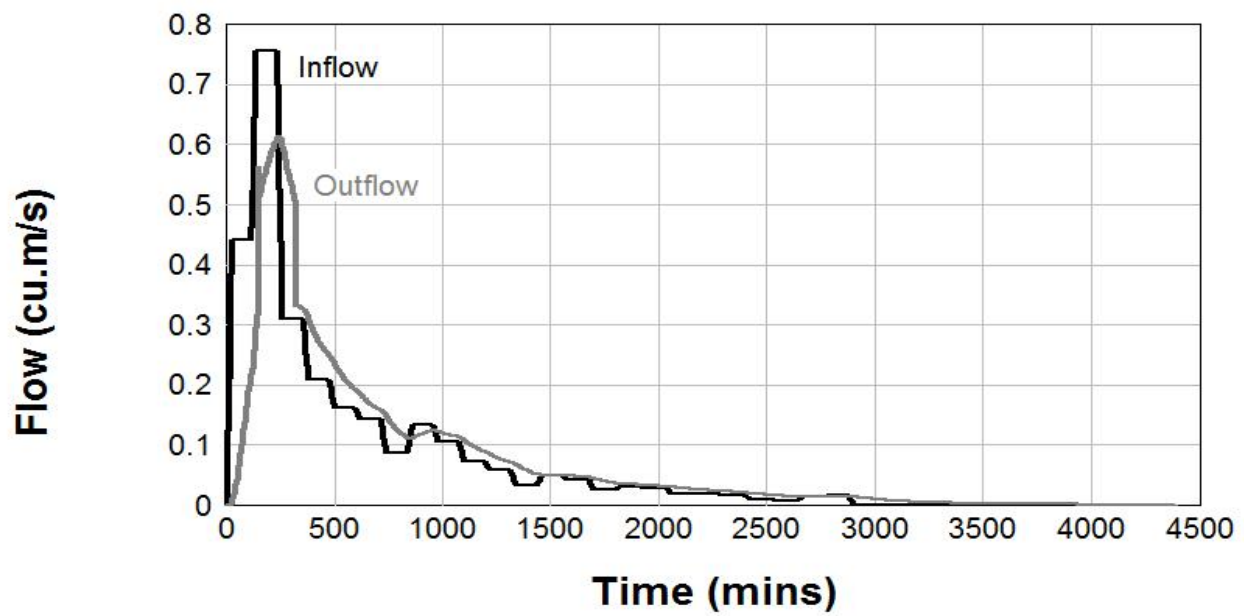


## Inflow / Outflow Basin Hydrographs

Stage 2A



Stage 2B



Sensitivity analysis to consider such issues as variable Mannings 'n' and well maintained re-vegetated state may be required by Council.

## **Design Criteria**

### **Impervious Area:**

#### **Residential**

5 year ARI and 100 year ARI events to be modeled;  
Impervious Area = 75% and Pervious Area = 25%

#### **Commercial/Industrial**

10 year ARI and 100 year ARI events to be modeled;  
Impervious Area = 90% and Pervious Area = 10%

#### **Medium Density residential**

5 year ARI and 100 year ARI events to be modeled;  
Impervious Area and Pervious Area should be calculated and demonstrated for Council approval.

### **General Design Parameters:**

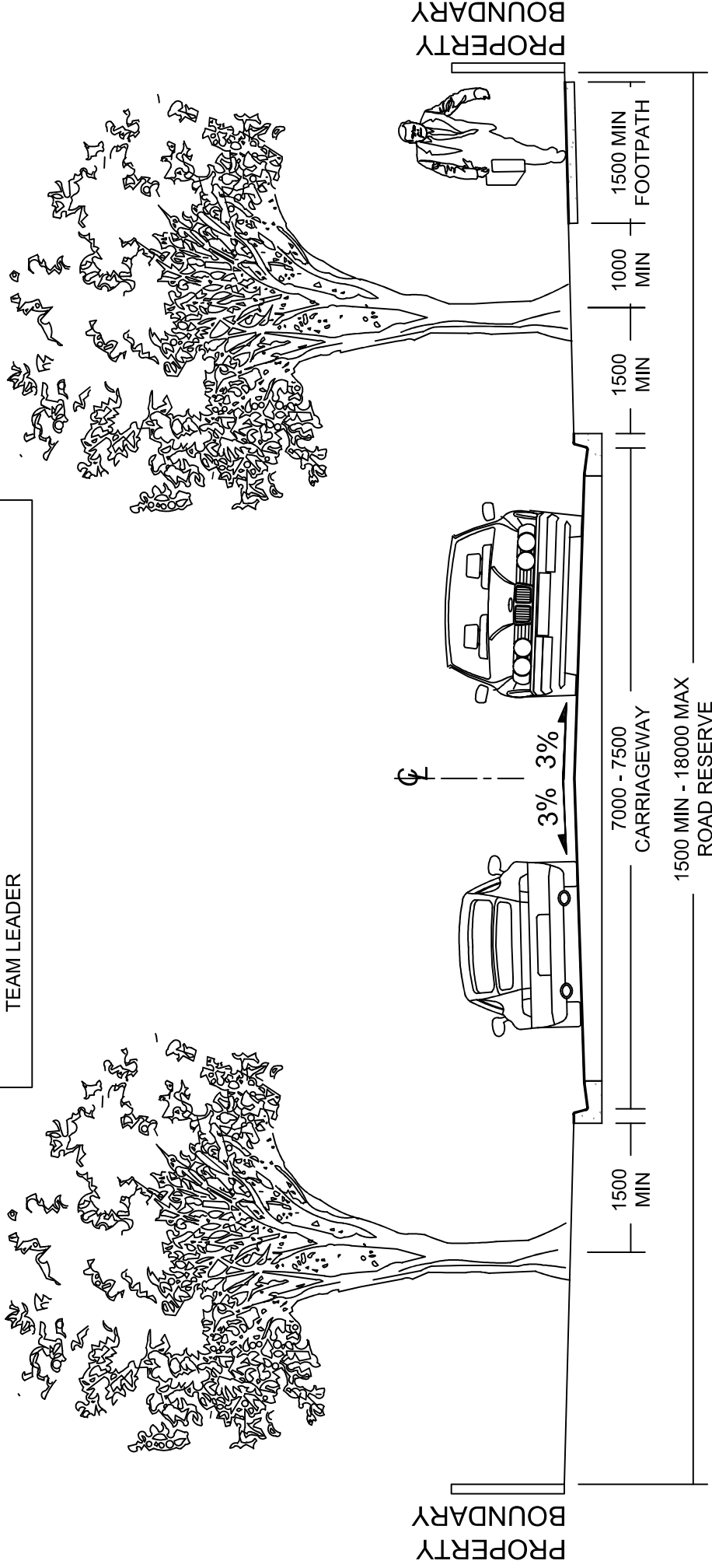
The following design parameters are to be used, where applicable, in the DRAINS model analysis:

- Soil type = 2.5
- Antecedent Moisture Content, AMC = 2.5
- Infiltration rates:
- Initial paved = 1mm and Grassed = 5mm
- Storms, generated in accordance with the Australian Rainfall and Runoff, Volume 1, 1987 or Bureau of Metrology rainfall gauge data.
- Time of concentration, calculated using the kinematic wave equation given in the Australia Rainfall and Runoff, Volume 1, 1987, or program generated.
- The surface roughness,  $n^*$  is as given in the Australian Rainfall and Runoff, Volume 1, 1987,
- Supplementary areas are not to be used.



NOTES:

1. REFER TO TYPICAL DETAIL DRAWING NO. 2012-5002-001 AND 2012-5002-002 FOR KERB AND WATER TABLE DETAIL
2. REFER TO TYPICAL DETAILING DRAWING NO. 2011-5001-001 FOR FOOTPATH DETAIL
3. TREES TO BE APPROVED BY PARKS AND GARDENS TEAM LEADER



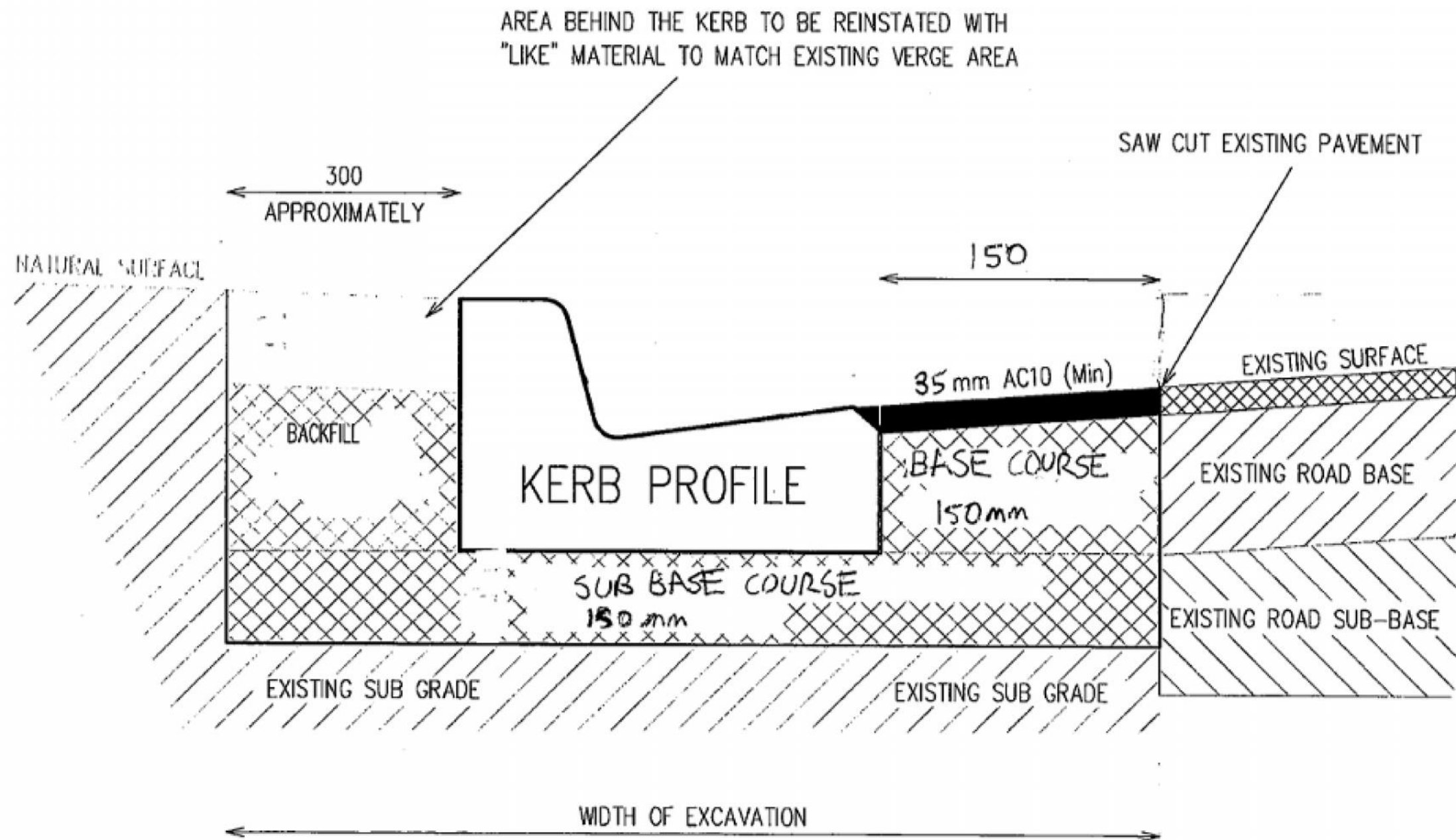
# RCMB ACCESS ROAD TYPICAL DETAIL

MANAGER				REV
DESIGN				REV
DRAWN	AC			CODE
CHECKED				SD001
SIGNATURES		DATE	DRAWING NUMBER	
			2012-5006-002	

SCALE AT A1

NTS

REV  
A



KERB CONSTRUCTION DETAIL

## Existing Intersection Assessment

Intersection	Stage 1A			Stage 1B			Stage 1C			Stage 2A			Stage 2B			Generated Traffic AADT	Generated Traffic per min	Signalised
	Total Trips	Portion	Trips	Total Trips	Portion	Trips	Total Trips	Portion	Trips	Total Trips	Portion	Trips	Total Trips	Portion	Trips			
	4470			15270			1790			12490			3970					
Old Swanport Road / Adelaide Road											10%	1249				1249	2	NO
New site access / Adelaide Road											10%	1249				1249	2	NO
Agricultural Drive / Adelaide Road		50%	2235													2235	3	NO
Agricultural Drive / Old Swanport Road		40%	1788													1788	2	NO
Rural Avenue / Old Swanport Road		10%	447													2432	3	NO
John Cowan Avenue / Old Swanport Road																1985	3	NO
Production Road / Old Swanport Road																2138	3	NO
Brinkley Road / Old Swanport Road																2291	3	NO
Cromwell Road / Adelaide Road																6872	10	YES
Bremmer Road / Maurice Road												25%	3122.5			3122.5	4	NO
Bremmer Road / Adelaide Road												20%	2498	25%	993	3491	5	YES
Lincoln Road / Adelaide Road												10%	1249	25%	993	2242	3	NO
Woodlands Road / Maurice Road												25%	3122.5	50%	1985	5108	7	YES
New site access / Old Swanport Road								60%	1074							1074	1	NO
New site access / Hindmarsh Road								40%	716							716	1	NO



### 11.3 Appendix 3 - Costings for Future Infrastructure Provision

Areas	2A		2B		1A		1B		1C	
approx gross area (ha)	141		36.39		41.72		142.59		16.74	
open space - 12.5% gross	17.6		4.5		5.2		17.8		2.1	
streets - 12.5% gross (25% 2A only)	35.3		4.5		5.2		17.8		2.1	
net res site area (saleable land)	88.1		27.3		31.3		106.9		12.6	
assumed average lot size (700m²)										
assumed lot yield	1259		390		447		1528		179	
Concept Plan Lot yield	1249		397		447		1527		179	
Costs										
Internal Site Works										
Preliminaries	\$2,498,000	\$2.3M	\$794,000	\$1.2M	\$894,000	\$1.1M	\$3,054,000	\$3.0M	\$358,000	\$0.4M
Earthworks	\$3,434,750	\$3.1M	\$1,091,750	\$1.6M	\$1,229,250	\$1.6M	\$4,199,250	\$4.2M	\$492,250	\$0.5M
Pavements	\$5,620,500	\$5.1M	\$1,786,500	\$2.7M	\$2,011,500	\$2.6M	\$6,871,500	\$6.8M	\$805,500	\$0.8M
Concrete	\$5,308,250	\$4.8M	\$1,687,250	\$2.5M	\$1,899,750	\$2.4M	\$6,489,750	\$6.5M	\$760,750	\$0.8M
Stormwater Drainage	\$6,699,728	\$4.5M	\$2,138,064	\$2.4M	\$2,411,945	\$2.3M	\$8,280,344	\$6.1M	\$736,010	\$0.7M
Sewer	\$4,996,000	\$4.5M	\$1,588,000	\$2.4M	\$1,788,000	\$2.3M	\$6,108,000	\$6.1M	\$716,000	\$0.7M
Water Supply	\$4,371,500	\$4.0M	\$1,389,500	\$2.1M	\$1,564,500	\$2.0M	\$5,344,500	\$5.3M	\$626,500	\$0.6M
Common Service Trench	\$2,498,000	\$2.3M	\$794,000	\$1.2M	\$894,000	\$1.1M	\$3,054,000	\$3.0M	\$358,000	\$0.4M
Electrical Reticulation & Street Lighting	\$6,557,250	\$6.0M	\$2,084,250	\$3.1M	\$2,346,750	\$3.0M	\$8,016,750	\$8.0M	\$939,750	\$0.9M
Sundries	\$1,873,500	\$1.7M	\$595,500	\$0.9M	\$670,500	\$0.9M	\$2,290,500	\$2.3M	\$268,500	\$0.3M
Sub Total	\$43,857,478	\$38.5M	\$13,948,814	\$20M	\$15,710,195	\$19.3M	\$53,708,594	\$51.3M	\$6,061,260	\$6.1M
Augmentation Works										
Stormwater	0		0		0		\$506,000		\$1,064,250	
Sewer	TBA		TBA		TBA		TBA		TBA	
Water	TBA		TBA		TBA		TBA		TBA	
Telecommunications	N/A		N/A		N/A		N/A		N/A	
Electricity	\$1,561,250		\$496,250		\$558,750		\$1,908,750		\$223,750	
Gas	N/A		N/A		N/A		N/A		N/A	
Sub Total	\$1,561,250		\$496,250		\$1,064,750		\$2,973,000		\$223,750	
External Road Upgrades										
Kerbing	\$155,957.33		\$391,659.01		\$809,681.45		\$550,974.89		\$259,932.35	
Signalisation	\$600,605.00		\$800,640.00		\$200,535.00		\$600,605.00		\$ -	
Sub Total	\$756,562.33		\$1,192,299.01		\$1,010,216.45		\$1,151,579.89		\$259,932.35	
TOTAL	\$46,175,290.33		\$15,637,363.01		\$17,785,161.45		\$57,833,173.89		\$6,544,942.35	
Bremer Road Extension \$643,650										

## Notes

**Internal Works:** Costs based on pro-rated rates for recent residential subdivisions done by MLEI

**Stormwater Drainage:** Assumed 30% of new allotments falling towards the rear with same boundary lengths 20m

### Augmentation Works:

Stormwater (based on discussions with Matt James from City of Murray Bridge)

Stage 2A & 2B - no augmentation works required; new drainage to be directed to existing Basin in Greenlands Drive Stage 1A & 1B - Upgrade of existing drainage to existing basin (Rural Ave and Old Swanport Road)

Stage 1A - 900mm dia for site flows + structure replacement Stage 1B - 1500mm dia for site flows + structure replacement Stage 1C - new drainage to be directed to new basin

No upgrades of existing basins are required; these are to be done by Council as part of separate works

Electrical

Based on SA Power Networks Standard Rate of \$1250; subject to tariff assessment between SA Power Networks and City of Murray Bridge

Gas & Telecommunications

No Augmentation works required, only standard CST as part of internal works

Have not looked at the costs if an additional gas transmission main is required. Existing Structure plan states that a further 2000 dwellings will trigger a second transmission main

Sewer & Water

Subject to review by SA Water

### External Road upgrade works:

Assumptions:

Assume existing pavement widths suitable for turning movements with no further widening required Signalisation costs include light tree for each approach with allowance for pedestrian crossings and linemarking.

The signalisation costs of the Adelaide Road / Agricultural Drive / Bremmer Road intersection covers all approaches for Stage 2A except the Agricultural Drive approach which is to be included with Stage 1A

Access from Stage 1B and 2B to Adelaide Road will be via Cromwell Road and Lincoln Road respectively.

Signalisation costs of the Adelaide Road / Lincoln Road / Cromwell Road intersection covers all approaches for Stage 1B except the Lincoln Road approach which is to be included with Stage 2B.



## 11.4 Appendix 4 - Financial Analysis Assumptions and Rationale

1. Council's 2014/15 budgeted operating statement is assumed to be a reasonable indicator of its current under-lying financial performance. I.e. there are not material temporary factors that either add to or reduce operating income or operating expenses in 2014/15 relative to a typical year. (Council's Manager Finance, Ms Julie Campbell has confirmed this to be so.)
2. Current annual demand for new dwellings in Murray Bridge is about 150 p.a. with 50% of this demand currently being satisfied from infill development on vacant sites in existing sub-divisions.
3. The land under consideration (areas 1A, 1B, 1C, 2A & 2B) collectively has the potential to generate about 3,800 residential allotments. The timely sequence of development of these individual areas is not clear but this is not critical for the analysis. In any event all land in individual component areas would not be developed at a given point in time but incrementally as market demand so warranted.
4. There is no reason to believe that Council itself would incur significant capital outlays as a result of the creation of these subdivisions. I.e. no major upgrade of existing infrastructure or additional community facilities would be required. There is a possibility that Council would need to incur some capital expenditure to renew and upgrade some existing roads associated with the subdivision of areas 1A, 1B and 2B (that may not otherwise be necessary if residential development didn't take place in these areas. These costs are unknown at this time. However these areas are more likely to be developed after some others and hence in net present value terms any such costs are unlikely to significantly impact on the projected net financial benefit to council from the development compared with what has been suggested in this report.
5. The Council would inherit approximately \$50M of infrastructure incrementally over time as a result of the creation of these subdivisions. This infrastructure will be in the form of roads, stormwater drainage, footpaths and kerbing. Based on comparisons with accounting practices for Council's existing infrastructure (and general practices elsewhere) it is assumed that this infrastructure would have an annual depreciation rate of \$1M pa (effectively equivalent to a weighted average useful life of the component assets of 50 years and no residual value). This represents an amount of \$263 per new allotment per annum.
6. No information is available as to additional operating costs (excluding depreciation) that Council would incur. For simplicity:
  - a. it is assumed that specified costs per allotment will increase by an amount equivalent to the increase in the number of allotments (3,800) relative to the existing number of rateable properties. Existing rateable properties are





assumed to be 11,688 (1 Jan 2014, as per 2012/13 Local Government Grants Commission Database Reports).

7. specified costs are based on Council's 14/15 budget allocations and are employee costs (\$13.431M) and materials, contracts and other expenses (\$12.774M). Also included is an amount equivalent to 50% of depreciation for other than infrastructure (i.e. buildings, furniture & fittings & plant & equip) (total other than infrastructure in 12/13 was \$2.269M). (Only 50% of this amount has been included because many such assets (e.g. buildings) would clearly increase at a rate significantly less than the pro-rata increase in the number of serviced allotments). The total base operating expenses on which a pro-rata increase has been assumed is therefore \$27.340M).
8. Additional operating expenses are therefore assumed to be \$8.889M (3,800/11,688 X \$27.340M) or \$2,339pa per rateable property when all areas are sub-divided and occupied. (In practice it should be possible to generate significant economies of scale and costs should be considerably less to provide current service levels).
9. Council's operating income other than rates in 2014/15 is budgeted to be \$12.341M (\$1,056 per rateable property). It is assumed that such income will grow proportionately over time with the growth of rateable properties.
10. Council currently (2014/15) applies a minimum rate (\$844) and capital value rating. It levies a rate in the dollar on residential properties of \$0.0062231 and on vacant land of \$0.00809002. It is assumed that Council will maintain its current rating arrangements in future. Evidence suggests a current average price for vacant residential sites of \$95,000 and for new homes of \$285,000. It is assumed that all sites will be residential and when developed will attract rates on average of \$1,773pa (\$285,000 X 0.0062231). In addition a waste charge of \$124 would also be levied. (i.e. total rates of \$1,897).
11. The areas currently generate rate revenue of approximately \$435,000. Dividing this amount by the potential number of allotments generated through possible sub-divisions (3,800) means that the revenue forgone from each new allotment would be \$114.
12. The NPV analysis is based on a 4% (real) discount rate. It assumes no development in years 0 to 5 and then an equal number of allotments developed each year for the next 45 (i.e. 84 allotments per annum). It assumes houses will be built on these allotments at the same time and that operating outlays (depreciation is not an outlay) and receipts are as described above. It also conservatively assumes that all infrastructure would need to be replaced in year 70 and calculates an NPV cost for that. Some infrastructure will need to be renewed earlier and most (in \$ value terms) later but any refinement of the assumption made would not have a material impact on the calculated result.
13. Using a 4% real discount rate \$50M in 50 years' time has a present value of \$7.036M or an equivalent annualised value of \$327,500. In other words this later amount (not



\$1M pa) is all that is needed to be generated each year to offset an outlay of \$50M in 50 years' time.



## 11.5 Appendix 5 - Structure Plan Assumptions and Calculations

Please refer to Appendix 6 for a plan showing the location of Area 1a, 1b, 2a, and 2b.

	Gross Land Area	Saleable Land*	Lot Yield (average 700m <sup>2</sup> )
Area 1 a	41.72 ha	31.29 ha	446
Area 1 b	142.59 ha	106.94 ha	1527
Area 1 c	16.74 ha	12.55 ha	179
<b>Total Area 1</b>	<b>201.05 ha</b>	<b>150.75 ha</b>	<b>2151</b>
Area 2 a	141.0 ha	87.5 ha **	1249
Area 2 b	36.39 ha	27.87 ha	397
<b>Total Area 2</b>	<b>177.39 ha</b>	<b>115.37 ha</b>	<b>1646</b>

### Area 1 and 2 Yield Calculations

Saleable land excludes the following:

\*25% of land area set aside for infrastructure and open space:

- 12.5% public open space
- 12.5% roads and other infrastructure

\*\*37.5% of land area set aside for infrastructure and open space:

- 12.5% public open space
- 25% roads and other infrastructure

*Note that in all areas except Area 2a, a significant number of existing roads exist, and will be utilised in future residential development. For this reason a lesser amount (12.5%) of land has been set aside for new roads and infrastructure that would be the case if no existing roads existed. For Area 2a, where few existing roads are present, 25% of land has been assumed for roads and infrastructure. 25% is a normal assumption for suburban residential development as assumed in these calculations.*





## 11.6 Appendix 6 - Location of Sub Areas 1A, 1B, 2A, 2B


















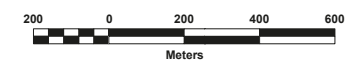
# The Rural City of Murray Bridge

## Residential Growth Area Investigation Concept Plan

Draft

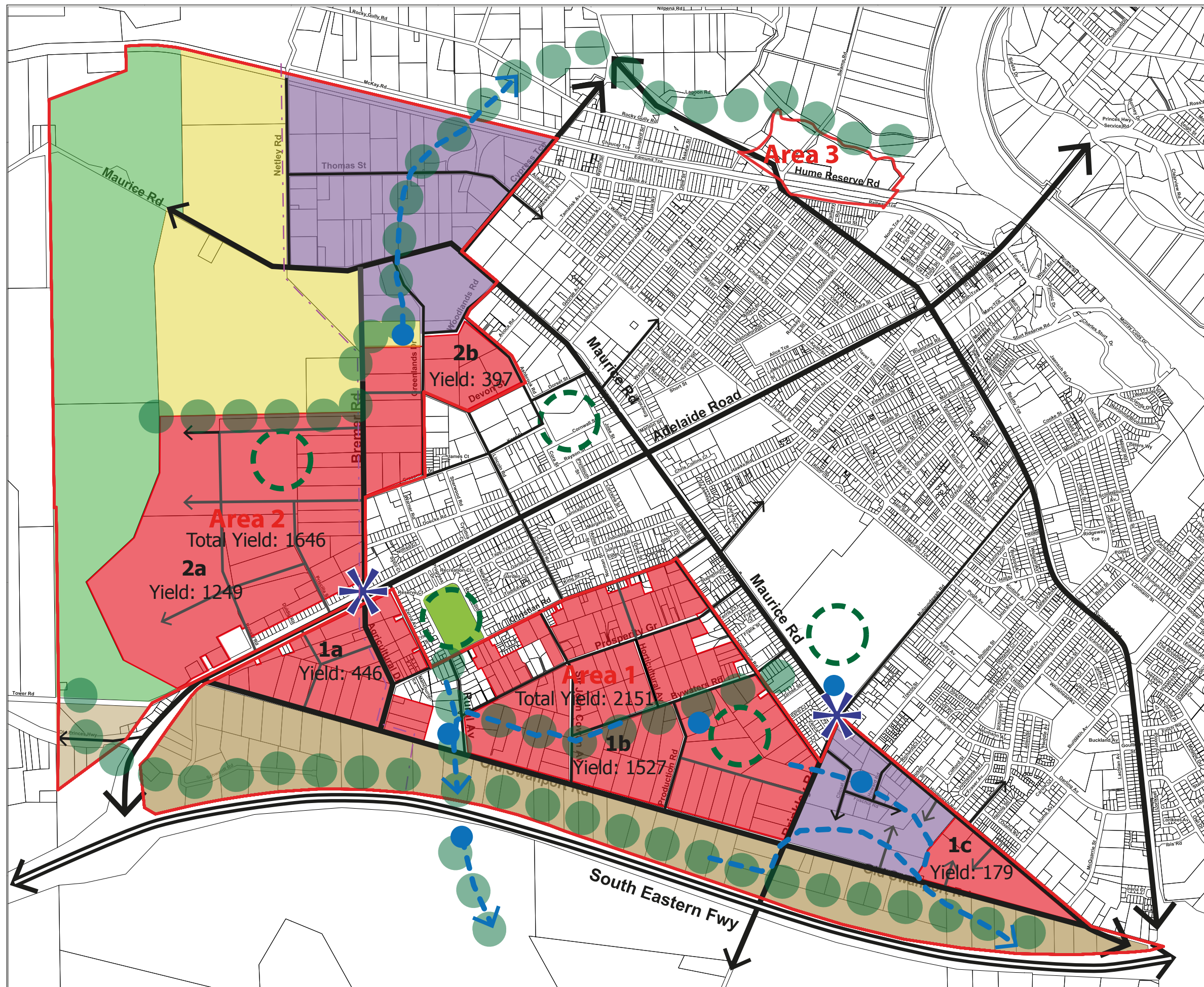
### Legend

-  Area of Interest
-  Cadastre Boundary
-  Residential Yield
-  Industry - existing and growth
-  Prison and Prison Expansion
-  Landscape Protection
-  Landscape Protection / Rural Living
-  Detention Basins and Drainage
-  Green Corridors and Linear Open Spaces - connect green spaces and separate land uses
-  District Parks - mix of formal sports parks and recreational parks
-  Centres - potential location for community, retail, business uses
-  Major Roads - existing
-  Major Roads - proposed (Bremer Road extension)
-  Minor Roads - existing
-  Minor Roads - indicative future



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+ DESIGN

September 1, 2014



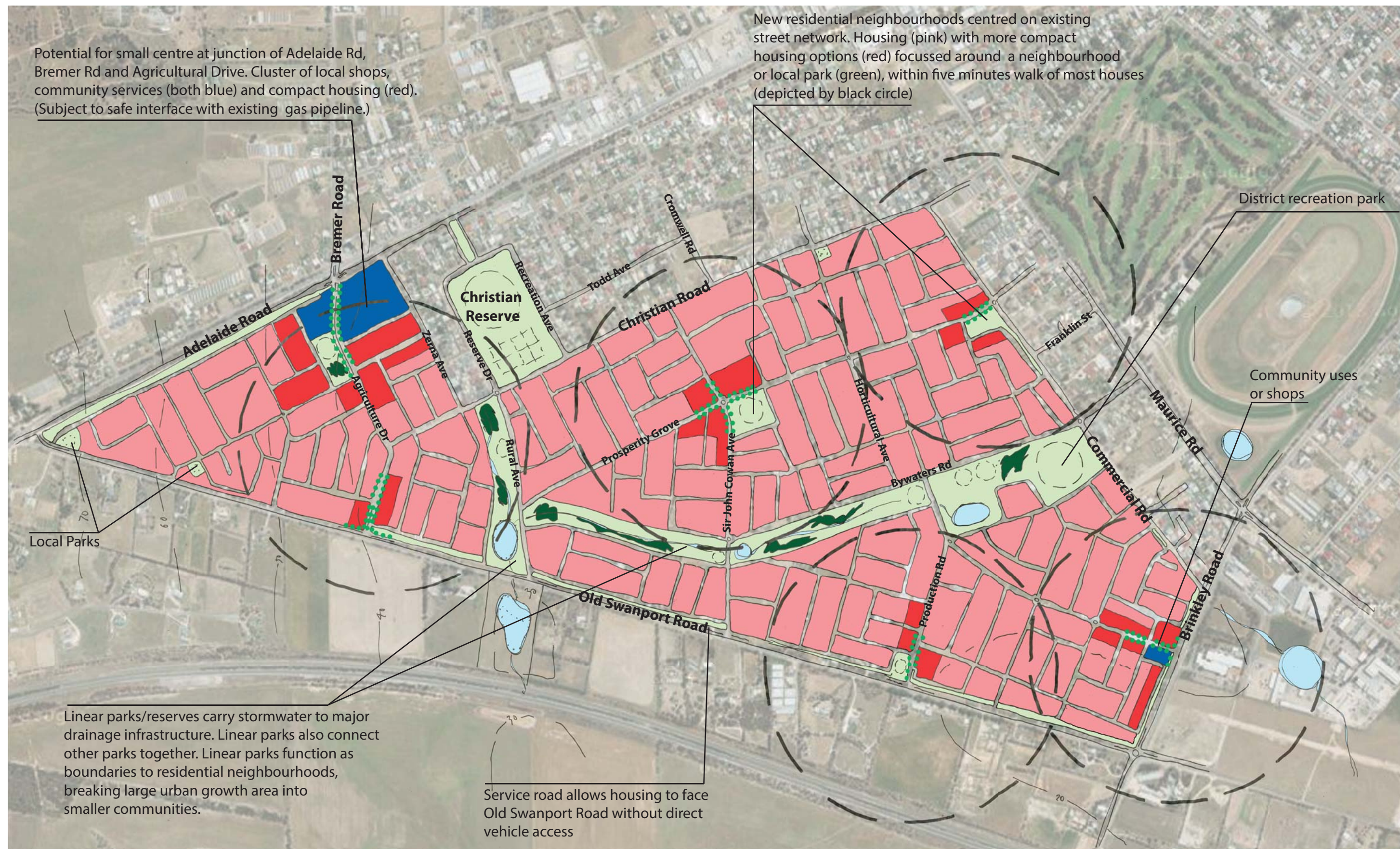
## 11.7 Appendix 7 – Illustrative Master Plans for Areas 1 and 2





Potential for small centre at junction of Adelaide Rd, Bremer Rd and Agricultural Drive. Cluster of local shops, community services (both blue) and compact housing (red). (Subject to safe interface with existing gas pipeline.)

New residential neighbourhoods centred on existing street network. Housing (pink) with more compact housing options (red) focussed around a neighbourhood or local park (green), within five minutes walk of most houses (depicted by black circle)



Local Parks

Linear parks/reserves carry stormwater to major drainage infrastructure. Linear parks also connect other parks together. Linear parks function as boundaries to residential neighbourhoods, breaking large urban growth area into smaller communities.

Service road allows housing to face Old Swanport Road without direct vehicle access

District recreation park

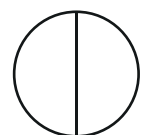
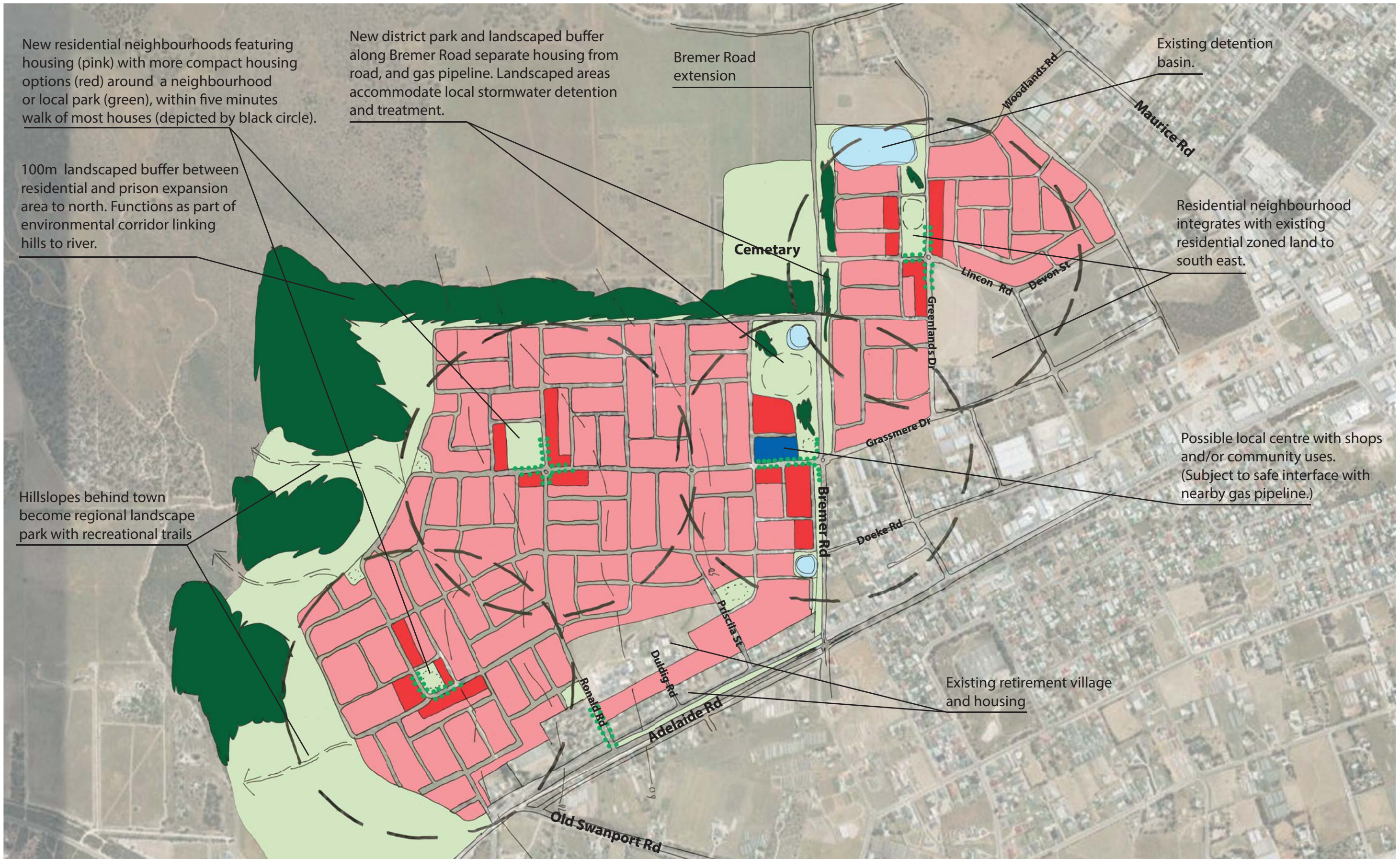
Community uses or shops

Note: This plan illustrates how Area 1 **could** be developed. It is provided for testing and illustrative purposes only. Alternative designs may be appropriate.

## MURRAY BRIDGE Residential Growth Areas Investigation Area 1 Illustrative Master Plan

1:5000@A1, 1:10,000@A3 November 2014





250m 500m

Note: This plan illustrates how Area 1 **could** be developed. It is provided for testing and illustrative purposes only. Alternative designs may also be appropriate.

## MURRAY BRIDGE Residential Growth Areas Investigation Area 2 Illustrative Master Plan

1:5000@A1, 1:10,000@A3 November 2014



## 11.8 Appendix 8 – Copy of Structure Plans, Areas 1, 2 and 3

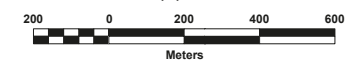


# The Rural City of Murray Bridge

## Residential Growth Areas Investigation Structure Plan - Areas 1 + 2

### Legend

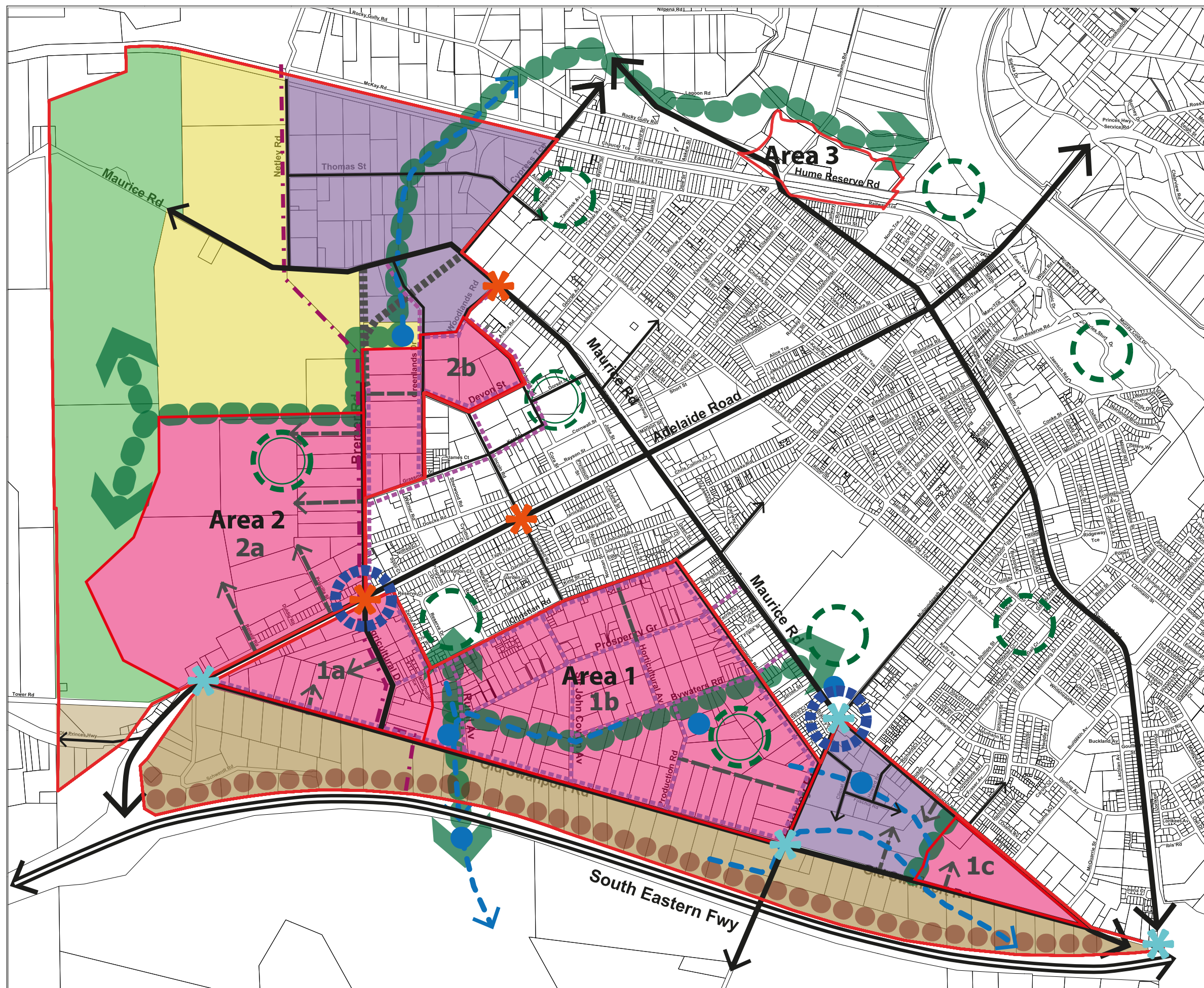
- Area of Interest
- Property Boundary
- Residential Growth Area
- Industry - existing and growth
- Community Uses (Prison, Prison Expansion, Cemetery)
- Landscape Protection (Hillslopes)
- Rural Living
- Detention Basins (existing) and Drainage
- Linear Open Spaces
- Green Corridor / Visual Buffer
- District/Regional Park locations - (2013 Open Space Strategy)
- Possible additional or alternative District Park locations to service residential growth areas
- Centres - potential location for community, retail, business uses
- Major Roads - existing
- Bremer Rd extension / Bypass (Route to be confirmed)
- Minor Roads - existing
- Existing road upgrades required
- ✱ Planned intersection upgrade (from 2012 structure plan)
- ✱ Proposed intersection upgrade
- - -> Minor Road connections - future
- SEAGas pipeline



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1:20,000@A3





### Residential Growth Areas Investigation

#### Concept Plan - Area 3

- Transport and Industry
- Landscape Protection/ Rural Living
- Landscape Protection (Floodplain Fringe + Slopes)
- Railway
- Unsealed Road
- Roads
- Drainage
- Prominent views
- Level Crossing
- Existing Buildings
- Possible Building Sites
- Landscaped buffer

0 25 50 75  
Meters  
September 2014 1:2500@A3

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