Contents

Page no.

1 Introduction 1-1

1.1 Project background and objectives 1-1
1.2 Project proponent 1-3
1.3 Environmental Impact Statement process 1-4
1.3.1 Purpose of the Environmental Impact Statement 1-4
1.3.2 Description of the process 1-4
1.3.3 Approval processes and legislation 1-5
1.4 Consultation 1-9
1.4.1 Local communities 1-9
1.4.2 Purpose of community engagement 1-9
1.4.3 Proposed approach to community engagement 1-10

2 Need for the proposal 2-1

2.1 Overall objective 2-1
2.2 Strategic directions 2-1
2.2.1 South Australia's Strategic Plan 2007 2-1
2.2.2 Metropolitan Planning Strategy 2-3
2.2.3 Playford (City) Development Plan 2-7
2.2.4 Playford Community Plan 2-10
2.2.5 City of Playford Council Plan 2008/09–2011/12 2-11
2.2.6 Other relevant strategies 2-11
2.3 Benefits and costs 2-13
2.3.1 Benefits 2-13
2.3.2 Costs 2-13
2.4 Project rationale and consequences of not proceeding 2-14
2.4.1 Rationale 2-14

3 Description of the proposal 3-1

3.1 The proposal 3-1
3.1.1 Location 3-1
3.1.2 Locality 3-1
3.1.3 The site 3-1
3.2 Nature of the proposal 3-5
3.2.1 Land division 3-5
3.2.2 Works and activities associated with land division 3-11
3.2.3 Neighbourhood Centre 3-12
3.2.4 Display Village 3-15
3.3 Construction staging and management 3-16
3.3.1 Staging 3-16
3.3.2 Management systems 3-17

4 Development history, land use, heritage, social and economic, traffic and transport 4-1
4.1 Historical development 4-1
4.1.1 Indigenous heritage 4-1
4.1.2 European heritage 4-1
4.2 Existing land uses 4-1
4.3 Social and economic characteristics 4-2
4.3.1 Social characteristics 4-2
4.3.2 Economic characteristics 4-5
4.4 Traffic and transport 4-7
4.4.1 Road network 4-7
4.4.2 Traffic volumes 4-8
4.4.3 Public transport services 4-8
4.4.4 Pedestrian/cyclist facility 4-8

5 Physical environment 5-1

5.1 Topography, geology and soils 5-1
5.1.1 Topography 5-1
5.1.2 Geology and soils 5-1
5.1.3 Acid sulphate soils 5-2
5.2 Hydrology and drainage 5-2
5.3 Groundwater and the aquifer 5-3
5.4 Coastal and marine ecology 5-3
5.5 Air quality and noise 5-4
5.5.1 Air quality 5-4
5.5.2 Noise 5-4
5.6 Terrestrial flora and fauna 5-5
5.6.1 Flora 5-5
5.6.2 Fauna 5-6
5.7 General climate 5-8
5.8 Winds 5-9
5.9 Climate change 5-9
5.10 Visual amenity and landscape character 5-9
5.11 Hazards and risks 5-12

6 Need for the proposal 6-1

6.1 Location, scale and staging 6-1
6.1.1 Need for the proposal 6-1
6.1.2 Location 6-2
6.1.3 Scale 6-3
6.1.4 Staging 6-3
6.2 Supply and demand for residential development 6-3
6.2.1 Demand 6-3
6.2.2 Supply 6-4
6.2.3 Affordable housing, aged housing and high needs housing 6-5
6.3 The ‘do nothing’ option 6-8

7 Water issues 7-1

7.1 Flood potential and management 7-1
7.1.1 Flood management strategy 7-1
7.1.2 Compliance with coastal flooding policy 7-4
7.1.3 Protection of significant conservation areas 7-4
7.2 Water, stormwater and wastewater management 7-5
7.2.1 Water provision 7-5
7.2.2 Wastewater 7-9
7.3 Water sustainability 7-9
7.3.1 Treated wastewater 7-10
7.3.2 Stormwater 7-10
7.4 Water quality 7-11
7.5 Groundwater 7-13
7.5.1 Nutrient and pollution management 7-13
7.5.2 Potential increases 7-15
7.5.3 Risk to infrastructure 7-15
7.5.4 Waterways 7-23
7.5.5 Monitoring and management of impacts on groundwater quality 7-23
7.6 Impacts on Cheethams Salt Pan operations 7-24
7.7 Disposal of excavated materials for proposed waterways 7-24
7.8 Acid sulphate soils 7-25
7.9 Management of land contamination issues 7-25

8 Coastal environment 8-1

8.1 Impact on natural coastal processes 8-1
8.2 Coastal and marine flora and fauna 8-2
8.2.1 Impacts of the proposal 8-2
8.3 Adelaide Dolphin Sanctuary 8-8
8.4 Sea level rise policies 8-8
8.5 Impact of increased population 8-8
8.6 Impact on Port Gawler Conservation Park, adjacent Crown Land and the Buckland Park Lake system 8-9

9 Climate change and sustainability 9-1

9.1 Risk management 9-1
9.2 Travel demand 9-5
9.2.1 Modelling of expected travel demand 9-5
9.2.2 Greenhouse gas emission reduction 9-6
9.3 Greenhouse gas emissions 9-7
9.3.1 Sources, levels and implications of greenhouse gas emissions 9-7
9.3.2 Mitigation measures 9-8
9.4 Resource management 9-11
9.4.1 Construction phase 9-11
9.4.2 Operational phases 9-12

9.5 Energy conservation 9-13
9.6 Waste management strategies 9-13
9.6.1 Capacity of existing infrastructure 9-14
9.6.2 Proposed strategies for commercial facilities and residential uses 9-15
9.7 Project impact on existing buffers and land use 9-19
9.8 Sustainable design strategies 9-20
9.9 Management for long-term environmental sustainability 9-20
9.10 Mosquito and insect management and control 9-22
9.10.1 Management strategies 9-23
9.10.2 Impact of mosquito management on other species 9-26
9.10.3 Impact of insect control measures on recreational fishing and local ecology 9-26
9.11 Neighbourhood centre 9-27
9.12 Energy efficiency 9-27
9.13 Landscaping 9-28
9.14 Commercial and residential waste management strategies 9-29

10 Flora and fauna 10-1

10.1 Local and regional context for native vegetation 10-1
10.2 Vegetation clearance 10-9
10.2.1 Vegetation clearance 10-9
10.2.2 Measures to minimise, mitigate and compensate for vegetation clearance 10-10
10.2.3 Significant environmental benefit 10-15
10.3 Edge effect on biota and ecological processes 10-16
10.4 Impact of runoff on marine organisms and seagrasses 10-17
10.5 Landscaping and revegetation 10-17
10.6 Pests, insects, animals and diseases 10-17

11 Other environmental issues 11-1

11.1 Air pollution control and monitoring 11-1
11.1.1 Air pollution 11-2
11.1.2 Odour 11-3
11.1.3 Dust during construction 11-3
11.1.4 Dust after occupation 11-3
11.1.5 Bioaerosols 11-4
11.2 Noise mitigation and attenuation measures 11-4
11.2.1 Noise during construction 11-4
11.2.2 Sensitive receptors within the Masterplan 11-5
11.3 Proximity to existing and potential mineral resource deposits and exploration and production tenements 11-6
11.4 Proximity to existing easements for infrastructure service provision 11-7

12 Traffic, parking and vehicle and pedestrian movements 12-1

12.1 Construction and post-construction traffic generation and truck movements 12-1
12.1.1 Traffic generation – 2011–216 12-1
12.1.2 Traffic generation post-2016 12-3
12.2 Traffic movements generated by the proposed development 12-3
12.2.1 Overall trip generation and capture rates 12-3
12.2.2 Forecast traffic movements for all transport modes 12-4
12.3 Traffic impact on surrounding road networks 12-6
12.3.1 External road network 12-6
12.3.2 Other local roads 12-7
12.3.3 Impacts on Virginia 12-8
12.4 Predicted travel demand and public transport routes 12-8
12.4.1 Forecast internal traffic movements for all transport modes 12-8
12.4.2 Public transport 12-10
12.5 Anticipated volume of goods deliveries and delivery hours 12-13
12.6 Movement within the Neighbourhood Centre 12-14

13 Urban design 13-1

13.1 Construction materials, surface treatments and colours 13-1
13.2 Noise mitigation 13-2
13.3 Application of Crime Prevention through Environmental Design principles 13-2
13.4 Car park shelter, shading and screening treatments 13-3
13.5 Screening of air-conditioning plant and ducting 13-4
13.6 Signage 13-4
13.7 Amelioration of visual impact 13-5

14 Community impacts 14-1

14.1 Implications for public services providers 14-1
14.1.1 Health 14-3
14.1.2 Transport 14-4
14.1.3 Education 14-5
14.1.4 High needs housing 14-7
14.1.5 Community services and community building 14-7
14.1.6 Recreation 14-10
14.1.7 Libraries 14-11
14.2 Predicted workforce and employment characteristics 14-11
14.3 Contribution to industry development in the northern Adelaide region 14-14
14.4 Residential population 14-15
14.4.1 Number and type of dwellings and expected resident population 14-15
14.4.2 Proposed staging and timing of stages 14-18
14.5 Affordable housing 14-21
14.5.1 Opportunities to reduce the cost of home ownership 14-21
14.5.2 Achieving Housing Plan for South Australia targets for affordable housing 14-22
14.6 Potential impacts on non-Aboriginal heritage sites 14-24
14.7 Potential impacts on Aboriginal heritage sites 14-25

14.8 Impact on Native Title Claimants 14-26
14.9 Impacts on visual amenity and landscape quality 14-27
14.10 Proximity to existing and potential dwellings and other land uses 14-30
14.11 Impacts on Virginia 14-32
14.11.1 Education 14-32
14.11.2 Retail 14-33
14.11.3 Health 14-33
14.11.4 Workforce 14-33
14.12 Impact on local and regional land uses 14-34
14.13 Community consultation processes 14-34
14.13.1 Establishment of a community enquiries register 14-34
14.13.2 Issues from community representatives 14-34
14.14 Addressing potential social and physical isolation issues 14-36
14.15 Land tenure arrangements 14-37
14.16 Infrastructure benefits and improvements to amenity 14-37
14.17 Impacts of any odour and other emissions drift from the adjacent composting operation 14-38
14.18 Community facilities 14-38
14.18.1 District Centre 14-39
14.18.2 Neighbourhood centres 14-40
14.18.3 Local centres 14-41
14.18.4 Stage 1 14-42

15 Infrastructure 15-1

15.1 Impacts on capacity of existing trunk infrastructure 15-2
15.2 Provision for police, correctional and judicial services 15-9
15.3 Emergency services 15-9
15.4 Access for buses 15-10
15.5 Walking path network 15-10
15.6 Best practice measures of infrastructure design 15-12

16 Economic issues 16-1

16.1 Economic implications of loss of production potential 16-1
16.2 Opportunity for investment in the area 16-2
16.3 Employment and investment opportunities 16-3
16.4 Potential to attract other allied industries and commercial ventures 16-5
16.5 Potential infrastructure costs or savings to the Government 16-5
16.6 Financial strategies to ensure infrastructure is in place 16-8
16.7 Impacts of the neighbourhood/community centre on existing and approved retail/commercial activities 16-11
16.7.1 Centre hierarchy 16-11
16.7.2 Impact on existing retail and commercial facilities 16-12
16.8 Impact on employment generation of ongoing commercial activities the development 16-13
16.9 Proposed hours of operation of retail and commercial activities 16-14

17 Risk/hazard management 17-1

17.1 Public safety strategies during construction 17-1
17.2 Prevention and management procedures for pollution spills and sewage leaks 17-1
17.3 Fire management processes 17-2
17.4 Bunding of hazardous materials storage areas 17-2
17.5 Impact of seismic events 17-2
17.6 Impacts on the obstacle limitation surface for airfields or aerodromes 17-2

18 Construction effects 18-1

18.1 Staging, planning and timing of the development 18-1
18.2 Construction workforce 18-1
18.3 Weed and disease management, control and prevention 18-3
18.4 Construction impact monitoring and minimisation 18-3

19 Legislation and policies 19-1

19.1 Compatibility with the Development Plan and Planning Strategy 19-1
19.1.1 Consistency with the Planning Strategy 19-1
19.1.2 Consistency with Playford (City) Development Plan 19-3
19.2 Urban growth boundary issues 19-8
19.3 Development of a residential site outside the metropolitan area 19-9
19.4 Potential zoning changes 19-9
19.5 Compatibility with State and Commonwealth conservation and environment protection legislation and initiatives 19-10
19.6 Compliance with legislative requirements 19-11
19.7 Compliance with the Environment Protection (Water Quality) Policy 2003 19-12
19.8 Addressing 'Tackling Climate Change Greenhouse Strategy 2007-2020' issues 19-12
19.9 Compliance with the Aboriginal Heritage Act 1988 19-13

20 Summary of commitments 20-1

20.1 Road closures 20-1
20.2 Stage 1 Neighbourhood Centre, Sales Office and Display Village 20-1
20.3 Stage 1 Residential Component 20-2
20.4 Future Stages 20-4

List of Figures

Page no.

1 Introduction

1.1 Locality plan 1-1
1.2 Major declaration area 1-3
1.3 Road closures 1-8

2 Need for the proposal

2.1 Current zones 2-8
2.2 Site's strategic context 2-18

3 Description of the proposal

3.1 Site with Metropolitan Adelaide 3-2
3.2 Site within the northern region 3-3
3.3 Site within its locality 3-3
3.4 Cadastral Plan 3-5
3.5 Proposed Superlot Land Division Plan 3-6
3.6 Proposed Stage 1 Plan 3-7,3-8
3.7 The Buckland Park Masterplan 3-9
3.8 The Stage 1 Layout Plan 3-10
3.9 Stage 1 Neighbourhood Centre Concept Plan 3-13
3.10 Display Village 3-15
3.11 Staging Plan 3-16

4 Development history, land use, heritage, social and economic, traffic and transport

4.1 Distribution land uses on the site and in its locality 4-2
4.2 Weekly household income comparison areas 2006 4-3
4.3 Industry of employment 2006 comparison areas 4-6
4.4 Existing road network 4-7

5 Physical environment

5.1 Flora survey 5-6
5.2 Fauna survey 5-7
5.3 Greenhouses 5-11
5.4 Jefferies silo in the distance 5-11

6 Need for the proposal

6.1 Distribution of affordable housing 6-6
6.2 Distribution of Affordable Housing in Stage 1 6-8

7 Water issues

7.1 Current impact of a 1 in 100 year ARI event 7-2
7.2 Proposed storm and flood management channels 7-3
7.3 SA Water water supply options 7-7

8 Coastal environment

8.1 Site relative to the coastal environment 8-1
8.2 Port Gawler Conservation Park adjacent Crown Land and Buckland Park system 8-9

9 Climate change and sustainability

9.1 Urban areas and mosquito habitat 9-23
9.2 Indicative location for mosquito barrier 9-25
9.3 Concept Neighbourhood Centre Landscape Plan 9-29

10 Flora and fauna

10.1 Flora in the Gawler River Corridor - East 10-2
10.2 Flora in the north-west 10-3
10.3 Flora around Thompson Creek 10-4
10.4 Flora in the south-west 10-5
10.5 Flora within Stage 1 10-6
10.6 Masterplan over remnant vegetation 10-9

11 Other environmental issues

11.1 Jefferies demonstration farm and composting facility with Masterplan 11-2
11.2 Mineral tenements and geothermal exploration licences 11-6

12 Traffic, parking and vehicle and pedestrian movements

12.1 Proposed bus route strategy 2031 12-11
12.2 Proposed bus route staging 12-12

13 Urban design

No figures in this chapter

14 Community impacts

14.1 Age profile over time 14-2
14.2 Mt Barker BBQ 2008 14-8
14.3 Mt Barker BBQ 2008 14-8
14.4 Mt Barker BBQ 2008 14-8
14.5 Rhodes Peninsula 2005 14-9
14.6 Rhodes Peninsula 2006 14-9

14.7 Affordable housing allotments in Stage 1 14-22
14.8 Principles for the distribution of affordable housing 14-24
14.9 Detail of line along Angle Vale Road 14-27
14.10 Detail of line along Park Road 14-28
14.11 Existing powerlines in Park Road 14-29
14.12 Photomontage showing proposed powerlines in Park Road 14-29
14.13 Relationship of surrounding land uses to the proposal 14-31

15 Infrastructure

15.1 Regional electricity infrastructure 15-3
15.2 Regional gas and telecommunications infrastructure 15-5
15.3 Regional transport infrastructure 15-6
15.4 Regional water infrastructure 15-8
15.5 Masterplan pedestrian and bicycle network 15-11
15.6 Stage 1 pedestrian and bicycle network 15-11
15.7 Water balance schematic 15-12

16 Economic issues

No figures in this chapter

17 Risk/hazard management

17.1 Airports and associated Obstacle Limitation Surfaces 17-3

18 Construction effects

No figures in this chapter

19 Legislation and policies

19.1 Proposed zone amendments 19-10

20 Summary of commitments

No figures in this chapter

List of Tables

Page no.

1 Introduction

1.1 Major development process 1-6

2 Need for the proposal

2.1 Planning Strategy for Metropolitan Adelaide: Relevant policies 2-4
2.2 Directions for creating a new plan for Greater Adelaide 2-7
2.3 The Site's strategic context 2-16

3 Description of the proposal

3.1 Real property description 3-4
3.2 Stage 1 housing types 3-11
3.3 Stage 1 Neighbourhood Centre 3-14
3.4 Gross leasable floor area 3-14

4 Development history, land use, heritage, social and economic, traffic and transport

4.1 Age profile comparison areas 2006 4-4
4.2 Proportion of over 15 year olds employed 2006 comparison areas 4-5
4.3 Existing traffic volumes in the vicinity of Buckland Park (2006) 4-8

5 Physical environment

5.1 Summary of background noise survey results (in d/BA) 5-4
5.2 Results of gun firing noise survey at Shooting Park 5-5
5.3 Long-term meteorological data for RAAF Edinburgh 5-8

6 Need for the proposal

6.1 Dwelling types and yields 6-5
6.2 Indicative Affordable Housing Mix 6-7

7 Water issues

7.1 Minimum site levels 7-4
7.2 Annual water demand 7-6
7.3 Short-term potable water supply options 7-6
7.4 Long-term potable water supply options 7-8
7.5 Water quality results compared to SA EPA *Environmental Protection Water Quality Policy – Aquatic Ecosystem ("Marine Waters")* criteria 7-13

8 Coastal environment

No tables in this chapter

9 Climate change and sustainability

9.1 Climate change impacts and adaption measures 9-2
9.2 Annual internal based transport trips by car and truck 9-5
9.3 Annual external based transport trips by car and truck 9-5
9.4 Annual total transport trips by car and truck 9-6
9.5 City of Playford kerbside management system 9-15
9.6 Building waste generate during construction stage 9-16
9.7 Household and commercial waste stream 9-16
9.8 Estimated household waste type 9-17
9.9 Summary of management and mitigation measures 9-17
9.10 Sustainability outcomes 9-21

10 Flora and fauna

10.1 Indigenous flora species recorded or predicted to occur on the site and their conversation status 10-8
10.2 Surveyed areas of vegetation potentially affected by the Masterplan – Flora area calculations 10-10

11 Other environmental issues

No tables in this chapter

12 Traffic, parking and vehicle and pedestrian movements

12.1 Estimated daily trips to/from the site: January 2011 to December 2016 12-2
12.2 Estimated peak hour traffic generation: January 2011 to December 2016 12-3
12.3 Trip levels and capture rates: 2016 to 2036 12-4
12.4 Trip levels by mode of travel: 2016 to 2036 (daily trips) 12-5
12.5 Forecast traffic impacts on Port Wakefield Road and Angle Vale Road (number off peak hour trips) 12-6
12.6 Incremental traffic impacts on other roads: 2031 12-7
12.7 Trip levels by mode of travel: 2016 to 2036 (daily trips) 12-9
12.8 Forecast daily bus demand: 2016 to 2036 12-13

13 Urban design

No tables in this chapter

14 Community impacts

14.1 Demographics over 25 year implementation period 14-2
14.2 Primary school enrolments and schools 14-5
14.3 Secondary school enrolments and schools 14-6
14.4 Pre-school placements 14-6
14.5 The proposal's residents 2036 employment by industry 14-12

14.6 Proposal's employment 14-12
14.7 Projected employment locations for residents 14-14
14.8 Dwelling yields 14-15
14.9 Housing type by household type 14-16
14.10 Definitions of allotment and dwelling types 14-17
14.11 Construction and occupation 14-19
14.12 Masterplan principles to address potential conflict 14-32
14.13 Enquiries directed to the proponents 14-35
14.14 Issues raised by the community 14-35

15 Infrastructure

15.1 Roll out of Stage 1 infrastructure 15-4

16 Economic issues

16.1 Estimated per annum job and income outcomes over 25 years 16-4
16.2 Estimate of proposal's employment during the operational phase 16-4
16.3 Total employment impact per year 16-5
16.4 Summary Stage 1 infrastructure – 2010 to 2016 16-6
16.5 Summary ultimate infrastructure – 2016 to 2036 16-7
16.6 Total operational employment impacts 16-14
16.7 Hours of operation at Neighbourhood Centre 16-15

17 Risk/hazard management

No tables in this chapter

18 Construction effects

No tables in this chapter

19 Legislation and policies

19.1 Relevant provisions of the Planning Strategy 19-2
19.2 Objectives for the form of development in the MOSS Zone 19-3

20 Summary of commitments

No tables in this chapter

List of Appendices

1 EIS Figures

2 *Planning Report* Connor Holmes 2008

3 *Land Supply and Demand Analysis* Connor Holmes 2008

4 *European Heritage Assessment* SASH Consulting 2008

5 *Demographic Analysis* Connor Holmes 2008

6 *Economic Assessment* Hudson Howells 2009

7 *Preliminary Geotechnical Investigation* Golder Associates 2008

8 *Preliminary Acid Sulphate Soil Investigation* Golder Associates 2008

9 *Groundwater Investigations* SKM 2008

10 *Aquifer Storage and Recharge Potential* REM 2008

11 *Marine and Coastal Assessment* Cooe 2008

12 *Noise Impact Assessment* Connell Wagner 2008

13 *Air Quality Assessment* Connell Wagner 2008

14 *Flora Technical Report* Dr Bob Anderson 2008

15 *Fauna Technical Report* Dr Bob Anderson 2008

16 *Climate Change and Sustainability Analysis* Parsons Brinkerhoff 2009

17 *Landscape Character and Visual Assessment* Swanbury Penglase 2009

18 *Stormwater Management, Water, Waste Water and Recycled Water Technical Paper* Wallbridge and Gilbert 2008

19 *Groundwater Monitoring* SKM 2009

20 *Preliminary Site Contamination Investigation* Connell Wagner 2008

21 *Site History Investigation* Connell Wagner 2008

22 *Mosquitoes* Samson Institute 2008

23 *Letter regarding the marine environment* Cooe 2009

24 *Traffic Impact Assessment* Parsons Brinkerhoff 2009

25 *Social Analysis* Connor Holmes 2008

26 *Affordable Housing* Connor Holmes 2008

27 *Centres Planning* Connor Holmes 2008

Chapter 1 Introduction

This chapter provides the background to the Buckland Park proposal (the proposal) and the proponents, a description of the environmental impact assessment process, and the public consultation processes that will be used.

1.1 Proposal objective and background

Proposal summary

The Buckland Park site (the site) is located approximately 32 kilometres north of the Adelaide Central Business District (CBD), adjoining the western side of Port Wakefield Road (Highway 1), opposite Virginia. It has an area of approximately 1,340 hectares, and is approximately 6 kilometres across. The site is described in more detail in Chapter 3.1.3.

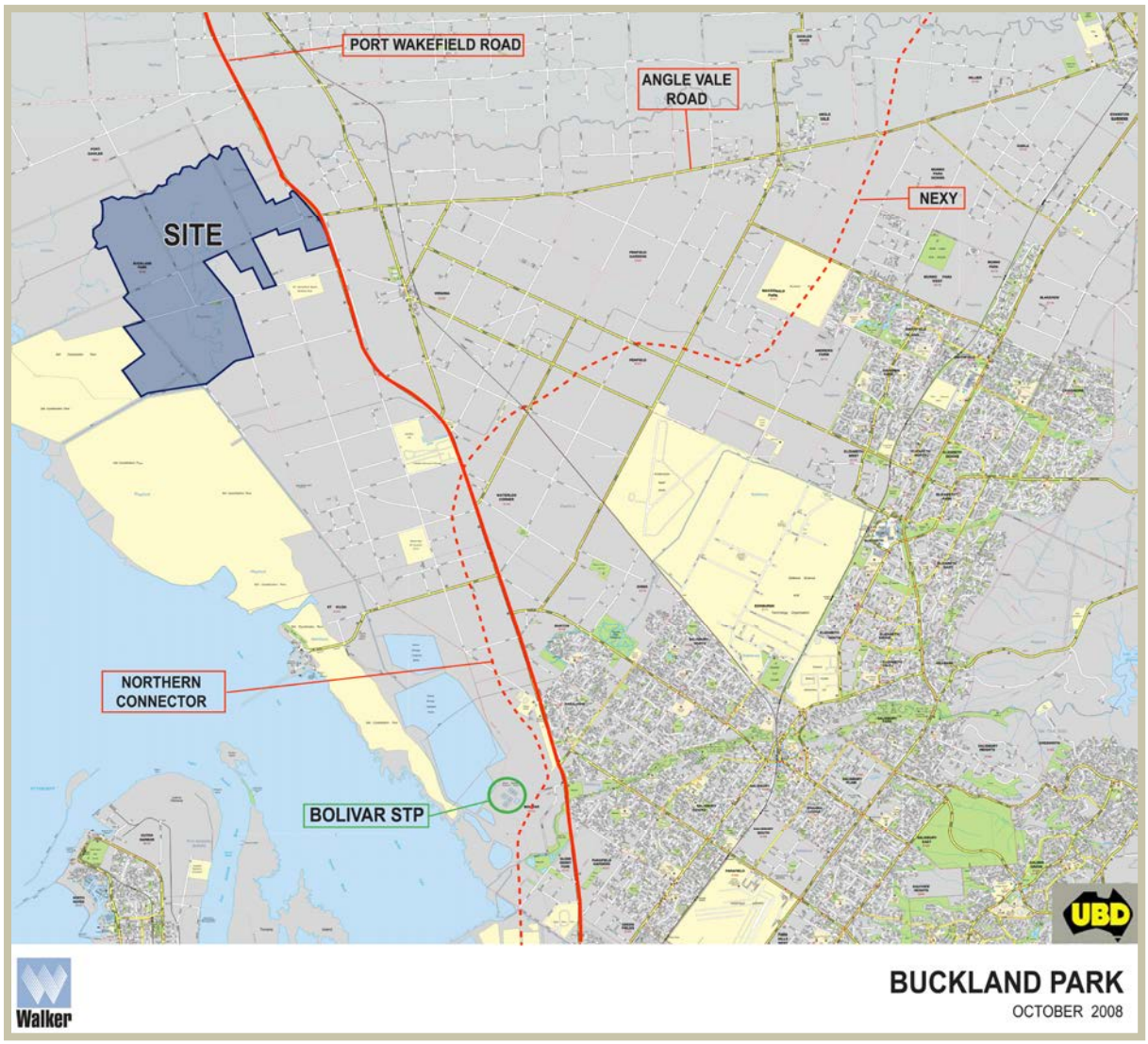


Figure 1.1 Locality plan

In summary, the proposal comprises:

- A land division into 29 super allotments, which will be subdivided again over time as the proposal is implemented.
- The land division of super lot 1 into 616 allotments, new public roads, public reserves and balance lots.

The land division will be guided by the Buckland Park Masterplan (the Masterplan), and a Stage 1 Layout Plan. These plans show the intended use of the allotments proposed, and will guide the progressive implementation of the proposal over a planned time frame of 25 years, commencing in 2010 and concluding in 2036.

The Masterplan accommodates 12,000 residential allotments, and allotments for the schools, centres, parks, employment and mixed use precincts and road network necessary to support the housing that will be built on those residential allotments.

The Stage 1 Layout Plan accommodates 616 housing allotments, a school site, a neighbourhood centre site, new roads and parks.

More detail on the proposal is provided in Chapter 3.

Proposal objective

The proposal's objective is the creation of a supply of housing allotments over a 25 year period which will contribute to Adelaide's economic and social well being by accommodating some of its projected population growth.

Proposal background

Part of the site was declared a Major Development Declaration Area in June 2003.

The declaration was varied on 4 January 2007, when more land was incorporated into the Major Declaration Area. A Development Application was submitted in May 2007.

Following consideration of the site's context the declaration was varied in June 2008 to include adjoining land to the south and fronting Port Wakefield Road. An amended development application was also submitted, consistent with the amended site area. The Major Declaration Area is illustrated below.

The development application was considered by the Development Assessment Commission (DAC), who determined the proposal required a full environmental impact assessment, and who issued final guidelines for that assessment in September 2008.

This environmental impact statement (EIS) addresses the guidelines issued in 2008. Each guideline has been cited in full in the relevant sections of the EIS.

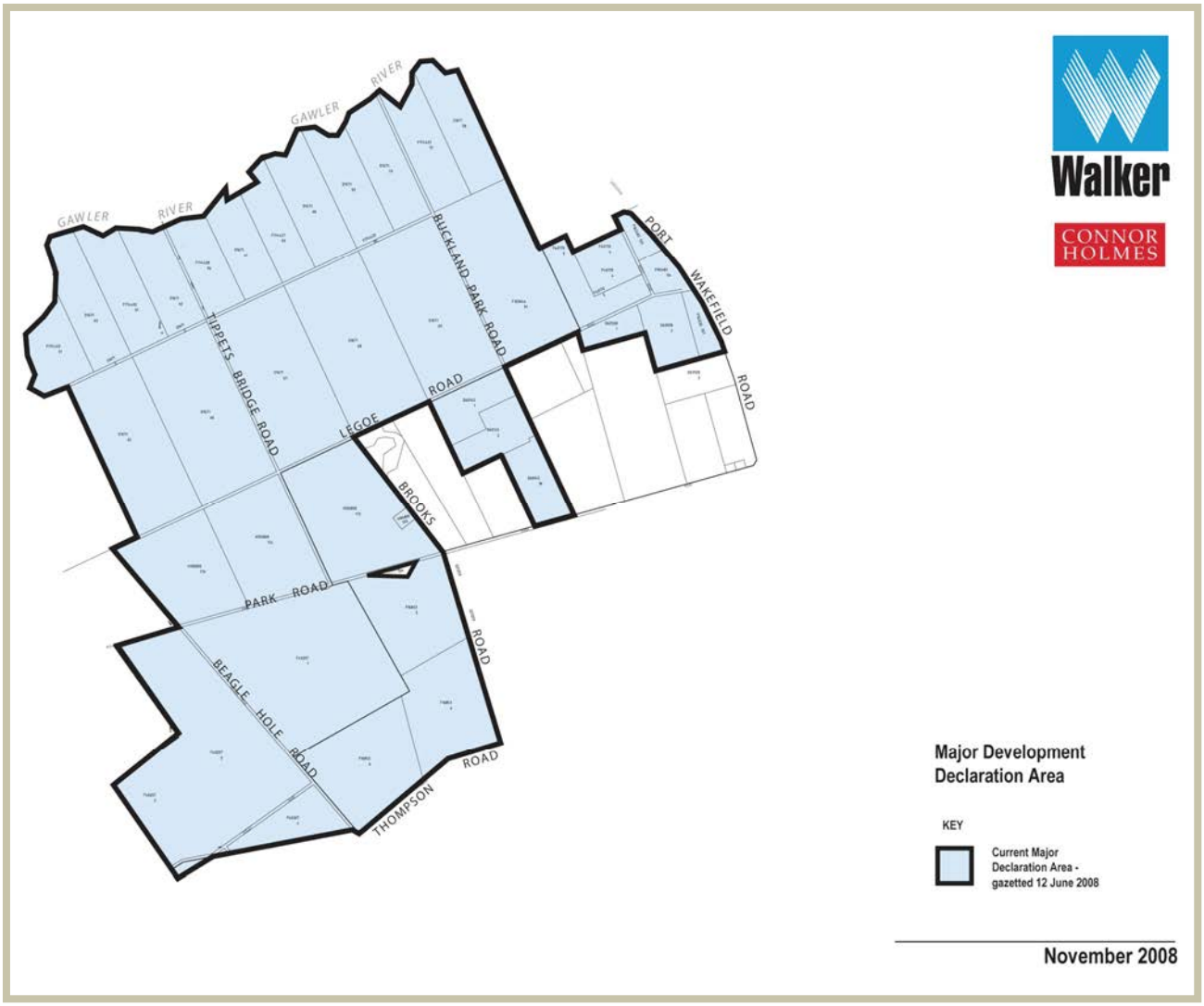


Figure 1.2 Major declaration area

1.2 Proposal proponent

The proposal's proponent is Walker Corporation Pty Ltd, a Sydney-based developer of master-planned residential communities, retail, commercial and industrial projects. The company has specialist expertise in planning, project management, finance, joint venture and development structures, infrastructure construction and project marketing.

Full contact details for Walker Corporation are provided below:

Walker Corporation Pty Ltd

ABN 95 001 176 263
GPO Box 4073
SYDNEY NSW 2001
Telephone: + 61 2 8273 9600
Facsimile: + 61 2 9252 7400
www.walkercorp.com.au

1.3 Environmental Impact Statement process

The term 'environmental impact statement' was established in Section 46B of the *Development Act 1993* (SA). The purpose of the EIS and a description of the EIS process are described below.

1.3.1 Purpose of the Environmental Impact Statement

The purpose of the EIS as set out in the Development Act is to:

- provide a clear description and analysis of the existing environment, the proposal, issues relevant to the development and the means by which these can be addressed;
- detail the expected environmental, social and economic effects of the development;
- consider the extent to which the expected effects of the development are consistent with the provisions of any Development Plan, the Planning Strategy and any matter prescribed by the Regulations under the Development Act;
- set out the proponent's commitments to meet conditions (if any) placed on any approval that may be given to avoid, mitigate or satisfactorily control and manage any potential adverse impacts of the development on the environment; and
- address any other information required by the Minister.

The aims of the EIS and the public consultation and review are to provide:

- a source of information from which interested individuals and groups may gain an understanding of the proposal, the need for the proposal, the consequences of not proceeding, the environment that would be affected, the effects that may occur and the measures to be taken to minimise those effects;
- a forum for public consultation and informed comment on the proposal;
- a framework within which decision-makers may consider the environmental aspects of the proposal in parallel with social, economic, technical and other factors.

1.3.2 Description of the process

The Minister declared the site a Major Development Declaration Area and guidelines were issued by the Development Assessment Commission requiring the proponent to prepare an EIS. This EIS is now undergoing the following process:

- the Minister refers the EIS to any prescribed authority or body, and to other relevant authorities or bodies for comment;
- the Minister undertakes public exhibition of the EIS document by advertisement for thirty business days during which time written submissions are invited;
- during this time a public meeting is held in the locality by the Minister's nominee (generally Planning SA) to provide information on the development or project, to explain the EIS document and processes, and to assist interested persons in making submissions under the Development Act;
- copies of any submissions from the public and agencies are given to the proponent soon after the public comment period has closed;
- the proponent prepares a written response in a 'Response Document' to the matters raised by the Minister, any prescribed or specified authority or body and members of the public;

- the Minister prepares an Assessment Report taking into account any submissions, the proponent's response to those submissions, and comments from any other authority or body considered as the Minister thinks fit.

The Response Document and the Assessment Report are made available for inspection and purchase at a place and period determined by the Minister. The Minister notifies availability of each of these documents by advertisements in The Advertiser newspaper and local press.

Role of the Governor

Under Section 48 of the Development Act, the Governor is the final decision-maker. In arriving at a decision, the Governor must have regard to:

- provisions of the appropriate Development Plan and Regulations;
- if relevant, the Building Rules;
- the Planning Strategy;
- the EIS and Assessment Report;
- if relevant, the *Environment Protection Act 1993* (SA), the *River Murray Act 2003* (SA) and/or the *Adelaide Dolphin Sanctuary Act 2005* (SA).

The Governor may approve the development subject to:

- 'reserved matters' where a specified matter is subject to more detailed assessment and decision; and/or
- conditions of consent that must be complied with by the entity enjoying the benefit of the approval.

1.3.3 Approval processes and legislation

Table 1.1 sets out more formally the main steps in the process from its commencement according to the Major Development provisions pursuant to Sections 46 and 48 of the *Development Act 1993* (SA) as amended, together with comments relevant to each step in the process.

The Governor may reserve a decision on a particular matter until further assessment, and may attach conditions to any consent issued. The Governor may delegate authority to the Development Assessment Commission for further decisions and review.

Primary legislation

Should the proposal be approved by the Governor under the Development Act, a number of subsequent approvals will be required before and during construction. Principal among those approvals will be those relevant to the:

- *Development Act 1993*
- *Aboriginal Heritage Act 1988*
- *Environment Protection and Biodiversity Conservation Act 1999*
- *Native Vegetation Act 1991*
- *Roads (Opening and Closing) Act 1991*.

Table1.1 Major development process

Development Act section	Main steps in procedure	Comments
46 (1)	The site was declared as a Major Development Area.	The Minister made a formal declaration on 5 June 2003 that a proposed land division for approximately 400 allotments was of major environmental, social or economic importance. It received an 'early no'.
46 (4)	The declaration was varied by the Minister on 4 January 2007.	The amended declaration related to a new proposal for approximately 7,000–10,000 residential allotments and associated works on a 1,000 ha site.
46 (6)	A development application was lodged by the proponent on 25 May 2007.	'The proponent' for the project is Walker Corporation Pty Ltd and DayCorp Capital Pty Ltd acting in joint venture.
46 (2)	The Development Assessment Commission (DAC) considered the development application in August 2007.	DAC determined an Environmental Impact Assessment was required and issued guidelines for that assessment, which were released on 19 September 2007.
46 (6)	The proponent lodged an amended development application on 23 April 2008.	The principal amendments to the application were: • the addition of extra land, bringing the total to 1,308 hectares, excluding public roads • an increase in the number of potential allotments to approximately 15,000 • the addition of a neighbourhood/community centre and display village.
46 (4)	The declaration was varied by the Minister on 12 June 2008.	The amended declaration encompassed: • additional land • a shopping centre of up to 8,000 m^2 gross leasable floor area plus associated community uses and any ancillary development • a display village and any ancillary development.
46 (12)	The Development Assessment Commission (DAC) considered the amended development application in August 2007.	Amended EIS guidelines were released on 16 September 2008.
46B (2–14)	The proponent prepares the EIS in accordance with the guidelines.	The EIS details the relevant expected environmental, social and economic effects. It also examines the proposal in terms of its consistency with the State Planning Strategy, the Development Plan and other regulatory requirements under the *Development Act 1993*. The EIS also sets out the proponent's commitments to the management of issues and effects arising from the project.
46B (5), (6)	The EIS is released for public and agency comment.	The EIS is released to the public and Government agencies for 30 business days. A public hearing is held during that period.

Development Act section	Main steps in procedure	Comments
46B(8)	The proponent prepares a response to comments and, where necessary, makes any amendments to the proposal.	The proponent responds formally to submissions and all matters raised by the public and Government agencies in a 'response document'. The proposal may be amended in response to issues raised.
46B(9)	Assessment Report	The Minister prepares an Assessment Report, which is released to the public. The assessment report clarifies matters related to the proposal to assist in the decision-making process. The proponent does not have a role in the preparation of this report.
48	Decision-making by the Governor.	The application (with any amendments) is forwarded to the Governor for a decision. The Governor determines the approval/rejection of all applications for Major Developments that are subject to an EIS.

Development Act 1993

Given the scale of the proposal and the 25 year implementation time frame, it is not possible to resolve every detail of every aspect as part of the major development assessment process. The proposal therefore includes a range of matters to be dealt with as either of the following:

- Conditions of consent: requirements that the proponent must meet before or during construction.
- Reserved matters: issues that are approved 'in principle' but that require further details to be submitted before a final approval can be given.

The EIS describes where the application of conditions of consent and/or reserved matters is envisaged.

Any development that is beyond the scope of the current proposal will require a separate *Development Act* authorisation.

Aboriginal Heritage Act 1988

Approval under the *Development Act 1993* does not obviate the need for separate approvals under the Aboriginal Heritage Act. On 22 October 2008, the proponent lodged an application with the Minister for Aboriginal Affairs and Reconciliation seeking a determination as to whether the site of Stage 1 of the proposal has indigenous significance in accordance with Section 12 of the Aboriginal Heritage Act.

A separate determination will be sought in relation to subsequent stages of the proposal as and when they are implemented, together with Ministerial approvals (as may be required) for any works that would impact on Aboriginal sites or relics.

Environment Protection and Biodiversity Conservation Act 1999

Approval under the *Development Act 1993* does not obviate the need for a separate approval under the *Environment Protection and Biodiversity Conservation Act*.

The proponent will seek a Ministerial determination on whether or not the proposal requires the application of the Act.

Native Vegetation Act 1991

Should the proposal be approved, clearance of native vegetation that is incidental to the approved proposal will be exempt from approval under the *Native Vegetation Act* provided the clearance is undertaken in accordance with:

- the approval given to the development;
- a management plan approved by the Native Vegetation Council that delivers a significant environmental benefit on the property or, alternatively, a Council approved payment-in-lieu is made to the Native Vegetation Fund.

Should the proposal be approved, the proponent will submit a management plan to the Native Vegetation Council for approval.

Roads (Opening and Closing) Act 1991

The proponent will separately seek approval for the closure of existing public roads as and when new public roads are created in each of the proposal's stages. The process requires separate consultation with affected parties and final approval by the responsible Minister.

Approval for partial closure of Legoe Road is sought in this EIS. Figure 1.3 shows the location of road closures anticipated as part of the proposal.

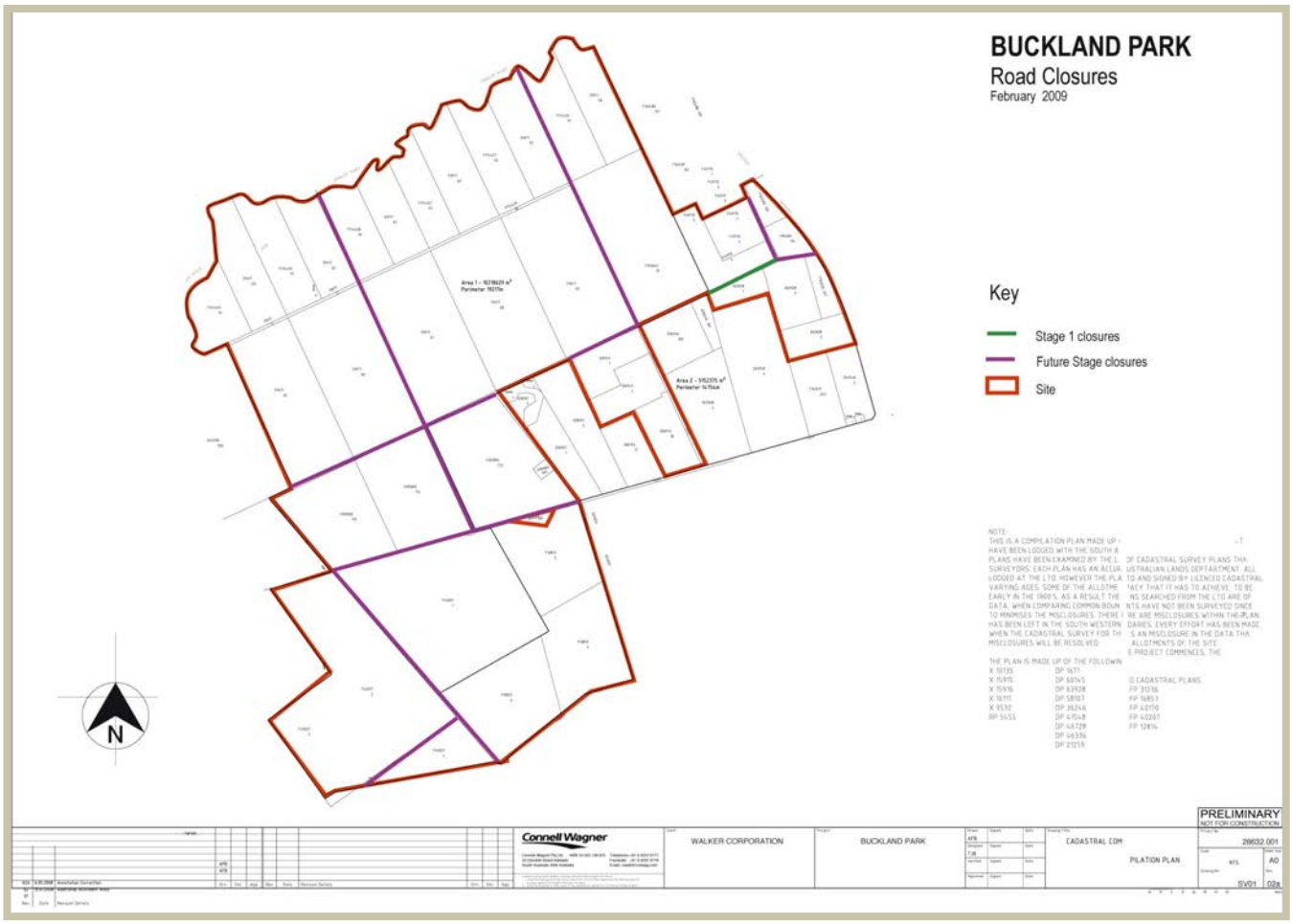


Figure 1.3 Road closures

Other legislation

Other key statutes applying to the establishment and operation of the proposal include:

- *Environment Protection Act 1993*
- *Adelaide Dolphin Sanctuary Act 2005*
- *Occupational Health Safety and Welfare Act 1986*
- *Public and Environmental Health Act 1987*
- *Natural Resources Management Act 2004*

1.4 Consultation

In addition to the statutory consultation process identified within Section 46B (5) and (6) of the *Development Act 1993* as amended, as described in Table 1.1. The proponent will undertake a parallel community engagement process within communities within the site's locality.

The purpose and approach to conducting the community engagement is described below.

1.4.1 Local communities

The community engagement will focus on the communities within the site's locality, but more general consultation will occur in the broader region, including:

- Within Playford LGA, particularly Virginia and Angle Vale.
- Within the Mallala LGA to the north of the Gawler River, particularly Two Wells.
- Within the Salisbury LGA to the south.

Recognition is given various interested stakeholders within these communities including:

- Property owners.
- Residents.
- Business and service owners and providers.
- Workers.
- Community and sporting groups and associations.

1.4.2 Purpose of community engagement

The primary purpose of the community engagement process is to inform members of the above communities and stakeholder groups about the proposal as described in this EIS, including:

- The proposed size, layout and staging of the proposal.
- Planning for facilities, including the range of housing styles, retail, commercial and community facilities, recreation and sporting amenities and facilities.
- Local employment opportunities both pre and post construction.
- Connectivity with surrounding townships including road and transport networks.
- Management of environmental factors including native flora and fauna, groundwater, and storm and flood mitigation.

- The provision of water, transport and other utilities.

The community engagement process undertaken by the proponent is not intended to explicitly seek comments and feedback on the proposal. That is the purpose of the formal community engagement on the EIS to be undertaken by the State Government. Rather, the proponent's community engagement process will seek to inform interested parties about the EIS and the process by which they can make formal comment.

1.4.3 Proposed approach to community engagement

Information 'drop-in' sessions

Based on discussions with staff from the Virginia Horticultural Centre (VHC) and the City of Playford, it is proposed that a series of information 'drop-in' sessions be held, where interested community members can find out about the proposal by:

- Viewing display material.
- Talking one on one with key members of the proponents' EIS project team.

It is proposed that information sessions be held at three locations:

- Virginia (two sessions)
- Angle Vale (one session)
- Two Wells (one session)

Each information session is to be held in a suitable location such as the local institute hall or shopping centre foyer to facilitate increased interaction. Sessions would be scheduled to run from 3–8 pm weekdays or 2–6 pm on Saturday/Sunday to enable people to drop in at a convenient time to them.

In addition, councillors of the City of Playford, the District Council of Mallala and the City of Salisbury will be briefed on the proposal.

Promoting the information sessions

The following mechanisms would be used to promote the Information Sessions:

- articles and advertisements in local papers including The Messenger (Salisbury), The Bunyip (Gawler) and Ripe (VHC bi-monthly newsletter);
- letters to key stakeholder groups including:
  - Residents' associations.
  - Business associations.
  - Horticultural groups.
  - Sporting and community groups.
- Letters to property owners adjoining or close to the site's boundary.
- Posters in public places in the townships;
- Liaison with local Councillors of the City of Playford, the District Council of Mallala and the City of Salisbury.

Email address

An email address has been created to allow the public to send questions and comments directly to the proponent. It is bucklandpark@walkercorporation.com.au.

All enquiries, and their nature will be registered for later reference.

Website

The EIS and its supporting documentation will be placed on a website for access by the general public. Its address is www.bucklandpark.com.au.

Chapter 2 Need for the proposal

This chapter outlines the rationale behind the proposal.

2.1 Overall objective

The proposal's key objective is the creation of a steady supply of housing allotments to support Adelaide's growth and economic wellbeing over the next 30 years, which are well served with the physical and social infrastructure needed to create a well functioning and sustainable community.

Achievement of this objective will be facilitated by the Masterplan and Staging Plan, which will guide the coordinated provision of housing and infrastructure, services and facilities over a 25 year time frame, and measures to avoid potential impacts on its physical environment.

2.2 Strategic directions

The key documents that reflect strategic thinking by Government and the community in relation to the proposal are:

- South Australia's Strategic Plan
- Metropolitan Planning Strategy
- City of Playford Development Plan
- City of Playford Community Plan
- City of Playford Council Plan 2008/09–2011/12.

Other relevant strategies include:

- Water Proofing Northern Adelaide
- Gawler River Floodplain Management Authority (GRFMA) & Scheme
- Development of Horticulture Industries on the Adelaide Plains–A Blueprint for 2030
- Adelaide and Mount Lofty Ranges Regional NRM Plan.

2.2.1 South Australia's Strategic Plan 2007

Within the South Australian Strategic Plan, the Government of South Australia has presented its blue print for strengthening the economy and community by establishing a direction for the next decade and beyond. The plan is based on six interrelated objectives:

- Growing prosperity.
- Improving wellbeing.
- Attaining sustainability.
- Creativity and innovation.
- Building communities.
- Expanding opportunities.

The plans, programs and budgets of all government agencies align with the Plan's key directions and strategies.

Key targets of the State Strategic Plan include:

- Increase South Australia's population to 2 million by 2050, with an interim target of 1.64 million by 2014 (T1.22).
- Improve the quality of life of all South Australians through maintenance of a healthy work/life balance (T2.12).
- Increase environmental flows by 500 GL in the River Murray by 2009 as a first step towards improving sustainability in the Murray-Darling Basin, with a longer-term target to reach 1500 GL by 2018 (T3.10).
- Achieve the Kyoto target by limiting the state's greenhouse gas emissions to 108% of 1990 levels during 2008–2012, as a first step towards reducing emissions by 60% (to 40% of 1990 levels) by 2050 (T3.5).
- Reduce South Australia's ecological footprint by 30% by 2050 (T3.7).
- Increase affordable home purchase and rental opportunities by 5 percentage points by 2014 (T6.7).
- Halve the number of South Australians experiencing housing stress by 2014 (T6.8).

Growing prosperity

The proposal is projected to generate both construction jobs and on-going employment in the service and maintenance areas, equating to directly and indirectly 2,229 Full Time Equivalent jobs (FTEs) of employment per annum over 25 years. This will contribute to the achievement of T1.10 Jobs, T1.11 Unemployment and T1.12 Employment Participation targets. This is particularly important in Metropolitan Adelaide's northern region, which has historically have experienced high unemployment levels.

The proposal will contribute to economic growth and can be expected to involve investment of more than $4,287 million over 25 years in the construction of external infrastructure, internal infrastructure, housing and other elements. It will thus contribute to achieving the T1.1 Economic Growth and T1.5 Business Investment targets.

Most significantly, the proposal is likely to contribute to Adelaide's competitive business climate by creating a supply of housing land capable of accommodating 12,000 houses, thereby assisting in keeping land housing costs down, by matching demand. This will be complemented by the inclusion of affordable housing and increase in competition with other projects in the northern Adelaide area. The proposal will therefore contribute to achieving the T1.2 Competitive Business Climate target.

By maintaining or improving Adelaide's attractiveness as a low cost centre, the proposal has an indirect potential to influence T1.23 Interstate Migration and T1.22 Total Population.

Attaining sustainability

The proposal has the ability to deliver many of the outcomes sought under Objective 3: Attaining Sustainability. The proposed approach to energy conservation through correct design of housing, encouragement of solar panels and achieving a five-star energy rating for dwellings, or better, can contribute towards the achievement of the T3.12 Renewable Energy, T 3.14 Energy Efficiency – Dwellings and T3.7 Ecological Footprint targets and in doing so, contribute to the T3.5 Greenhouse Gas Emissions Reduction target. The use of alternate technologies, such as gas powered air conditioning will assist.

The proposal has the potential to create a biodiversity corridor along the Gawler River and provide a significant component in the link between the Gulf St Vincent and the upper reaches of the Gawler River and its tributaries, the North Para River and the South Para River. This could, in fact, represent one of the five biodiversity corridors sought under the T3.2 Land Biodiversity target.

Substantial positive impact upon native vegetation is possible through the protection of, and care for, the river red gum woodland along the Gawler River and the samphire shrubland in the south of the site (T3.1 and T3.2). Biodiversity benefits can flow from the use of indigenous plantings in the public domain, while a contribution to the reduction of our ecological footprint can be made through extension of the One Million Trees Program to the site.

Expanding opportunity

The proposal can make a meaningful contribution to the provision of affordable housing (T6.7) and, indirectly, contribute to the decline in the number of South Australians experiencing housing stress (T6.8). The proposal can achieve the 15% Affordable Housing component sought by the State Housing Plan.

2.2.2 Metropolitan Planning Strategy

In December 2007, the State Government released a Planning Strategy for Metropolitan Adelaide. The Planning Strategy provides a physical and policy framework for reaching the various targets outlined in the South Australia's Strategic Plan. There are three volumes in the Planning Strategy. The site is within the Metropolitan Adelaide volume, which:

- Provides a framework for development based on principles of ecologically sustainable development and management of the Adelaide metropolitan area.
- Creates an environment of certainty for investors, State agencies, local government and the community by providing a clear indication of the State Government's policy directions for the physical development of the metropolitan area.

The Strategy includes an Urban Growth Boundary (UGB) which seeks to:

- Protect valuable agricultural production areas from urban development.
- Facilitate the efficient provision and use of infrastructure and services inside the boundary.
- Facilitate the clustering of activities.
- Reduce the social disadvantage which can be caused through distance.
- Reduce travel time and costs to and from employment.
- Provide certainty to investors.

The following range of environmental, development and community initiatives within the Planning Strategy, are relevant to the proposal:

- Water resources.
- Biodiversity.
- Open space, recreation and sport.
- Land use and transport integration.
- Energy efficiency.
- Integrated waste management.
- Coastal, estuarine and marine environments.
- Education facilities.
- Health and community services.
- Hazard avoidance, minimisation and management.
- Activity centres.
- Residential neighbourhoods and housing.

- Urban design.
- Primary industry.
- Employment and business focus areas.
- Commercial uses.

The relevant individual policies are listed in Table 2.1.

Table 2.1 Planning Strategy for Metropolitan Adelaide: Relevant policies

Policy Area	Policy no.	Policy
Water resources	1	Efficient use of water
	2	Water sensitive urban design
	3	Integrate the management, protection and use of water resources
	4	Coordination of multi-objective management of stormwater
	5	Development of alternate water re-use schemes
Biodiversity	1	Integrate the protection of biodiversity and ecosystem processes into urban development
	2	Increase the integrity and viability of areas of biological significance
	3	Increase the viability of areas of biological significance by creating linkages between such areas
Open space, recreation and sport	1	Create strategic open space
	2	Ensure that biodiversity assets are protected
	4	Provide a network of accessible recreation facilities
Land use and transport integration	1	Integrate transport and land use planning decisions
	3	Maximise accessibility to, and the use of, the public transport system
	4	Encourage people to walk and cycle to destinations
	9	Ensure integrated transport and land use supports quality of life outcomes
Energy efficiency	1	Reduce energy requirements for transportation and buildings
Integrated waste management	1	Develop waste treatment and resource recovery facilities
	3	Ensure urban design and buildings incorporate space, facilities, access and construction methods to manage waste
Coastal, estuarine and marine environments	2	Protect coastal, estuarine and marine habitats
	3	Minimise the discharge of stormwater, pollution and nutrients to coastal and marine environments
	4	Avoid, prevent or reduce coastal hazards such as flooding, erosion or acid sulphate soils

Policy Area	Policy no.	Policy
	5	Minimise the adverse impacts of development on coastal, marine and estuarine environments
Education facilities	1	Provide access to a range of education and care facilities
	2	Locate education and care facilities so that access to them is equitable and convenient
	5	Ensure education and care facilities and services are adaptable and responsive to changing needs and demographics
Health and community services	1	Create living environments with services and facilities to support healthy lifestyles and active communities
	2	Match location and delivery of health and community services and facilities with the needs of the community
Hazard avoidance, minimisation and management	1	Minimise risk of flood damage to persons and property
	3	Ensure development does not mobilise, and is protected from, acid sulphate soils
Activity centres	2	Support a range of activity centres that are complimentary and meet community needs
	3	Encourage an appropriate mix of uses to create multifunctional activity centres
	4	Actively encourage people to walk, cycle and use public transport to access activity centres
	5	Improve the transit focus of activity centres through greater integration with public transport facilities
	7	Encourage attractive, functional and vibrant activity centres
Residential neighbourhoods and housing	1	Facilitate and support a variety of affordable housing development options
	2	Increase the diversity of activities within walking distance of housing
	5	Develop transit-focused neighbourhoods to provide opportunities for people to walk to public transport and other services and facilities
	6	Create safe, convenient and pleasant environments for walking, cycling and public transport use
	9	Provide a network of parks and recreation areas within neighbourhoods
	10	Design and develop neighbourhoods in an ecologically sustainable manner
	11	Integrate ecologically sensitive design principles into housing development
	12	Accommodate a range of facilities in neighbourhoods
	13	Facilitate and support a variety of affordable housing development options
	14	Encourage a broad distribution of social housing

Policy Area	Policy no.	Policy
Urban design	1	Enhance elements that contribute to the overall character of the metropolitan area
	2	Create well designed and inspiring urban environments and public spaces
	3	Promote the principles and practice of good urban design
Primary industry	1	Identify and protect areas of primary production significance
	2	Encourage the establishment of enterprises that value add to primary production
	4	Identify and plan for future viable and sustainable industry
	6	Manage the interface between primary industry and urban/rural areas
Employment and business focus areas	1	Create a diverse range of business and employment opportunities
	2	Ensure the provision of an adequate supply of land for business and employment purposes
	3	Promote the development of 'green' businesses
Commercial Uses	1	Locate commercial uses in suitable areas in activity centres

In summary, the most relevant provisions of the Planning Strategy to the proposal seek to:

- Ensure there is an adequate and appropriate supply of land for residential purposes.
- Integrate transport and land use planning.
- Concentrate new housing into areas that have employment, infrastructure and services.
- Achieve sustainability targets, particularly reducing our ecological footprint to reduce the impact of human settlements and activities.
- Ensure proposals to change the economic use of land to housing include an assessment of the implications of that change on economic activity.
- Prepare development strategies for surplus and under-used sites, including treatment of contamination, upgrading of physical infrastructure and community issues.
- Develop higher residential densities in strategic locations around centres and transport nodes and interchanges to provide housing choice and support public transport use.

Detailed commentary on the compatibility of the proposal with the Planning Strategy is provided in Chapter 19.

The South Australian government is reviewing Adelaide's strategic planning. On 5 November 2008 the Minister for Urban Development and Planning initiated the "Growth Investigations Areas" project to ensure there is enough land to accommodate Adelaide's projected growth over the next 25 years.

The results of the project will become progressively available over 2009.

Coupled with the project is the Government's recently announced *Directions for Creating a New Plan for Greater Adelaide* which responds to current and emerging thinking on a vision to direct Greater Metropolitan Adelaide's growth. This EIS considers the relationship of the proposal to the Directions.

Table 2.2 Directions for creating a new plan for greater Adelaide

Directions
A city which will undergo urban regeneration and revitalisation in many existing areas (while sensibly protecting valued heritage and character), with vibrant new higher-density neighbourhoods created in and near the CBD and along designated transit corridors to the west, north and south.
A city that embraces well-planned fringe growth with new population centres closely connected to transport infrastructure and employment opportunities.
A city that encourages the sustainable growth of near country towns and townships, while protecting our most valuable environmental, agricultural and tourism assets.
A city that will see the provision of high speed mass transport linked to the growth in residential housing and jobs. The government will spend nearly $2billion over the next 10 years to modernise our public transport system.

Revised population projections indicate that up to 600,000 additional people could be living in South Australia by 2036. The majority of this population growth is anticipated to occur in Greater Metropolitan Adelaide.

This represents a 40% increase on the existing population, presenting considerable growth management questions for the Government.

Consequently, high population growth and an ageing profile could create a demand for almost 250,000 additional dwellings in Greater Metropolitan Adelaide over the next three decades.

The Government has therefore committed to a Plan that incorporates the following:

- Within the next 30 years Greater Adelaide can house 500,000 more people, nearly 250,000 new dwellings and 160,000 new jobs.
- New housing will move over time from a 50:50 split between existing suburbs and new suburbs, to a 70:30 split.
- Well located and functioning Transit Oriented Developments.
- A 25 year supply of broad-acre land identified, and a 15 year supply of land zoned for urban use at all times.

2.2.3 Playford (City) Development Plan

The Playford (City) Development Plan is a product of the process of review and assessment of its land use allocation and development policies. The Development Plan is the key document used by the relevant authority in the South Australian planning and development system.

Development Plans contain the zones, maps and policies that guide property owners and others with regard to what may or may not be achieved on any given piece of land in the area covered by the Plan. The information within the plan is intended to provide detailed criteria against which development applications will be assessed.

The policies and zonings in Development Plans should be reviewed and updated over time. The *Development Act 1993* provides the legislative framework for undertaking amendments to a Development Plan. Amendments can be instigated, either by the relevant local council or the Minister for Urban Development and Planning. The document used to propose changes to a Development Plan is called a Development Plan Amendment (DPA).

In summary, the role of the Development Plan is to:

- Inform the community about how an area is expected to be developed.
- Assist adjoining owners/occupiers to appreciate what kinds of development they can expect in their neighbourhood.

- Inform applicants as to the type of development that is encouraged (or otherwise) in an area.
- Provide the foundation upon which development assessment decisions are made.
- Provide the foundation upon which any appeal decisions are made.

The parts of the Development Plan that are relevant to the proposal are:

- Horticulture West Zone.
- MOSS (Recreation) Zone.
- Council-wide provisions.

The site is located within the Horticulture West Zone and the MOSS (Recreation) Zone of the Playford (City) Development Plan, authorised 7 August 2008.

More detail on compliance with the provisions of the Development Plan is at Chapter 19.

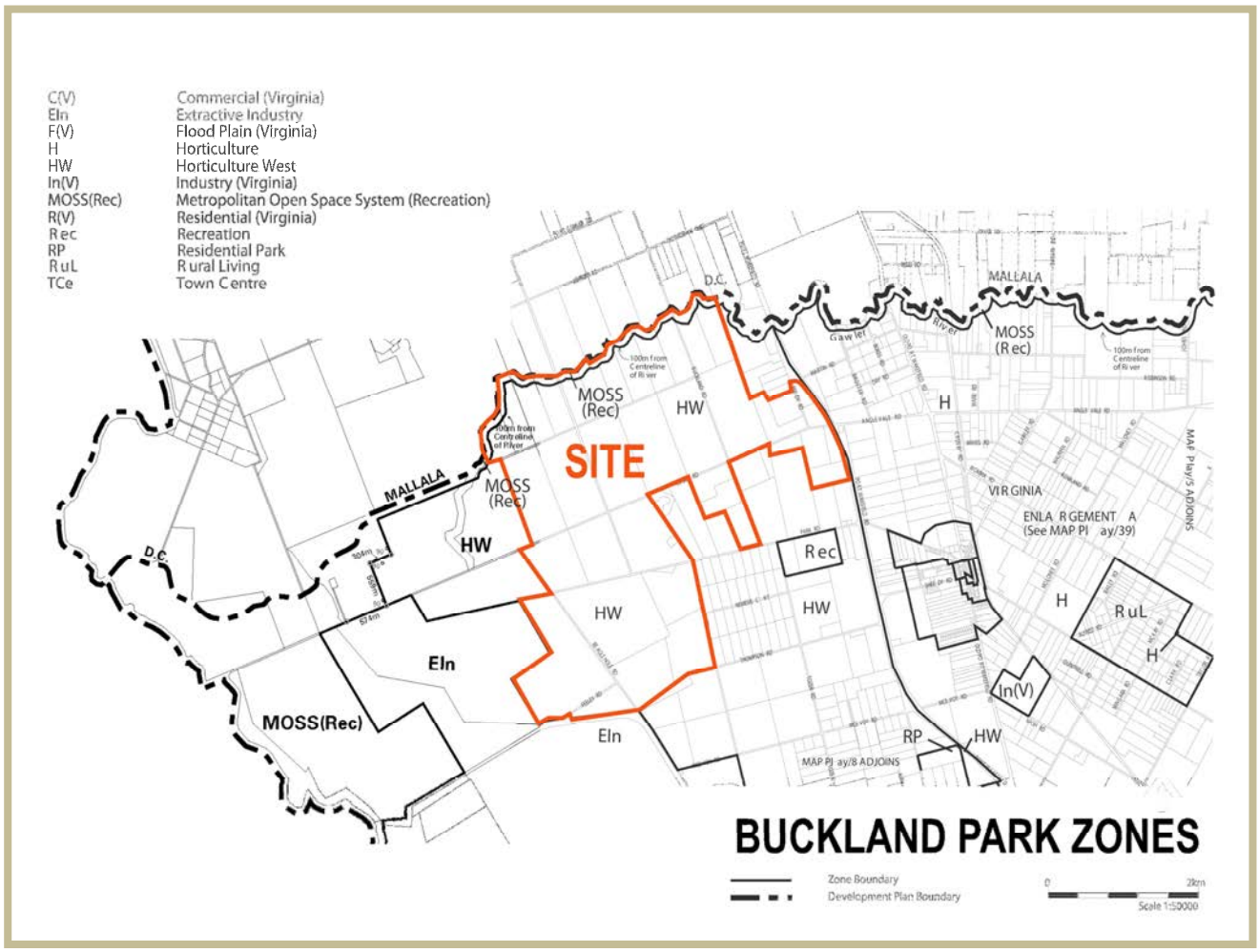


Figure 2.1 Current zones

Horticulture (West) Zone

The Horticulture (West) Zone's key objective is to accommodate a broad range of horticultural activities, while specifically discouraging residential and urban development.

The Zone recognises the importance of horticultural areas in Adelaide's northern plains to the state's economy.

Objective 1: Retention of land for horticultural purposes

The northern Adelaide plains' horticulture area provides significant economic benefit to the State and region. The location and seasonal advantages of the horticulture area, including proximity to the produce markets, major transport routes, labour supply and extended growing periods are unique within the South Australian context. The Zone is also strategically located to take advantage of the Adelaide to Darwin railway.

It is envisaged that, in association with packaging sheds and irrigated horticulture, there will be demand for modern greenhouses including hydroponics on allotments. Such developments are promoted within the Zone.

A threat to the long-term economic viability of the Zone is the conversion of horticultural land to residential/rural living activities. These activities are incompatible with horticulture production and could raise the cost of production for those remaining in production.

Objective 2: A zone characterised by open rural areas, market gardens, greenhouses, hydroponics, vineyards, orchards and pasture.

Objective 3: Education and extensive employment opportunities in horticulture and related industries.

Objective 4: Horticultural activities supported by horticultural related industrial and commercial activities such as packing sheds, cold storage facilities and small-scale processing facilities.

Objective 5: Intensive horticulture in appropriate locations supported by adequate infrastructure and environmental management techniques.

Objective 6: Horticultural activities that are protected from the encroachment of residential and rural living development.

Objectives 8 and 9: Preservation and enhancement of the area's rural character and scenic qualities, and the flow of flood water from the Gawler River is not impeded, and the pattern of movement of flood waters are not changed.

The objectives of the Zone are supported by more detailed principles of development control. In addition to emphasising development should principally be for horticultural purposes, the principles also provide guidance in relation to the provision of physical infrastructure, vehicle access, impact management, stormwater and waste disposal, land division, water courses and flooding.

MOSS (Recreation) Zone

The northern portion of the site adjoining the Gawler River is affected by the MOSS (Recreation) Zone. This zone extends for 100 m from the centreline of the Gawler River into the site for the entire length of Gawler River, which forms the northern boundary.

The pertinent objectives of the Zone, which are pertinent to the proposal seek:

- The establishment of a regional open space network which is integrated and linked to adjoining areas.
- Linear open space for a range of public and private activities.
- Maintenance of stormwater capacity and flood mitigation measures for adjoining areas.
- Provision for cycling and walking paths.
- Protection of the Gawler River riparian zone.

- Presentation and enhancement of the attributes of the Gawler River.
- Provision of public access to and along the length of the Gawler River.
- Protection of the Gawler River 100-year ARI Flood Plain from development that may impede the flow of floodwaters.

Objectives 1 to 5, 7 to 10, 12 and 13 are reproduced here.

Objective 1: Establishment of a regional open space network.

Objective 2: A zone that provides a linear open space for a range of public and private activities, including passive and active recreational land uses in an open and natural landscaped setting as part of the Metropolitan Open Space System, within a well landscaped setting.

Objective 3: Protection of items of Aboriginal and European heritage significance and areas of scientific, archaeological or cultural importance.

Objective 4: The maintenance of stormwater capacity and flood mitigation measures for adjoining areas, and the protection of recharge of underground aquifers.

Objective 5: Provision of cycle and walking paths within an integrated system of open spaces linking adjoining land uses.

Objective 7: Protection of the Gawler River, Little Para River and Smith Creek riparian zones through the conservation and enhancement of existing locally indigenous vegetation and the creation of a wildlife corridor.

Objective 8: Preservation and enhancement of the character, scenic beauty and amenity of the Gawler River, Little Para River, Smith Creek, Hills Face and coastline.

Objective 9: Provision of public access to and along the length of the Gawler River, Little Para River, Smith Creek, Hills Face and coastline.

Objective 10: Land kept free of buildings and structures along the Gawler River.

Objective 12: The Gawler River 100 year Average Return Interval Flood Plain kept free of development which could impede the flow of floodwaters.

Buildings, solid fences and increases in the level of land all have the potential to impede the flow of floodwaters or change the pattern of the movement of floodwaters. This in turn may increase the depth, velocity or spread to floodwaters in other parts of the floodplain, resulting in an increase in damage or inconvenience in that location.

Objective 13: Development of the Gawler River Flood Plain which recognises varying degrees of flood hazard.

2.2.4 Playford Community Plan

The Playford Community Plan establishes and provides the framework for implementing the strategic direction for the City of Playford. This direction is being embraced by the City, its business and residential communities.

The Playford Community Plan is a collective direction for the Council area. It is a reflection of a diverse community's hopes and desires to establish a positive future for the area. Through the work undertaken for the Playford Community Plan, Playford Council has prepared a range of objectives and strategies that it believes are realistic, together with measures and targets to monitor the progress of the area and its communities.

Goal plans

The Playford Community Plan sets out three goals for the City of Playford:

- Economic prosperity.

- Environmental care.
- Community wellbeing.

These three goal plans provide an integrated, planned approach for the City of Playford, while allowing flexibility to respond to emerging needs.

2.2.5 City of Playford Council Plan 2008/09–2011/12

The Council Plan identifies the City of Playford's priorities over a 4-year period, defines its key strategic response and provides an annual budget to fund activities and therefore, it communicates Council's contribution to the realisation of the community vision, contained within the Playford Community Plan.

Goal Committees have been formed, with each focused on one of Council's strategic goals of Community Wellbeing, Economic Prosperity, Environmental Care and Organisational Excellence, identifying the strategic priorities that will guide Council's efforts and resources over the four years period.

The strategic priorities include the following:

- Community wellbeing: health and wellbeing, community safety, liveable communities and lifelong learning.
- Economic prosperity: urban growth and townships, targeted business and industry, learning and employment, economic sustainability and civil infrastructure.
- Environmental care: land, growth, energy, waste and water.
- Organisational excellence: service sustainability, community engagement, organisational development and decision-making.

2.2.6 Other relevant strategies

Other strategies and documents relevant to the Buckland Park proposal include those described as follows.

Water Proofing Northern Adelaide

Metropolitan Adelaide's northern region includes the adjoining Councils of Playford, Salisbury and Tea Tree Gully. The region is experiencing significant change with new residential suburbs. In addition, it is rapidly becoming the industrial, commercial and technology centre of South Australia.

The Water Proofing Northern Adelaide Project is the region's commitment to ensure future growth is sustainable and water is used as effectively as possible, it is a coordinated plan to Water Proof Northern Adelaide and sustain the region.

Sustainability is being achieved through innovation, cooperation and shared commitment. Over the preceding 10 years the City of Salisbury has broken new ground in the use of wetlands and water recycling projects to improve overall water efficiency in the region.

The Australian Government Water Fund is providing a $41.8 million grant, with the State provide over $16 million and the three Councils will invest over $22 million up to 2010 signifying the collaborative commitment to assist the North of Adelaide in becoming more sustainable.

The impact of achieving Water Proofing Northern Adelaide on the region that it targets but on the wider South Australian community cannot be overstated.

It seeks to ensure northern Adelaide's 300,000 residents have potable and 'fit for purpose' water, while at the same time reducing Adelaide's reliance on the scarce resources of the River Murray.

This is to occur through reduced consumption, better management of existing systems and the use of pioneering technologies not yet in use anywhere in the world.

Gawler River Floodplain Management Authority (GRFMA) and Scheme

The Gawler River Flood Mitigation Authority has been established to implement a flood mitigation scheme that was developed and sponsored by the Northern Adelaide Barossa Catchment Water Management Board to be jointly funded by the three spheres of Government.

It is a Government and community response to the periodical flooding that occurs to the Gawler River. The last major flood event occurred in 1992, with a further significant flood event in November 2005.

The City of Playford is one of the six constituent councils of the GRFMA.

The GRFMA has been established for the following purposes:

- To co-ordinate the construction, operation and maintenance of flood mitigation infrastructure in the Gawler River area (the Floodplain).
- To raise finance for the purpose of developing, managing and operating and maintaining flood mitigation works within the Floodplain.
- To provide a forum for the discussion and consideration of topics relating to the Constituent Council's obligations and responsibilities in relation to management of flood mitigation within the Floodplain.
- To enter into agreements with Constituent Councils for the purpose of managing and developing the Floodplain.

Development of Horticulture Industries on the Adelaide Plains—A Blueprint for 2030

Development of Horticulture Industries on the Adelaide Plains—A Blueprint for 2030 July 2007 prepared for the Virginia Horticulture Centre (VHC), provides a vision for the horticulture industry on the Adelaide plains to assist long-term strategic planning and the efficient use of land and resources.

The Blueprint identifies the Adelaide Plains' horticulture industry as being concentrated around Virginia and Angle Vale, with expansion likely to occur into the area around Two Wells. The Blueprint suggests the Virginia 'horticulture cluster' should be preserved and expanded where production, packaging, processing and support industries are located in close proximity.

The Blueprint recognises the intrinsic lower value, and therefore lower priority, of land on the western side of the Port Wakefield Road, where the site is located. This land is envisaged as being suited to hydroponic greenhouse production.

Adelaide and Mount Lofty Ranges Regional Natural Resources Management (NRM) Plan

Under the *Natural Resources Management Act 2004*, to better manage the State's natural resources the Adelaide and Mount Lofty Ranges Natural Resources Management Board (NRMB) is required to develop an NRM plan for its region.

Therefore the NRMB have prepared the Adelaide and Mount Lofty Ranges Regional NRM Plan.

The plan aims to provide leadership, encourage community action, foster partnerships and identify where investment is required. The plan has been put together with extensive consultation with the community and stakeholders.

This plan links to the State's NRM Plan and South Australia's Strategic Plan, and sets out the long-term vision for the region and will guide ongoing actions.

In addition to expressing goals, the Plan outlines the Board's proposed investment over a three-year period, and also provides strategic direction for all NRM partners who invest in the region. Part of this process includes establishing long-term goals, plainly defined outcomes and targets.

2.3 Benefits and costs

Since European occupation the site has been cleared grazing and some cropping. Some remnant vegetation remains along the Gawler River and in the south west portion of the site. The site has a low agricultural value and aside from the Gawler River corridor, limited attraction or high visual amenity.

The proposal is an opportunity to make significant environmental, social and economic improvements to the site and for the surrounding community.

Investigations into the proposal's effects on the environment, and required management are set out in detail in this EIS.

The proposal and site has been extensively investigated over a number of years. The following benefits and costs were identified during those investigations.

2.3.1 Benefits

The benefits to the local environment include:

- Economic benefits for the region's, Adelaide's and SA's economy flowing from business, employment and expenditure generated during the construction phase, the ongoing operation of the community.
- The supply of housing land to support Adelaide's projected growth over coming decades, contributing to meeting demand and managing housing affordability.
- The supply of housing land strategically located in relation to infrastructure, centres and potential growth areas in Metropolitan Adelaide's northern region.
- The creation of a large, planned community making the implementation of services, infrastructure and facilities feasible, and coordinated with the construction of housing.
- The creation of a large community, which can accommodate a range of housing types and a diverse population over time.
- The protection and enhancement of the physical and natural environment, facilitated by the proposal's large scale and Masterplan which will allow the implementation of comprehensive management schemes over time.
- The rehabilitation and revegetation of Gawler River corridor and its remnant vegetation, and its transfer to public ownership, creating public access.
- Creation of a planned community of a scale which facilitates the implementation of efficient sustainability measures, as opposed to measures targeted at individual home owners, which are potentially less efficient.

2.3.2 Costs

- The loss of an estimated $1,780,000 per year farm gate value, including multipliers associated with current agricultural production on the site, based on 2008 production from the site.
- The provision of public infrastructure, services and facilities in a locality currently not provided with those items.

2.4 Proposal rationale and consequences of not proceeding

2.4.1 Rationale

The proposal's characteristics

The proposal's Masterplan and Staging Plan and control by a single proponent, allows it to be implemented in an orderly and economic manner. This is enhanced by its large scale.

This is unique in Adelaide's experience of creating new suburbs.

More specifically, all the proposal's aspects have been outlined in the Masterplan, which will guide the detailed design and implemented with each of the proposal's stages, resulting in a large, well serviced community. Each of the proposal's stages will also be created with its required services.

The Masterplan and Staging Plan will ensure each stage is effectively linked to past and previous stages, in terms of its road, transport, open space and utility networks, and in terms of its social and community networks.

Strategic context

The site is being investigated in the Growth Investigation Areas project.

The site's strategic context has changed over recent years. The changed circumstances included the following:

- Instigation of flood mitigation works associated with the Gawler River, which are anticipated to reduce flood risks in the area.
- Relocation of the 7RAR Battalion with 1,200 personnel from its current location in Darwin to new facilities within the Edinburgh Defence Precinct, including the construction of over $620 million of new facilities at Edinburgh. This in turn creates a significant demand for housing.
- Construction of the Northern Expressway (NEXY), a major piece of road infrastructure. It will improve accessibility to the northern suburbs of Adelaide as will the northern connector and consequently the regions ability to attract employment and support new urban areas.
- A decline in Metropolitan Adelaide's land stocks and housing affordability over the last 3 years.
- The site's location relative to Greater Metropolitan Adelaide's other new and growing suburbs, including those that are either commenced, committed, proposed or under investigation, has been reviewed by Connor Holmes (Appendix 2).

Table 2.3 contains a comparison of eight different new or growing areas with the site:

- Golden Grove
- Concordia
- Hewett
- Sellicks Beach
- Bowering Hill
- Mt Barker
- Dry Creek
- Roseworthy.

The new and growing areas have been analysed against the following eight location indicators:

- Location within Metropolitan Adelaide Area as described in the Planning Strategy.
- Distance by road to:
  - Adelaide CBD
  - Regional centres
  - Major employment areas
  - Major rail interchanges
  - Major hospitals
  - TAFE colleges
  - Universities

It was found that the site's relationship to these key urban facilities was:

- Superior to six of the eight comparable growth areas, on at least five of the eight location indicators.
- Superior to two of the four comparable growth areas within Metropolitan Adelaide on at least five of the eight location indicators.

The site more strategically well placed, often by a considerable margin, than the most of the comparable growth areas reviewed, including others within Metropolitan Adelaide.

Figure 2.2 illustrates the site's strategic context relative to the eight new or growing areas mentioned above, and strategic sites identified in the Planning Strategy including:

- Economic growth areas.
- Key industry sites.
- Defence industry and technology.
- Significant employment nodes.
- Regional centres (activity nodes).
- District (activity nodes).

The site relative to Greater Metropolitan Adelaide's other growth areas is strategically favourable. It is in close proximity to the greater number of Adelaide's economic growth areas and significant employment nodes, including key industry, Defence and technology sites. It is also in close proximity to rail interchange facilities at Salisbury and Elizabeth, tertiary education and major medical services.

Table 2.3 The Site's strategic context

Urban areas	Size (ha)	Type	Within Metro area	Distances to key services/facilities (km by vehicle)						
				CBD	Regional centre	Major rail interchange	Major hospital	TAFE College	University	Major employment lands
The site	**1,340**	**Proposed**	**Y**	**30**	**18**	**15**	**20 (LM)**	**15 (Salisbury)**	**30 (City)**	**9 (Edinburgh Parks)**
Golden Grove	1,240	Completed	Y	22	9	9	9 (M)	9 (Modbury)	22 (City)	10 (Parafield)
Concordia	500	Committed	N	45	20	20	24 (LM)	3 (Gawler) 17 (Elizabeth)	45 (City)	20 (Edinburgh Parks)
Hewett		Completed	N	45	20	20	24 (LM)	3 (Gawler) 17 (Elizabeth)	45 (City) 33 (Levels)	20 (Edinburgh Parks)
Sellicks Beach		Completed	Y	53	26	26	42 (F)	26 (Noarlunga)	43 (Flinders)	26 (Noarlunga Centre) 32 (Lonsdale)
Bowering Hill	397	Committed	Y	43	14	14	30 (F)	26 (Noarlunga)	31 (Flinders)	14 (Noarlunga Centre) 20 (Lonsdale)
Mt Barker		Expanding	N	35	38 (Marion)	35	35 (F)	Mt Barker	35 (City) (Flinders)	38 (Marion) 45 (Mawson Lakes) 45 Gillman)
Dry Creek		Under investigation	Y	12	9	10	12 (RAH)	12 (Pt Adelaide)	12 (City) 5 (Levels)	3 (Gillman) 5 (Mawson Lakes)
Roseworthy		Under investigation	N	49	24	25	28 (LM)	Roseworthy 8 (Gawler) 25 (Elizabeth)	49 (City) 37 (Levels)	25 (Edinburgh Parks)
No. of location indicators inferior to the site			**4**	**6**	**5**	**5**	**6**		**6**	**6**

Key: LM – Lyell McEwin Hospital; F – Flinders Hospital; RA – Royal Adelaide Hospital; Levels – The University of SA Levels Campus; BP proposed Buckland Park major development area

Areas selected include consideration of some of the areas identified within the Minister's News Release "Growth Investigation Areas" dated 5 November 2008

Source: Connor Holmes

Land supply

Up to 250,000 new houses will be required to meet Adelaide's demands over coming decades. Connor Holmes predicts much of that demand will need to be met in Metropolitan Adelaide's northern region, which has more suitable, available land and considerably better access to employment, infrastructure, and future infrastructure (Appendix 3). As new suburbs are established in the northern region, they will draw in more infrastructure, employment and services, providing a catalyst for the creation of additional suburbs.

Strong land price increases in Adelaide's residential market can at least be partially addressed by a substantive increase in the supply of land. While land prices are influenced by a range of factors, the strength of demand coupled with restricted supply have contributed to a rapid escalation in prices.

The proposal can accommodate 12,000 new houses, or 5% of the amount needed to meet Adelaide's demand.

The supply of housing land and competition in the residential market provided by the proposal will contribute to restraining house prices in Adelaide.

The proposal will make a major contribution to the provision of the required housing.

Consequences of not proceeding

Adelaide's required housing will be provided in smaller projects, located over dispersed areas which require an incremental approach to planning for infrastructure and services, which may be inefficient and uneconomic for service providers.

Adelaide requires a large amount of new housing over the next 25 years. A constrained supply of housing will have negative implications for housing affordability.

The Gawler River, where it passes the site, has the potential to be a major environmental asset, for the whole community. This potential will not be realised if the proposal does not proceed. This section of the river will remain in private ownership, and current grazing will continue.

While the construction of 12,000 new houses in any part of Adelaide will have economic benefits, the economic benefits associated with the proposal will be enjoyed most particularly in Metropolitan Adelaide's northern region.

It could be argued Metropolitan Adelaide's northern region is more worthy of those benefits than other areas.

If the proposal does not proceed, those economic benefits will be lost to the region.

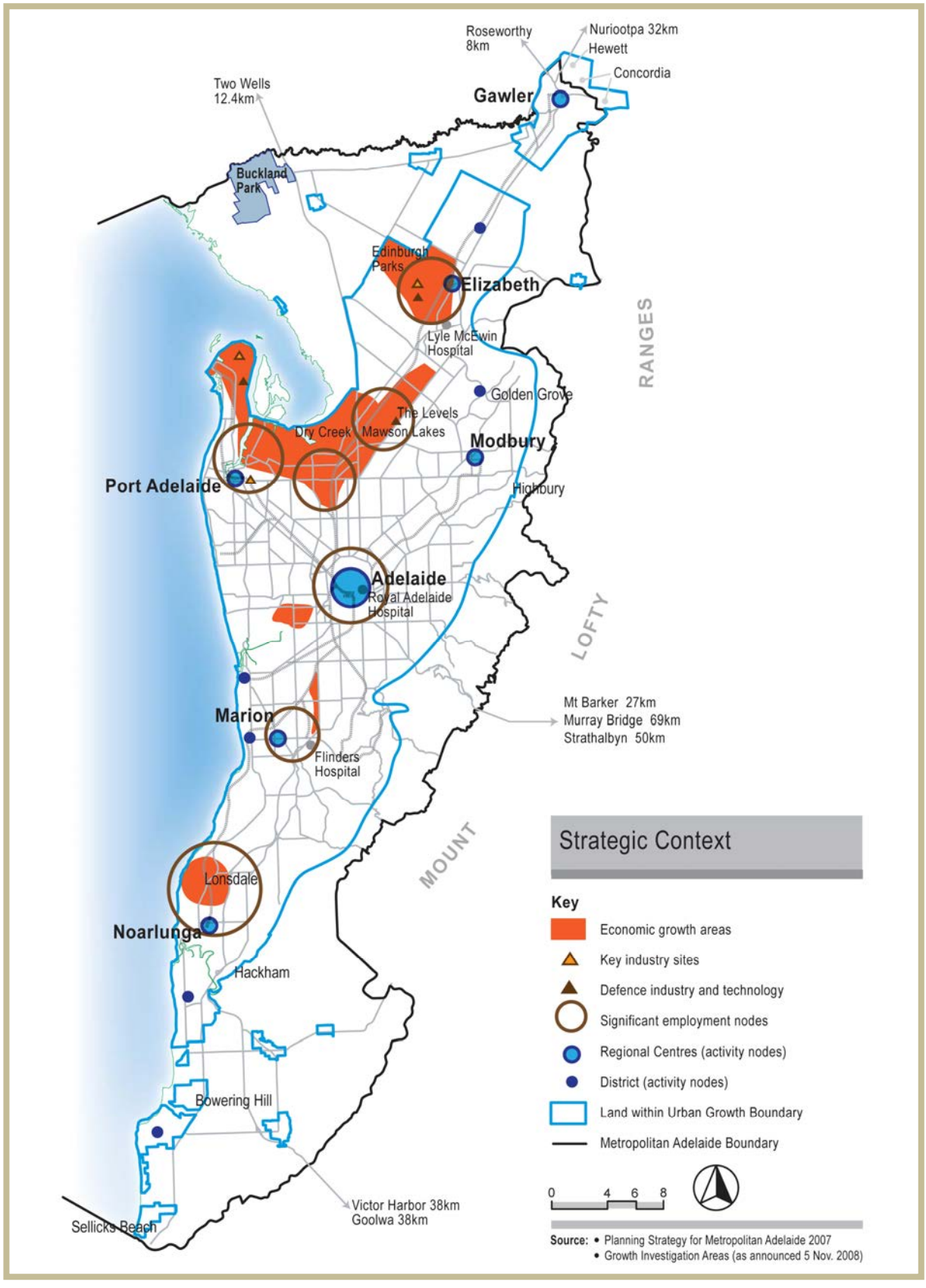


Figure 2.2 Site's strategic context

Chapter 3 Description of the proposal

This chapter provides a description of the proposal, the surrounding locality, and the site. Given the scale of the site and 25 year proposal implementation time frame, it is not feasible to provide specific design details for some aspects of the proposal. For example, the detailed land division of future stages must be coordinated with the detailed investigations of measures to mitigate impacts on significant flora communities or sites of aboriginal heritage significance.

This EIS makes an assessment of the issues which can be considered in more detail during the design of land divisions of future stages.

3.1 The proposal

3.1.1 Location

The site part of Metropolitan Adelaide, within its northern region, as illustrated in Figures 3.1 and 3.2.

The site is located on the western side of Port Wakefield Road (Highway 1), near Virginia, approximately 32 km north of the Adelaide CBD, 14 km from Elizabeth and 16 km from Salisbury. The region is known as the Adelaide Plains.

3.1.2 Locality

The site is within the City of Playford, between 2.5 and 4 km from the Gulf St Vincent coastline. It is bounded by Port Wakefield Road, the Gawler River, Cheetham Salt Limited salt pans, and horticultural activities and their associated houses. The site's northern boundary is formed by the Gawler River, which traverses the region from east to west. Buckland Park Lake is located 2 km to the north west of the site, separated by the Gawler River. Figure 3.3 shows the site within its locality.

3.1.3 The site

The site comprises approximately 1,340 ha used for agriculture since European occupation, primarily low intensity grazing. The northern and southern parts of the site contain areas of remnant native vegetation. Some made, and unmade public roads cross the site.

The site is 6 km across, from its south west corner to its north east corner. It is flat, with the south-west corner at 2–3 m AHD, reaching 10–12 AHD at its north-east corner.

Thompson Creek traverses the southern portion of the site, from north to south. It has two reaches.

There are several glass houses in poor condition located in the site's central area. Perpetual Holdings Pty Ltd operate a substantial glass house enterprise within the site, at the corner of Brooks Road and Park Road.

Table 3.1 gives the real property description. The proponent has entered into legal agreements with each owner within the site regarding the future purchase of their land. These agreements permit the proponent to make submissions to government regarding the future use of the land.

Figure 3.4 shows the location of each certificate of title within the site.

There is a small allotment of Crown Land within the site. It has been excluded from the site area, and is not incorporated into any of the built elements accommodated in the Masterplan.

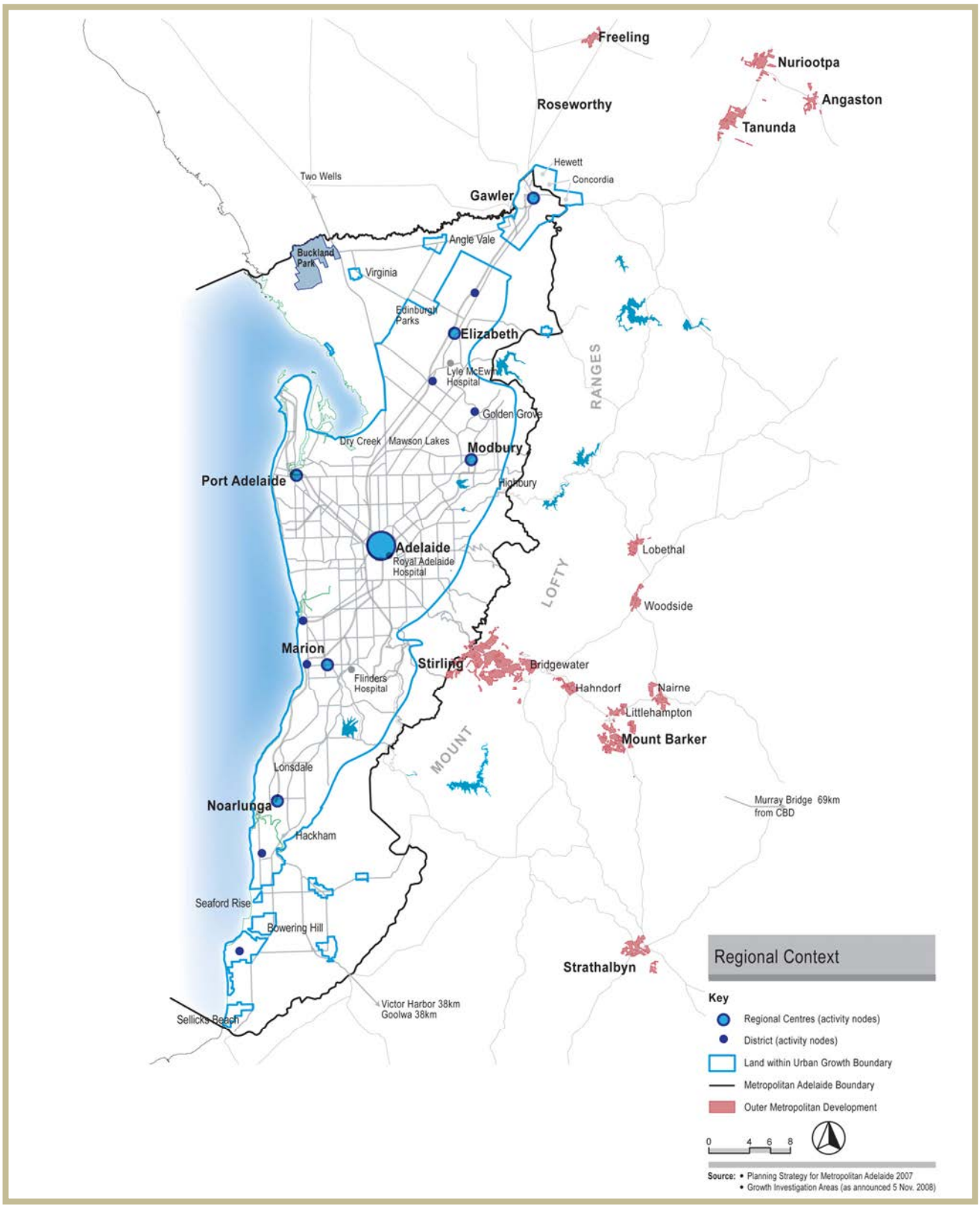


Figure 3.1 Site within Metropolitan Adelaide

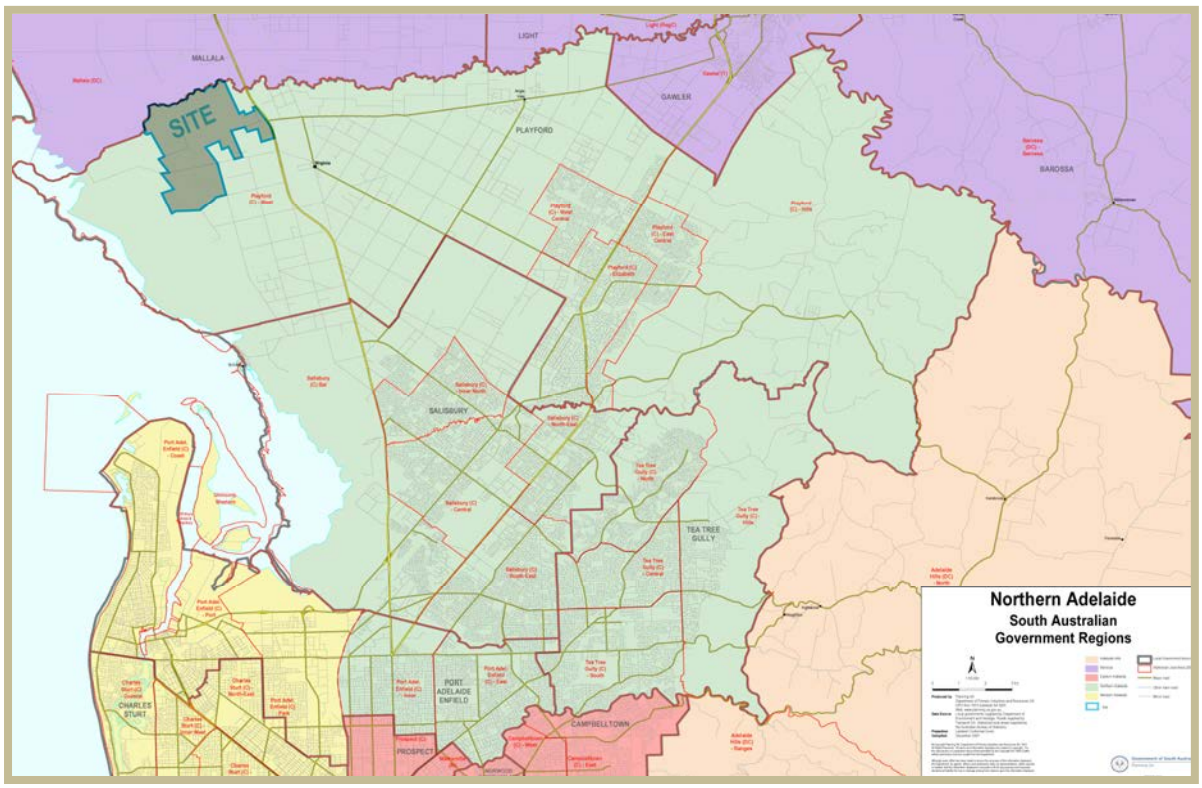


Figure 3.2 Site within the northern region

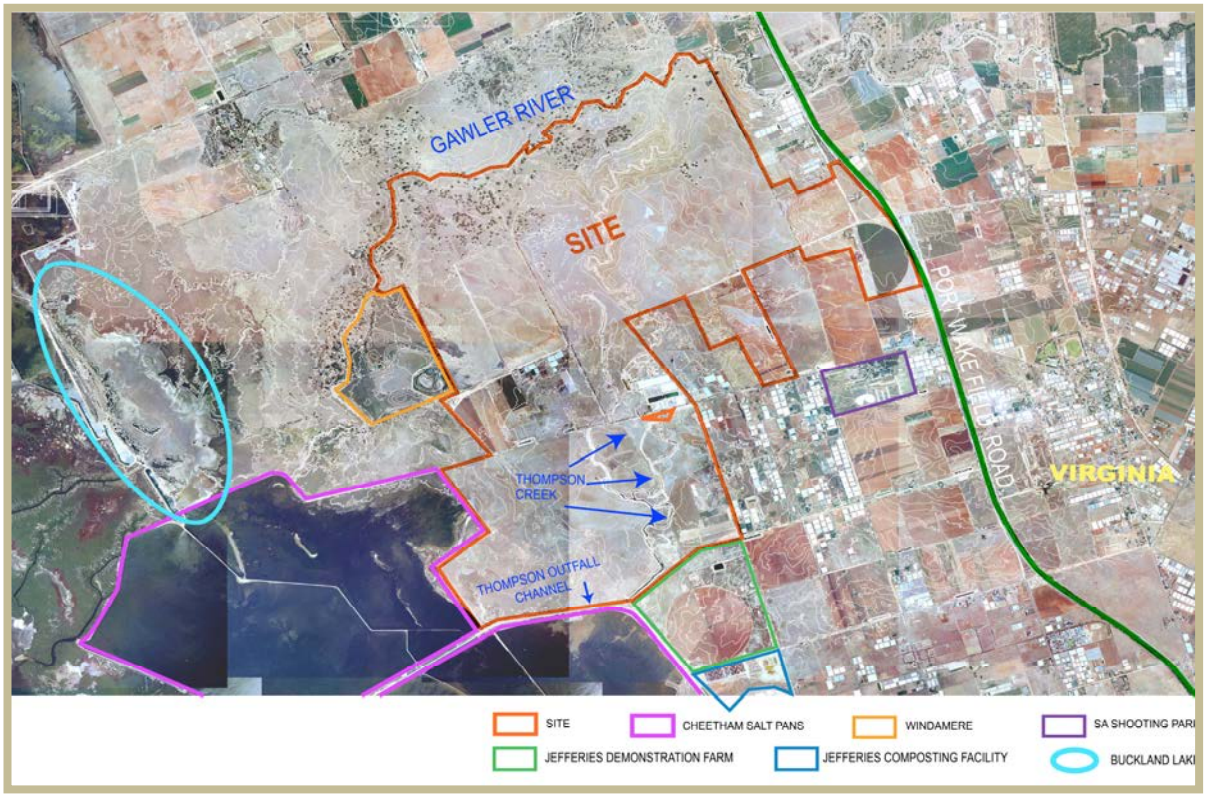


Figure 3.3 Site within its locality

Table 3.1 Real property description

Reference	Title Certificate	Lot	DP/FP	Area
1	5868/779	91	174402	25,600
2	5868/784	63	1671	26,600
3	5868/773	91	174403	19,700
4	5868/777	62	1671	21,900
5	5868/776	94	174428	19,900
6	5868/783	61	1671	20,200
7	5868/771	93	174427	17,600
8	5868/782	60	1671	27,700
9	5868/780	92	174426	24,300
10	5868/770	59	1671	25,500
11	5868/774	91	174425	24,000
12	5868/785	58	1671	26,600
13	5868/772	65	1671	57,150
14	5868/778	66	1671	65,460
15	5868/767	67	1671	65,190
16	5868/766	68	1671	65,330
17	5868/768	69	1671	65,300
18	5868/769	91	163644	66,580
19	5399/95	179	105800	40,000
20	5399/96	174	105800	44,900
21	5909/380	Sec 503	H105800	1,189
21	5909/379	Sec 173	H105800	57,860
22	5883/977	1	60145	15,400
23	5883/978	2	60145	15,240
24	5883/980	18	60145	15,490
25	5916/59	1	63928	7,487
26	5916/60	2	63928	15,460
27	5916/61	3	63928	12,220
28	5303/891	267	FP163235	6,737
29	5755/199	134	FP162483	6,611
30	5763/790	133	FP162482	4,937
31	5228/167	4	40170	12,600
32	5424/348	5	40170	17,300
33,34,36	5875/910	1,2,3&4	40207	240,300
35	5447/579	5	16853	38,970
37	5447/585	6	16853	44,780
38	5447/581	4	16853	39,660
39	5868/775	95	174429	3,440
40	5868/781	S	1671	2,157
Public roads				**30.33**
Total hectares				**1,337.68**

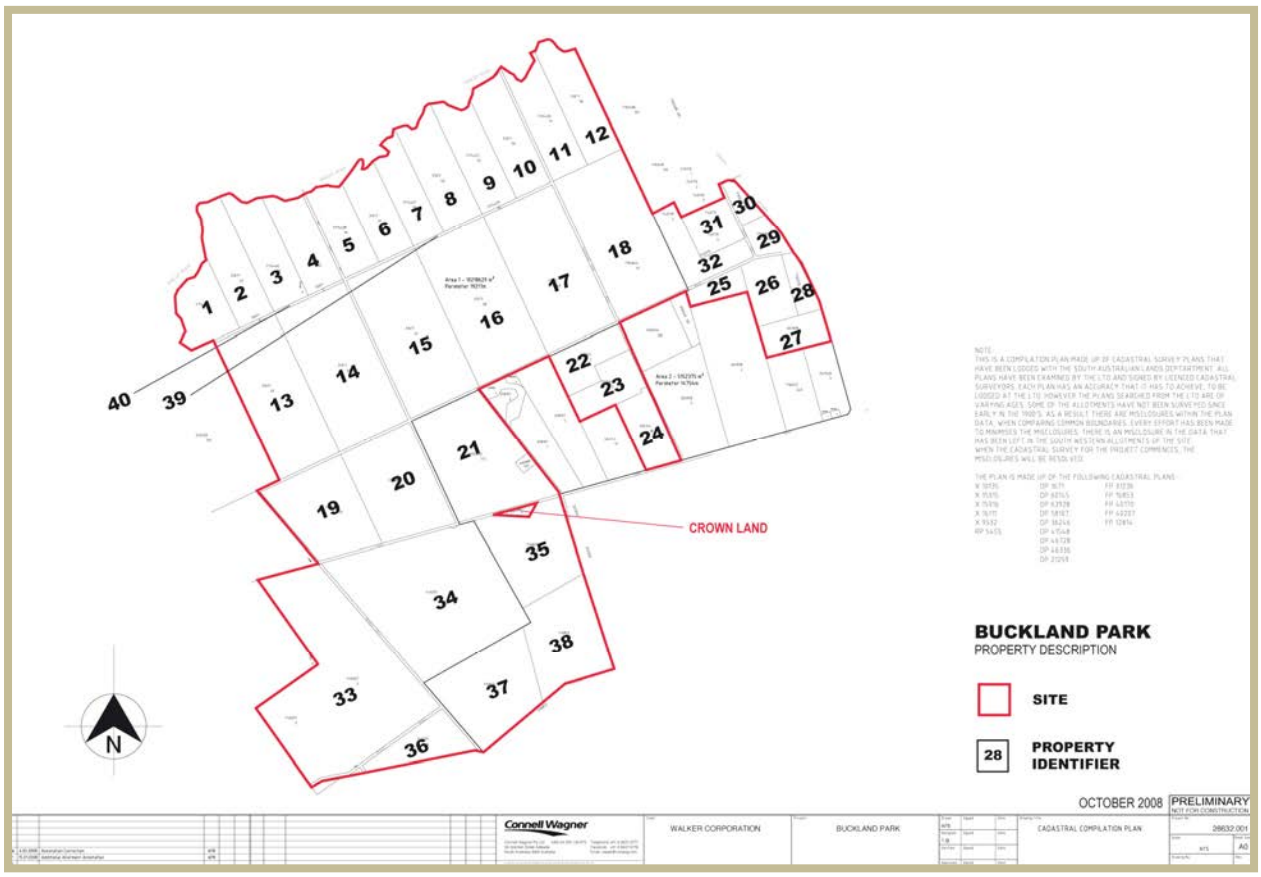


Figure 3.4 Cadastral Plan

3.2 Nature of the proposal

The proposal has been described in the Major Development Declaration (South Australian Government Gazette, 4 January 2007 and South Australian Government Gazette, 12 June 2008) as comprising:

- Land division creating more than one additional allotment and associated works and activities.
- Development associated with the establishment and operation of a shopping centre of up to 8,000 m^2 of gross leasable floor area and associated community uses, including any related ancillary development, including signage.
- Development of a display village including any related ancillary development, including signage.

The specific nature of each element of the proposal is discussed below.

3.2.1 Land division

Approval is sought for:

- The division of the site into 29 superlots in accordance with the Superlot Land Division Plan for the proposal's future stages shown on the Staging Plan, subject to such subsequent assessment and approvals as may be required.

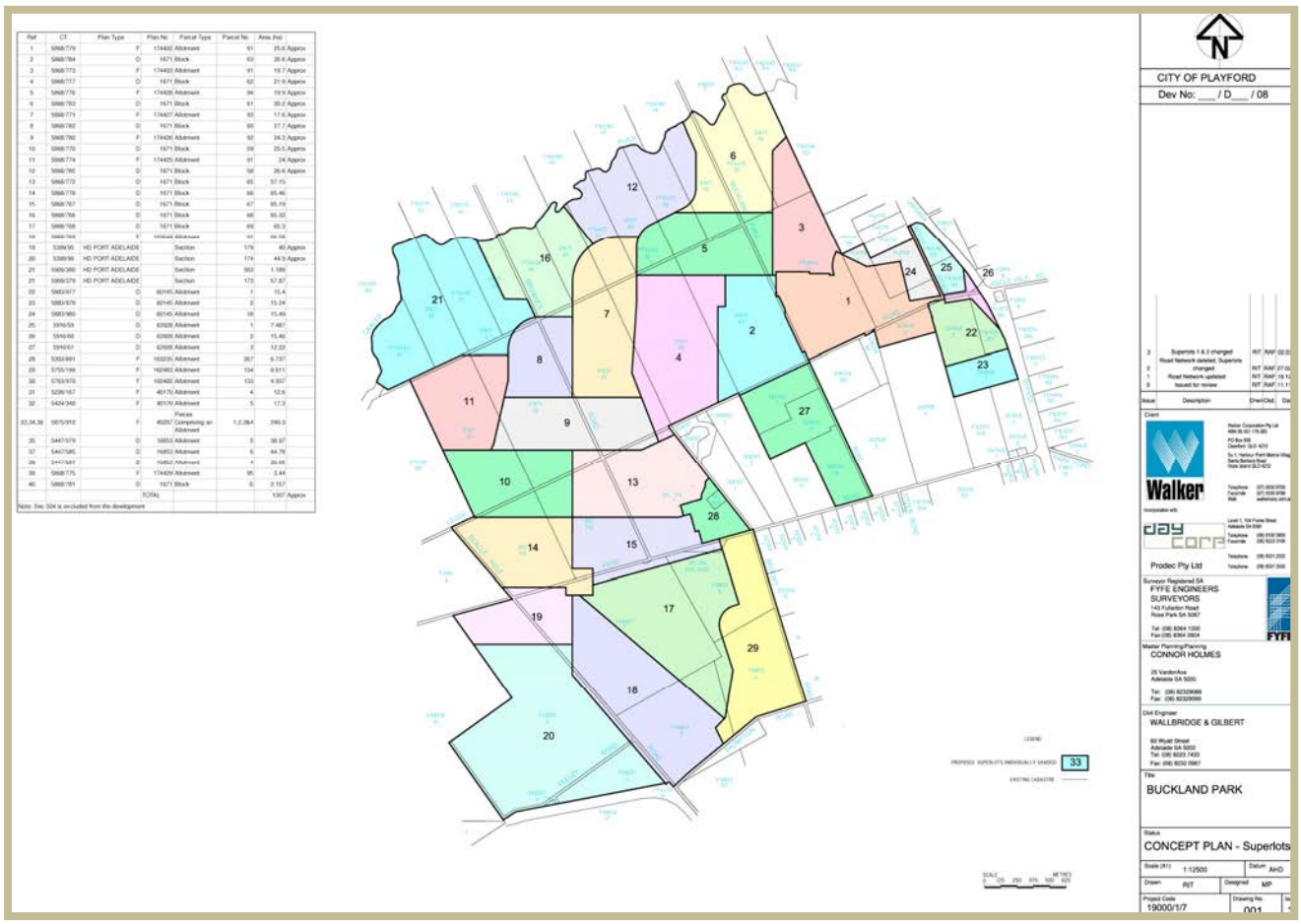


Figure 3.5 Proposed Superlot Land Division Plan

- The division of proposed Superlot 1 in accordance with the Stage 1 Land Division Plan for the future uses and activities accommodated in the Stage 1 Layout Plan. The Stage 1 Land Division Plan seeks approval for:
  - 616 allotments for housing.
  - New public roads.
  - The closure in part of Legoe Road.
  - One school site of 3.4 ha.
  - One neighbourhood centre site of 3.15 ha.
  - Public open space.
  - Two balance lots.

Superlots 2 to 29 will be the subject of future land divisions to create the allotments needed for the future use and activities accommodated the Masterplan.

To facilitate the creation of each stage road closures will be required, as described in Figure 1.3. The process of the closure of roads will accord with the requirements within the *Roads (Opening and Closing) Act 1991*.

Figure 3.6-1 Proposed Stage 1 Land Division

Figure 3.6-2

Figure 3.6-3

Figure 3.6-4

The Masterplan

The Masterplan illustrates the planned relationship of the various land use components.

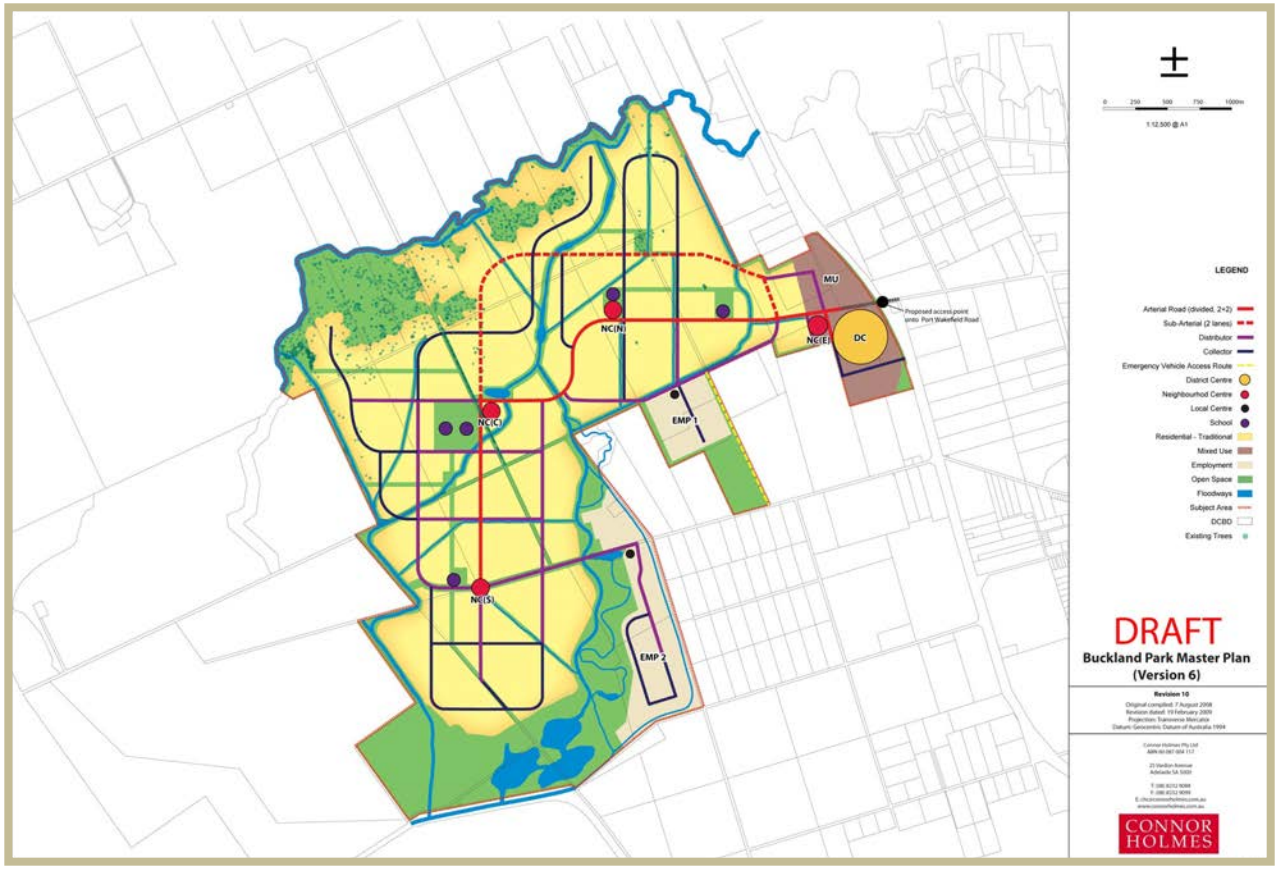


Figure 3.7 The Buckland Park Masterplan

The Buckland Park Masterplan has been designed to include the following features:

- Residential areas capable of accommodating approximately 12,000 dwellings, in a range of forms and densities, and in distinct neighbourhoods.
- A road hierarchy comprising a main entry boulevarde, arterial, sub-arterial, distributor, and collector roads, designed to connect centres and housing, and accommodate regional and local bus routes. Local roads are not shown on the Masterplan, as they will be the subject of detailed design.
- A district centre, four neighbourhood centres and local centres located on bus routes, and in close proximity to the residential or employment areas they will serve. One neighbourhood centre will be temporary.
- Employment, commercial and mixed use precincts accessible to the principle roads shown in the road hierarchy and adjoining horticulture land outside the site boundaries.
- Stormwater and floodwater management systems.
- Open space capable of providing passive and active recreation facilities, and incorporating stormwater and flood management systems and significant indigenous vegetation.

- Four primary schools and two secondary schools located within centres and on bus routes.
- Separation of sensitive uses from existing non residential activities in the locality.

Stage 1

The Stage 1 Layout Plan illustrates the planned relationship of the various land use components within Stage 1.

Figure 3.8 The Stage 1 Layout Plan

The Stage 1 layout plan has been designed to incorporate the following key features:

- A range of housing types, including a 10% component of Affordable Housing.
- New public roads to connect the allotments to the public road network. The first stage of the Masterplan's main entry boulevarde is included.
- The closure in part of Legoe Road, and approval is sought in this EIS for that closure.
- A primary school site located on the main entry boulevarde to facilitate car and bus access, and open space containing pedestrian and bike paths.
- Land within the primary school site can accommodate a sports field, which could be shared with the primary school.

- A neighbourhood centre site located at Stage 1's entry point, on the main entry boulevarde to facilitate car and bus access.
- Two parks located within residential neighbourhoods.
- Balance lots which will accommodate roads and housing allotments in conjunction with future construction stages.
- Linear open space to accommodate stormwater infrastructure, landscaped outlooks to homes, and pedestrian and bike paths.

Stage 1 has a total area of 63.23 ha. The components of Stage 1 are described in Table 3.2.

Table 3.2 Stage 1 housing types

Component	Size	Number
Housing		
Premium	500 m^2+	288 (46%)
Courtyard	450 m^2–500 m^2	175 (28%)
Large Villa	375 m^2–450 m^2	91 (15%)
Small Villa	300 m^2–375 m^2	32 (5%)
Gatehouse	150 m^2–175 m^2	30 (5%)
Subtotal		**616 (100%)**
Open space and stormwater		
Subtotal	8.53 ha	
Roads		
Subtotal	17.81 ha	
School site	3.4 ha	
Neighbourhood Centre site	3.15 ha	

3.2.2 Works and activities associated with land division

Approval is sought for all works and activities associated with the Superlot and Stage 1 land division, whether those works are within the site or external to it. Such works may include, but will not be limited to, any or all of the following:

- Constructing infrastructure required to service the allotments, such as:
  - roads, traffic management devices, street signs and related signage and street furniture,
  - footpaths, pedestrian trails, cycleways, shared-use paths and related signage,
  - stormwater and flood management systems,
  - effluent treatment system,
  - water supply system,
  - gas, power and telecommunications networks.
- Undertaking landscaping and planting works within roads and open spaces.

- Undertaking earthmoving works and creating temporary stockpiles of moved earth.
- Constructing fences on allotment boundaries.
- Establishing construction infrastructure such as equipment compounds, amenities for the construction workforce, temporary access roads, directional signage and the like.
- Clearing vegetation as required to undertake any of the above.

3.2.3 Neighbourhood Centre

Approval is sought for a neighbourhood centre within Stage 1. The neighbourhood centre will be constructed in two phases. The first phase will be commissioned to coincide with the occupation of the first dwellings. It will include:

- A small supermarket for convenience shopping. The proponent will negotiate suitable lease agreements with potential tenants, in the event a supermarket is not financially viable at opening.
- A community space equipped with office and meeting facilities – a community worker will be based in the space.
- Six speciality shops suitable for a café, private medical and dental surgeries and other small businesses. The proponents will negotiate with suitable potential tenants, in the event a supermarket is not be financial viable at opening.
- A sales and display centre operated by the proponents.
- Landscaping, including an entry statement and children's playground.
- 200 car parking spaces;
- Signs, including the entry statement and business identification signs.

The second phase will be constructed when demand for additional facilities is generated by new residents occupying Stage 1, or during later phases. It will include additional community space, additional supermarket space and four additional specialty shops.

Within the neighbourhood centre, an "extension area" has been included for other private facilities, for example, a childcare centre, recreation facilities, a hotel, offices, or housing. The proponent will negotiate with potential businesses.

Approval is not sought for the uses and activities which will occupy the extension area. These will be the subject of future development applications to Playford City Council, subject to the proposal receiving approval.

The layout and size of the Neighbourhood Centre is described in Figure 3.9 and Table 3.3.

Table 3.4 describes the gross leasable floor area of the retail components.

The Stage 1 neighbourhood centre is not part of the proposal's ultimate centre hierarchy. When the adjoining district centre is commissioned, the neighbourhood centre will be redundant.

At that time, the neighbourhood centre buildings will be either:

- removed and the site redeveloped, or
- refurbished for another use, ancillary to the district centre, or
- incorporated into the district centre.

Approval is sought in principle to establish the neighbourhood/community centre as described in general terms in this section. Design details of the neighbourhood centre will be prepared, subject to the proposal receiving approval.

Figure 3.9 Stage 1 Neighbourhood Centre Concept Plan

Table 3.3 Stage 1 Neighbourhood Centre

Component	Site area		
	Phase 1 (m^2)	Phase 2 (m^2)	Total (m^2)
Neighbourhood centre – Buildings			
• Supermarket	1,500	1,000	2,500
• Specialty shops	600 (6 shops)	400 (4 shops)	1,000
• Community space	200	200	400
• Sales office (2 storey)	225	00	225
• Subtotal	2,525	1,600	4,125
• Car park 200 maximum x 30 m^2	6,000	00	6,000
• Town square	500	00	500
Total	**9,025**	**1,600**	**10,625**

Component	Total (m^2)
Neighbourhood centre – Extension area	
• Potential - private recreation or private service (e.g. childcare centre, commercial) or residential,	10,500
Total	**10,500**
Neighbourhood centre – open space	
• Landscape entry statement, water feature, landscaping, child's playground	10,375
Total	**10,375**
Total neighbourhood centre – 31,500 m^2	

Table 3.4 Gross leasable floor area

Component	Gross Leasable Floor Area		
	Phase 1 (m^2)	Phase 2 (m^2)	Total (m^2)
Neighbourhood centre – Buildings			
• Supermarket	1,750 (shop floor and 250m^2 mezzanine office)	1,250 (shop floor and 250m^2 mezzanine office)	3,000
• Specialty shops	600 (6 shops)	400 (4 shops)	1,000
• Sales office (2 storey)	450	00	450
Total gross leasable floor area	**2,800**	**1,650**	**4,450**

It is therefore requested the neighbourhood centre's detailed design be considered a reserved matter in accordance with Section 48 of the *Development Act 1993.*

3.2.4 Display village

Approval is sought for a display village within Stage 1, located adjacent to the neighbourhood centre. It is planned to accommodate thirty two display dwellings, constructed progressively with the construction of Stage 1, and beyond into future stages.

The proponent will negotiate the timing for construction and the design of the display dwellings with house builders wishing to display their homes, subject to the proposal receiving approval.

The location of the display village relative to the neighbourhood centre is shown in Figure 3.10.

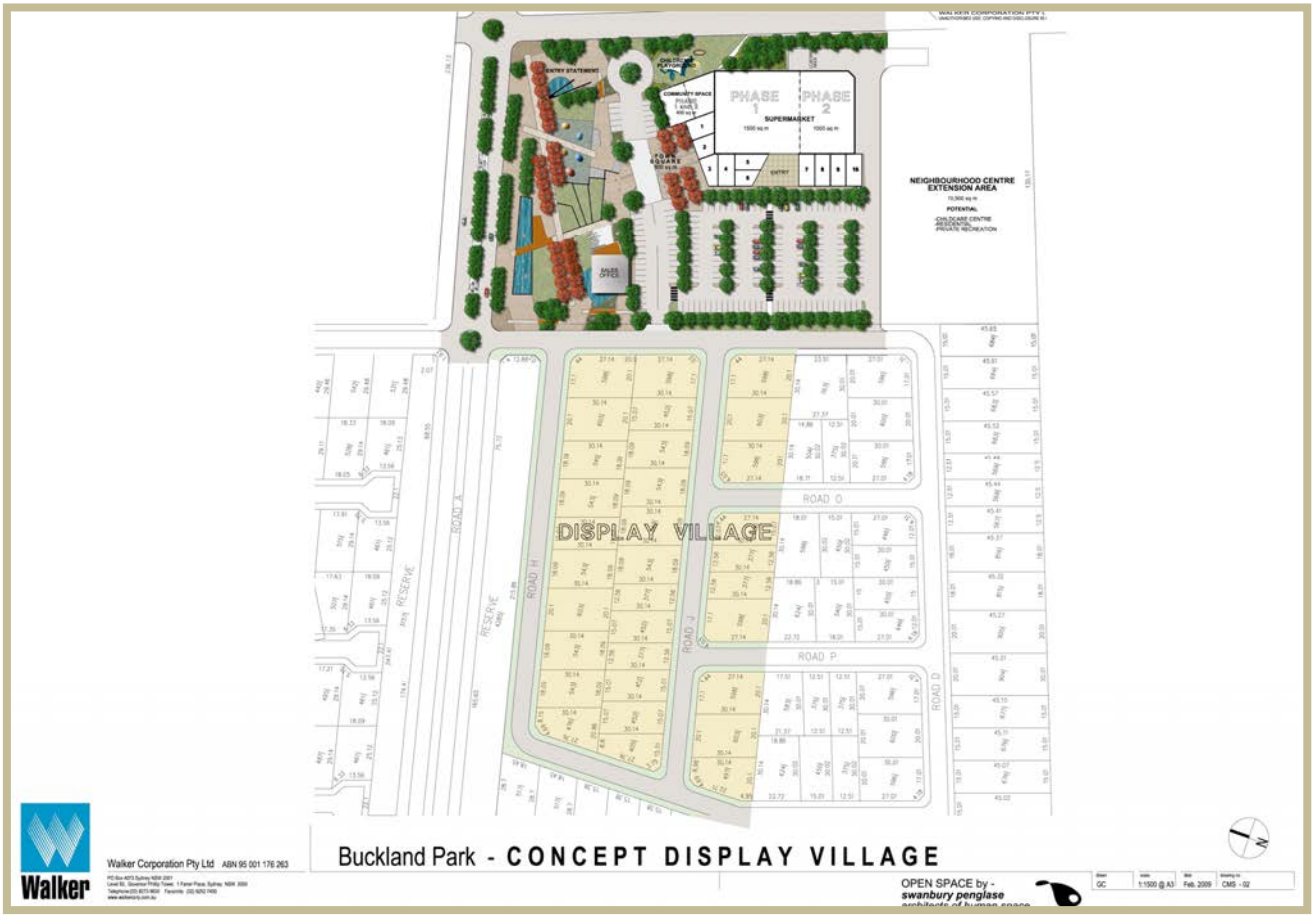


Figure 3.10 Display Village

The display village allotment layout has been designed to ensure that display homes and sites can be sold as homes when no longer required for display. It incorporates a proportion of allotments suitable for the display of houses suitable for the proposal's Affordable Housing component.

The sales office within the neighbourhood centre is proposed as an administration centre for house allotment sales, and to display marketing information and particular suppliers of building elements.

Individual builders may choose to operate some office functions from within their display home, for example, in garages equipped for the purpose.

Within the proposed display village, individual builders will also be offered the opportunity to install signage.

Sufficient parking for the display village is proposed within the neighbourhood centre.

Approval is sought in principle to establish the display village as described in this chapter. Design details of the display village and display village houses will be prepared, subject to the proposal as described in this EIS receiving approval.

It is therefore requested the display village's detailed design and house design be considered a reserved matter in accordance with Section 48 of the *Development Act 1993.*

3.3 Construction staging and management

3.3.1 Staging

The planned staging of the proposal's construction and occupation over 25 years is illustrated in Figure 3.11.

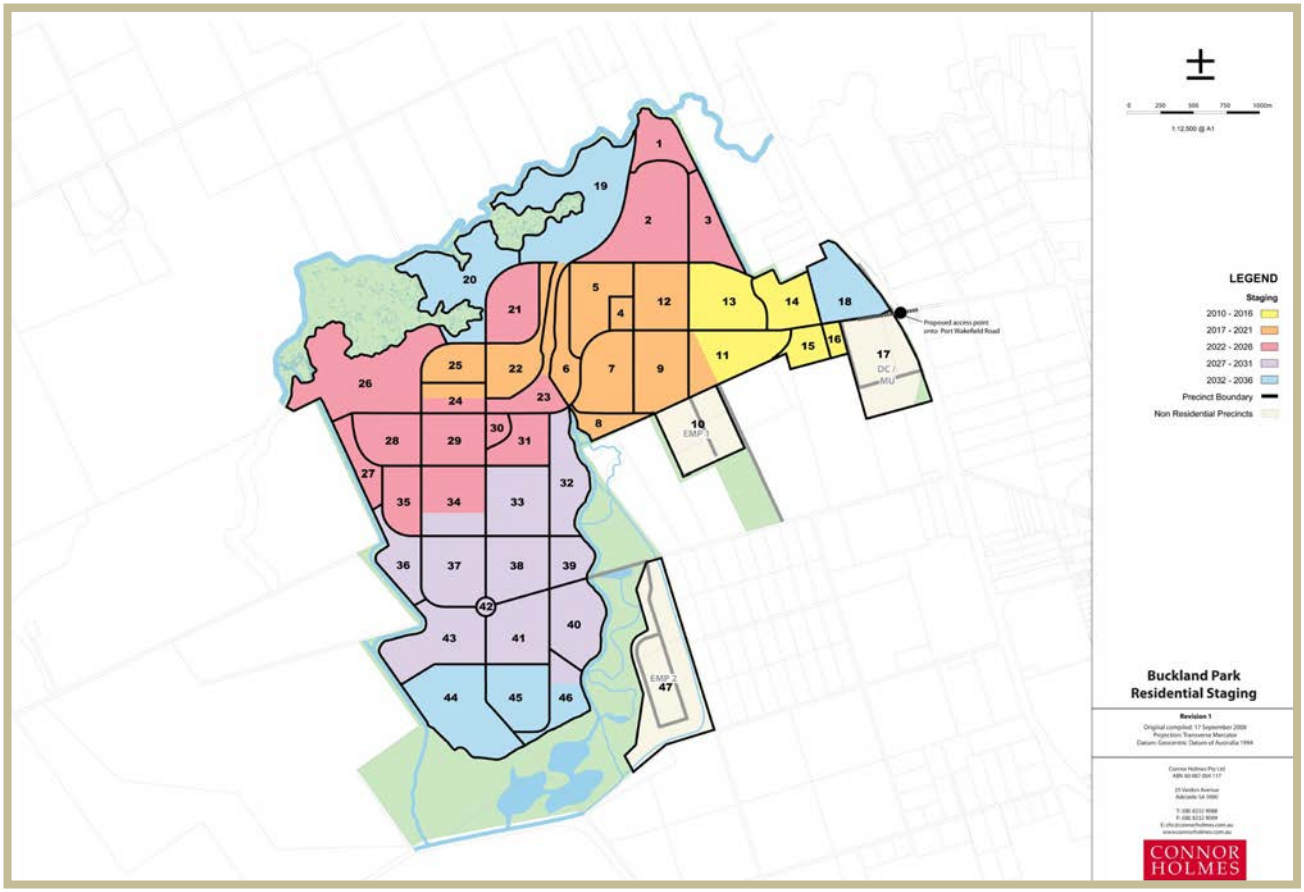


Figure 3.11 Staging Plan

The staging illustrated is intended as a tool to inform planning for housing, facilities, services and infrastructure. Over the 25-year time frame there will be variations in the rate of construction according to market conditions and the like.

The Staging Plan has been prepared to guide the orderly progression of construction to achieve the principles of the Masterplan, and allow the orderly and efficient implementation of infrastructure. The Staging Plan gives consideration to:

- The location of existing transport infrastructure, facilities and services.
- The location of future transport infrastructure, facilities and services within the Masterplan.
- Minimising potential construction related impacts on stages already completed.

Accordingly, the staging plan anticipates construction will commence within Stage 1, located at the eastern side of the site, closest to existing transport infrastructure and services.

Construction will then roll out toward the west, with construction access and the like through the main entry boulevarde.

3.3.2 Management systems

A Construction Management Plan (CMP) will be prepared for each of the proposal's stages.

CMPs provide a number of specific measures for minimising the effects of transport and storage of construction materials on the local amenity, including:

- The identification of construction zones within each stage, considering the location and potential impacts on residents, both within completed stages and external to the site.
- A construction traffic management plan. Construction traffic will be limited to nominated and approved construction routes through the site and its locality. Identifying the routes will assist with managing affects of construction on external roads, and protect residential streets from unwarranted traffic. Within the site, construction traffic will be confined to the designated construction zones.
- Measures to protect public safety in accordance with regulations and legislation, including fencing and sign posting of construction areas to prevent public access.
- Noise and air quality management plans, including the standards that must be met, monitoring measures and protocols for correcting any variations from the standards.
- A consultation strategy, including the name and contact details of the project manager responsible for responding to complaints, and a protocol for dealing with those complaints.
- A heritage management plan including provision for monitoring by the Kaurna people when any ground is disturbed for the first time, and protocols for the management of any items of archaeology that may be found.
- A flora and fauna management plan, including provisions for weed control, collection of plant material for use in rehabilitation, the protection of significant vegetation to remain, required for rehabilitation and protocols for the care and relocation of fauna.
- Soil and erosion management plan.
- Water management plan, including ground water.
- Acid Sulphate Soil Management plan, based on detailed investigation of the subject construction stage to identify the extent and nature of any issue.
- A plan for the provision of utilities necessary to support construction activities.

Chapter 4 Development history, land use, heritage, social and economic, traffic and transport

The chapter describes the historical and current context of the site.

4.1 Historical development

4.1.1 Indigenous heritage

The Kaurna people are the site's traditional owners. Prior to European occupation, the Kaurna people inhabited the fertile estuarine and river flood plains of the coast.

There are three previously reported Aboriginal Heritage sites, as defined in the *Aboriginal Heritage Act 1998,* two low density stone artefact scatters and a scarred tree. Recent field work, described in Chapter 14.7, identified six additional sites, and some land with archaeological potential.

4.1.2 European heritage

Sue Anderson concluded that, while the locality has a long history as a pastoral estate under various owners, there are no items of European heritage significance on the site (Appendix 4).

The Buckland Park homestead, located to the site's north on the opposite side of the Gawler River is the nearest building of interest.

Since European occupation large areas of natural vegetation has been cleared for roads and farms, and the natural drainage altered.

4.2 Existing land uses

The predominate land use in the site's locality is agriculture, generally grazing, orchards, market gardens and glass houses, with associated dwellings. The small towns of Virginia and Two Wells provide support to their surrounding horticultural communities.

Cheetham's salt pans adjoin the southern end of the site's western boundary.

Windamere estate, with its house and olive orchards, and a pastoral property adjoins the site to the west. There is another pastoral property beyond the Gawler River to the site's north-west.

The Jefferies demonstration farm adjoins the site's southern boundary, and the Jefferies composting facility is located further to the south, beyond the farm, approximately 1.1 km from the site's southern boundary.

The SA State Shooting Park is located on the southern side of Park Road, approximately 1.06 km from the site.

The site itself is largely devoid of structures. There are dilapidated greenhouses located on the southwest corner of Legoe and Tippets Bridge Road, and Perpetual Holdings have a substantial glass house enterprise on Brooks Road.

Much of the site is used for grazing, with only part of being used intensively for agricultural purposes in recent years.

The site is not connected to mains water, or a sewer. The Western Reticulation Systems Virginia (WRSV) pipeline, which provides treated water from the Bolivar Waste Water Treatment Plant (WWTP) to agricultural producers in the northern Adelaide Plains, passes through the site, although it does not supply recycled water to site.

The town of Virginia is located to the site's east.

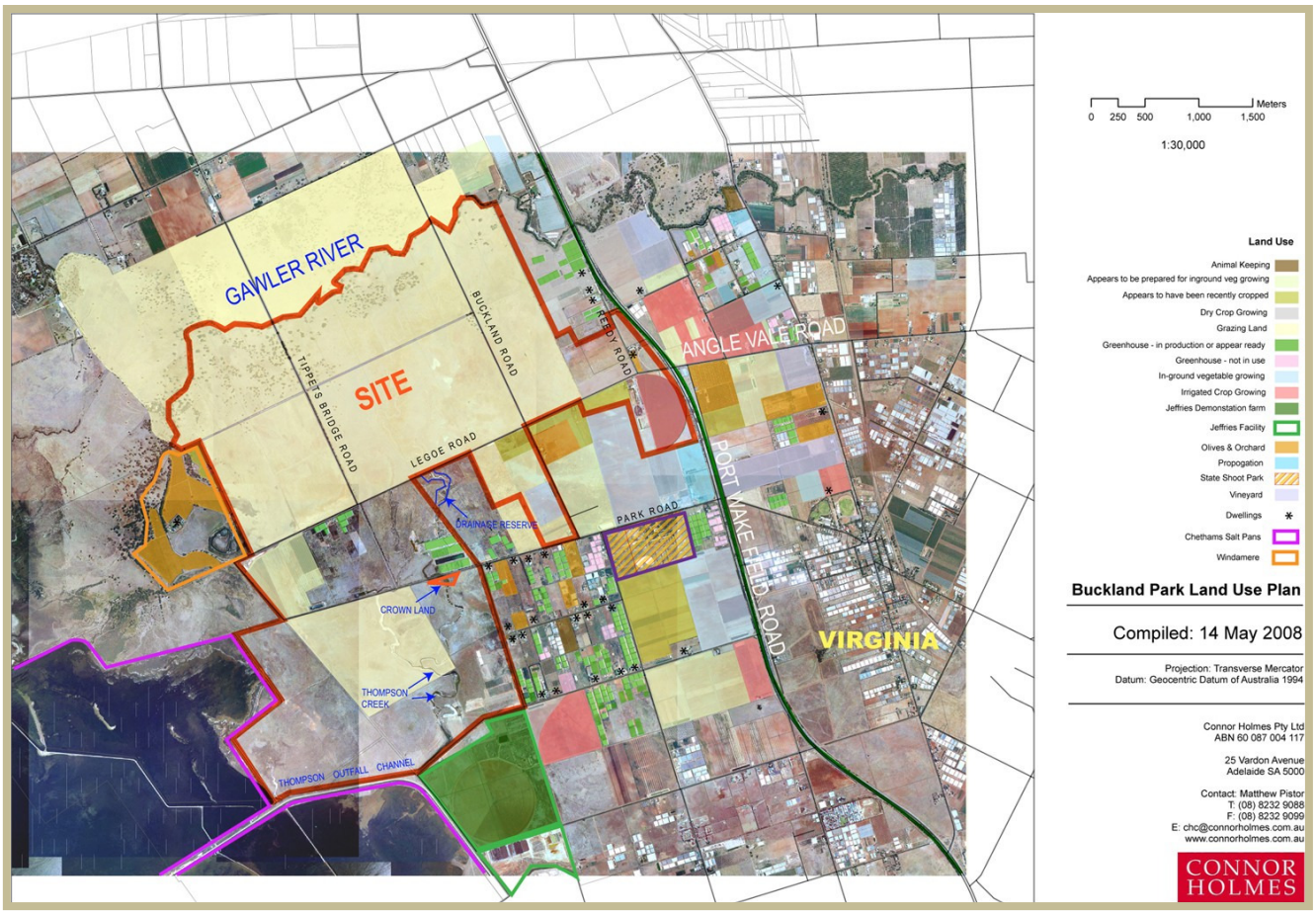


Figure 4.1 Distribution of land uses on the site and in its locality

4.3 Social and economic characteristics

4.3.1 Social characteristics

Connor Holmes have investigated the social and economic characteristics of the site's locality (Appendix 5).

The existing social characteristics of the wider locality have been considered, particularly those suburbs that are comparable to the site and the proposal. To create a profile of proposal's future population and social needs, consideration has been given to the characteristics of the Adelaide Statistical Division (ASD), the Playford Local Government Area (LGA) and six suburbs also located in northern Adelaide with new or growing residential estates, specifically:

- Andrews Farm
- Blakeview
- Burton
- Craigmore
- Hewett

- Mawson Lakes
- Playford LGA
- Adelaide Statistical Division (ASD)

Australian Bureau of Statistics (ABS Census 2006) data provides the basis for the investigations contained in this report.

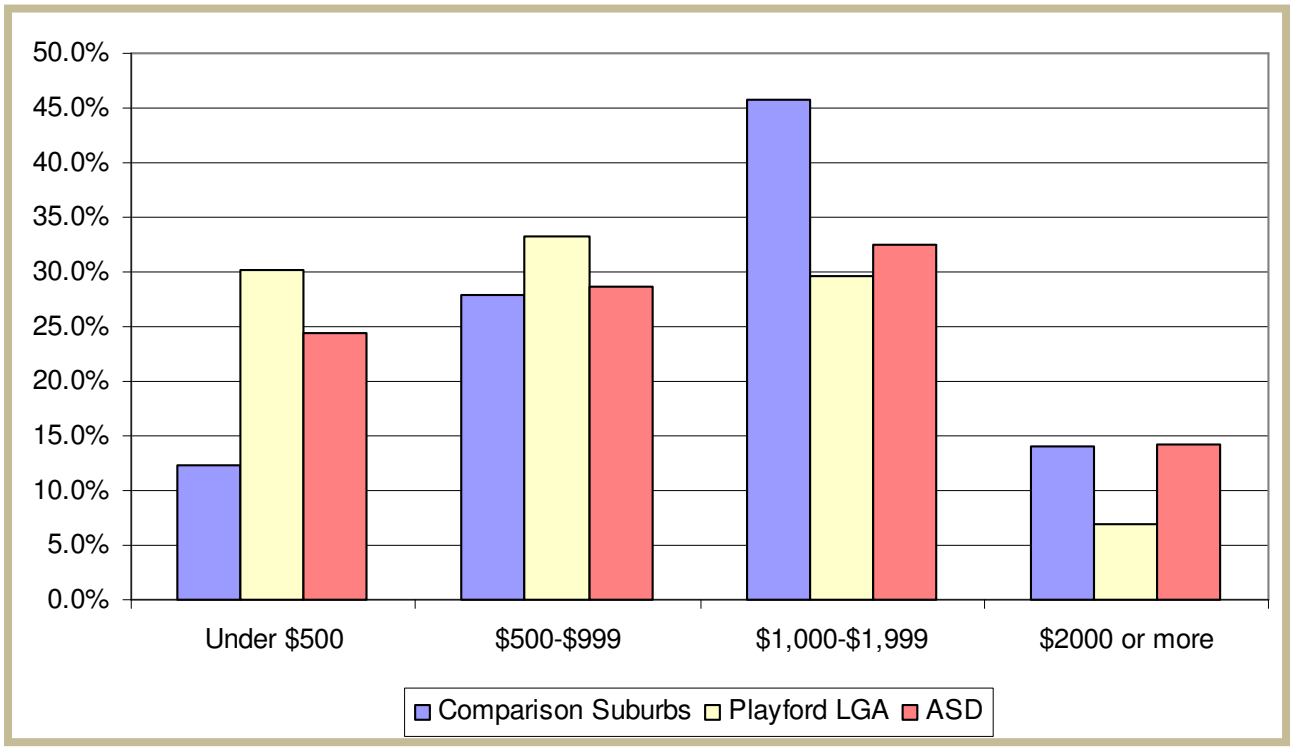
Car ownership

In both the ASD and Playford LGA around half of all households own one or no vehicles, though the ASD has a slightly higher average ownership.

In the suburbs of Andrews Farm, Blakeview, Burton, Craigmore, and, in particular, Hewett, two vehicle households are most common and average car ownership is correspondingly higher than the ASD or Playford LGA. This reflects the location of these suburbs, the availability of public transport and the high proportion of two income families which can afford more than one car.

Household income

Household income levels in the comparison suburbs of Andrews Farm, Blakeview, Burton, Craigmore, Hewett and Mawson Lakes are generally higher than both the ASD and the Playford LGA.



Source: ABS Catalogue No. 2001.0

Figure 4.2 Weekly household income comparison areas 2006

Less than 15% of households have a weekly income of less than $500, similarly less than 15% of households have a weekly income of $2,000 or more. However some of the comparison suburbs have average income levels significantly higher than others. For example Mawson Lakes and Hewett have average household incomes in

excess of $80,000 per annum, whereas Burton and Andrews Farm have average household incomes of less than $60,000 per annum.

Age profile

Table 4.1 provides an age profile for comparison suburbs and demonstrates each has a younger age profile than the ASD. Playford LGA also has a greater proportion of children and smaller proportion of older people than the ASD. The suburbs of Hewett and Andrews Farm in particular have a very young age profile in comparison with the ASD, with over 30% of the population consisting of children aged less than 15 years and less than 10% consisting of persons aged 55 years and over.

Table 4.1 Age profile comparison areas 2006

Age	ASD	Playford LGA	Andrews Farm	Blakeview	Burton	Craigmore	Hewett	Mawson Lakes
0–4	5.6%	7.4%	9.4%	8.6%	9.1%	7.5%	11.1%	8.7%
5–9	5.9%	7.9%	10.4%	9.6%	8.2%	8.5%	10.6%	6.7%
10–14	6.3%	8.2%	10.6%	9.6%	8.7%	8.9%	9.4%	5.6%
15–19	6.7%	7.5%	8.0%	7.5%	8.1%	7.9%	7.6%	6.4%
20–24	7.2%	7.2%	7.9%	6.6%	9.5%	7.2%	4.9%	8.7%
25–29	6.2%	6.2%	8.3%	7.9%	10.0%	6.3%	6.2%	11.2%
30–34	6.6%	6.5%	7.3%	9.4%	8.3%	7.4%	11.3%	11.5%
35–39	7.1%	7.3%	10.0%	9.4%	7.6%	8.3%	10.2%	10.3%
40–44	7.3%	7.6%	8.0%	7.9%	8.4%	8.9%	9.7%	7.5%
45–49	7.4%	7.1%	7.0%	7.1%	6.8%	7.9%	7.0%	6.7%
50–54	6.8%	5.8%	3.7%	4.9%	4.4%	5.5%	3.8%	5.4%
55–59	6.5%	5.1%	2.9%	3.4%	3.1%	4.1%	2.9%	4.2%
60–64	4.9%	4.0%	2.5%	2.5%	2.2%	2.9%	2.5%	2.6%
65–69	3.9%	3.6%	1.7%	2.0%	1.4%	2.6%	1.4%	1.3%
70–74	3.4%	3.3%	1.0%	1.9%	1.4%	1.7%	0.9%	1.0%
75 and over	8.0%	5.4%	1.2%	1.9%	2.7%	4.4%	0.7%	2.3%

Source: ABS Catalogue No. 2001.0

Education

With the exception of Burton, all comparison suburbs have higher rates of non-government school enrolments than the ASD. There are more non-government school enrolments at secondary school level than primary school in all comparison areas.

Employment

Workforce participation

Table 4.2 provides the proportion of the population aged 15 years and over who are employed in full or part time work in comparison areas. The remainder of the over 15 year old population is either unemployed or not in the workforce by choice. These proportions exclude persons who did not state their labour force status.

At 2006 these comparison suburbs had an over 65 year old population of less than 5%, whereas it is expected that the over 65 year old population at the site in 2036 will be around 13% and it anticipated the majority of people in this age bracket will not be in the workforce.

Table 4.2 Proportion of over 15 year olds employed 2006 comparison areas

Location	Employed persons
ASD	59.0%
Playford LGA	52.3%
Andrews Farm	68.5%
Blakeview	69.1%
Burton	61.6%
Craigmore	65.6%
Hewett	76.9%
Mawson Lakes	76.0%

Source: ABS Catalogue No. 2001.0

4.3.2 Economic characteristics

Industry of employment

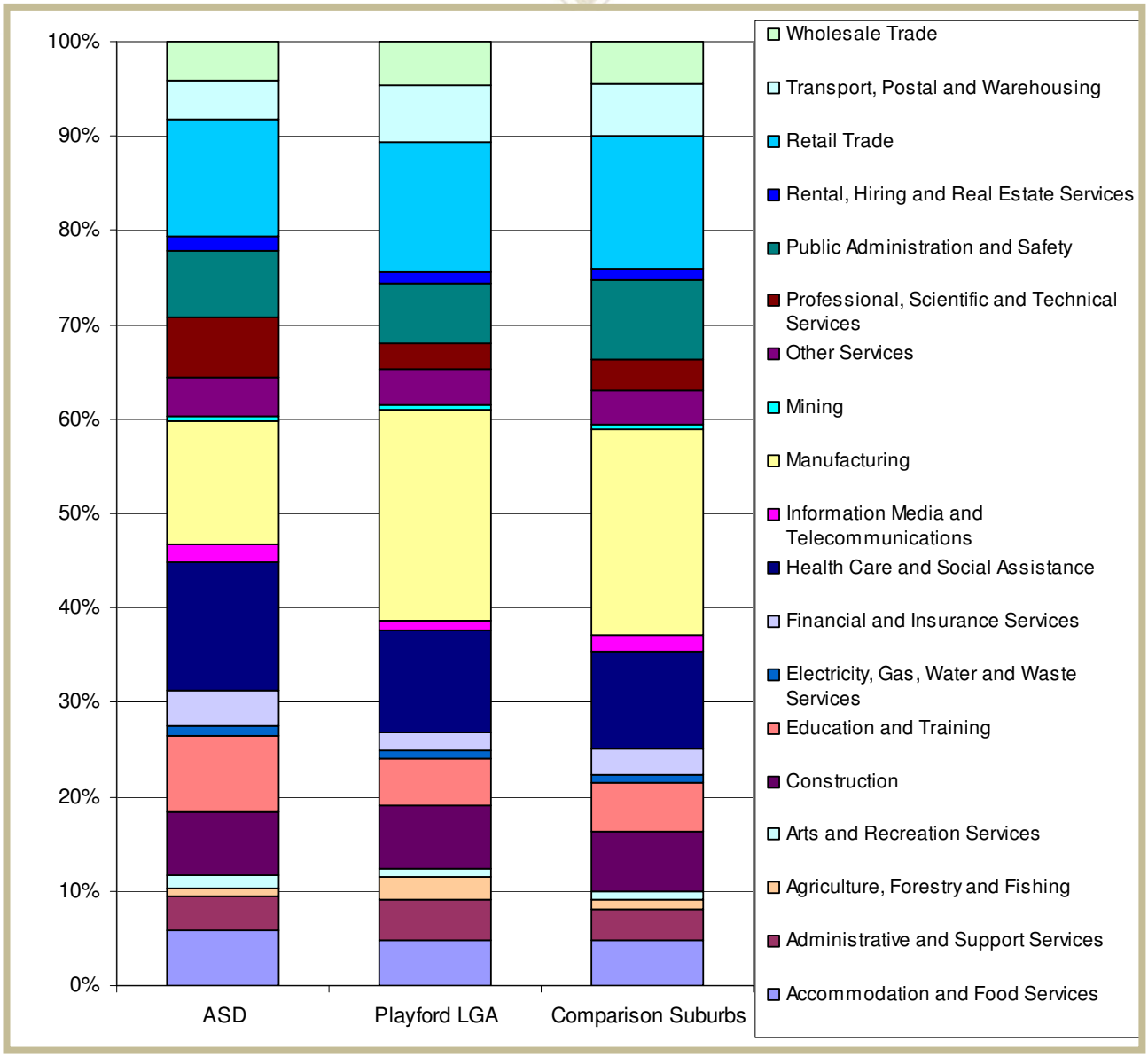
Figure 4.3 illustrates the employment profile of comparison areas. The employment profile of the comparison suburbs and Playford LGA are similar, whereas there are some notable differences between the comparison suburbs and the ASD, specifically:

- a lower proportion of manufacturing employees
- a lower proportion of transport, postal and warehousing employees
- a lower proportion of wholesale trade employees
- a lower proportion of retail trade employees
- a lower proportion of agriculture, forestry and fishing employees
- a higher proportion of professional, scientific and technical services employees
- a higher proportion of health care and social assistance employees
- a higher proportion of financial and insurance services employees
- a higher proportion of education and training employees.

Location of employment

Place of work data for the Playford LGA at the 2006 Census was reviewed by Connor Holmes. The majority of working Playford residents are employed within metropolitan Adelaide's northern and north-western regions.

Adelaide's northern region is an area of strong population growth and can be expected to provide for major residential and employment expansion over coming decades. Figure 2.2 shows the relative location of key employment areas in Adelaide's northern region to the site.



Source: ABS Catalogue No. 2001.0

Comparison suburbs – Andrews Farm, Blakeview, Burton, Craigmore, Hewett, Mawson Lakes

Figure 4.3 Industry of employment 2006 comparison areas

Major regional employment growth opportunities focusing on industry and related activities exist at Port Adelaide, Gillman, Dry Creek, Cavan, LeFevre Peninsula, Edinburgh Parks and Kingsford Estate. Commercial, retail, office and high tech opportunities exist at Mawson Lakes and Technology Park. New employment precincts have also been planned for Playford North and Blakeview.

Agricultural production

Hudson Howells undertook a survey of all landowners within the site in August 2008 in order to determine the current farmgate value of agricultural production (Appendix 6). All landowners were contacted and each was asked to provide:

- The total value of agricultural production from their land for the 2007/08 financial year.

- Number of people they employed.

The total farmgate value of agricultural production generated from the site in the 2007/08 financial year was $786,000 excluding Perpetual Holding's operation on Brooks Road. Some of the landowners advised they rotate crops, and therefore the value of production varies from year to year.

Of the thirteen land owners contacted, five are not currently farming their land.

4.4 Traffic and transport

The site is close to key transport routes which link it to metropolitan employment hubs, services and facilities.

4.4.1 Road network

The regional road network serving the site's locality comprises a mix of national highway links, arterial roads, and other local roads, as illustrated in Figure 4.4.

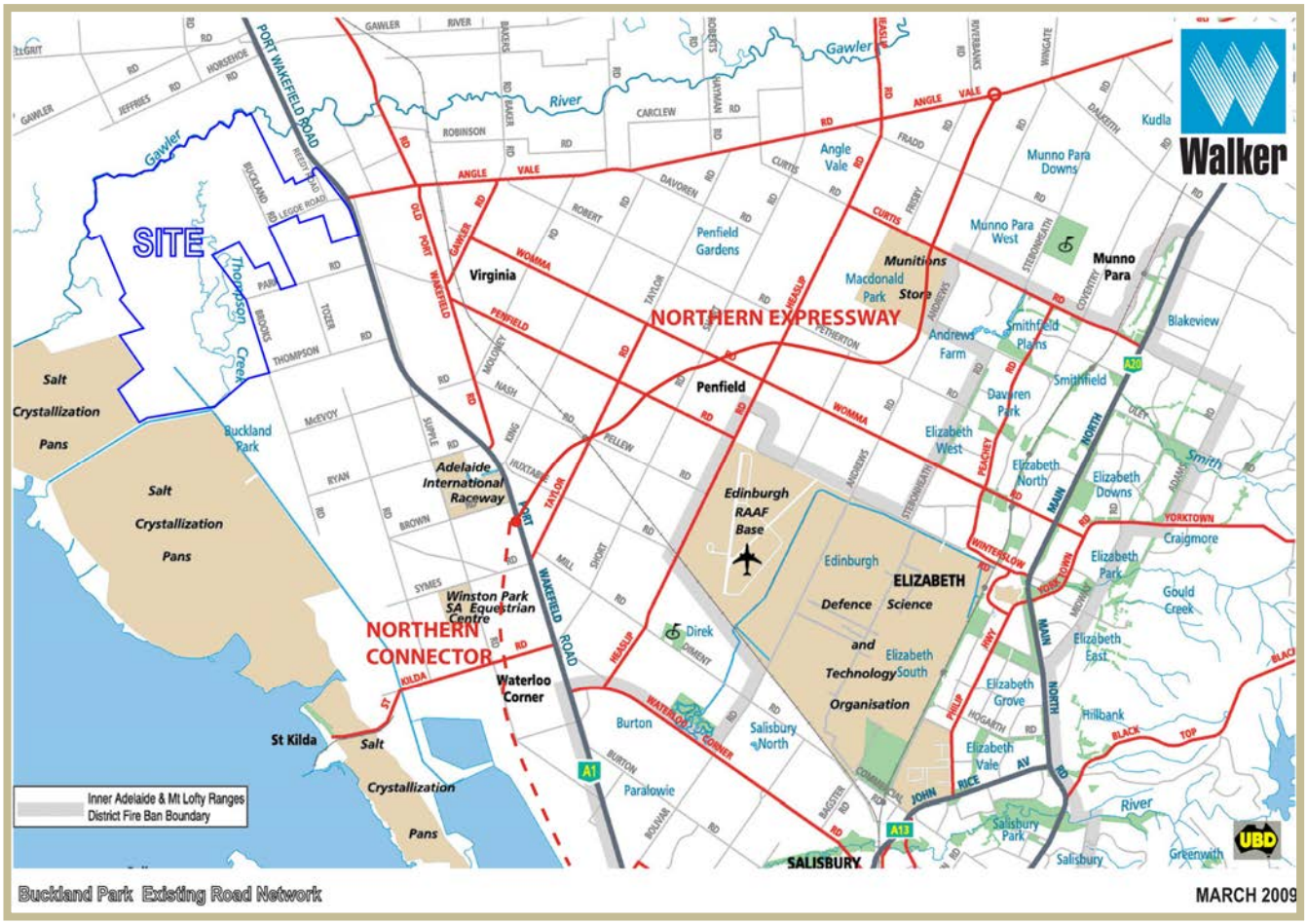


Figure 4.4 Existing road network

4.4.2 Traffic volumes

Traffic volumes on key arterial roads in the vicinity of the site are as shown in Table 4.3.

Table 4.3 Existing traffic volumes in the vicinity of Buckland Park (2006)

Road	Location	Annual average daily traffic volume (AADT)
Port Wakefield Road	Adjacent Buckland Park	10,800–11,700 vpd
Angle Vale Road	East of Port Wakefield Road	2000 vpd

Source: DTEI.

Port Wakefield Road is a National Highway linking South Australia with the Northern Territory and Western Australia. It also provides regional access to the northern part of the Adelaide metropolitan area, to the Mid North and Far North regions of South Australia, Yorke Peninsula and Eyre Peninsula.

Angle Vale Road provides intra-regional access between Port Wakefield Road and Gawler, and thence via the Sturt Highway to the Riverland, Victoria, New South Wales and Queensland.

Old Port Wakefield Road principally provides a local access function to Virginia and Two Wells. It also provides a direct connection, at Virginia, to Penfield Road which links through to Edinburgh Parks and the Elizabeth region. No recent traffic volume data is available for Old Port Wakefield Road.

4.4.3 Public transport services

Metro bus route 900 operates as a loop service from the Elizabeth Interchange via Virginia to the Salisbury Interchange, along Womma Road, Port Wakefield Road, Waterloo Corner Road, and return. This service currently operates during AM and PM peak traffic periods only, and does not operate at night, on weekends or during public holidays.

The Gawler rail service operates as a seven-day-per-week service between Gawler and the Adelaide CBD, with the following key stations providing links to regional Adelaide Metro bus services:

- Smithfield Interchange, near to the Munno Para Shopping Centre.
- Elizabeth Interchange.
- Salisbury Interchange.

4.4.4 Pedestrian/cyclist facility

There are no known pedestrian or cyclist facilities currently in the vicinity of Buckland Park.

It is understood, however, that a shared pedestrian/cycle path is currently being constructed as part of the Northern Expressway project between Gawler and Port Wakefield Road.

Chapter 5 Physical environment

This chapter deals with the existing physical environment including:

- Topography, geology and soils.
- Hydrology and drainage.
- Groundwater.
- Coastal and marine ecology.
- Air quality and noise.
- Terrestrial flora and fauna.
- General climate.
- Winds.
- Visual environment.

5.1 Topography, geology and soils

5.1.1 Topography

The site's topography is characterised as low lying and low relief coastal plain.

The site's highest point is in its north-east portion, at approximately 10–12 m AHD.

The site falls away from the Gawler River towards the Thompson Outfall Channel, at approximately 2–3 m AHD.

The Gawler River is a perched river system. It is higher than its adjoining flood plain.

The site has no hills or distinguishing topographical features.

5.1.2 Geology and soils

Golder and Associates reference the Geologic Survey of South Australia—Adelaide 1:250,000 map sheet, which indicates the majority of the near-surface stratigraphy of the site comprises the Quaternary sediments of the Pooraka Formation, and the St Kilda and Glanville Formations towards the coast. The Pooraka Formation is described as mottled clay and silt inter-bedded with sand, gravel and thin sandstone layers. The St Kilda formation is characterised by estuarine muds, sands, peats and shelly beds and often contains lenses of highly permeable sand layers (Appendix 7).

The Late Quaternary sediments on the Northern Adelaide Plains overlie the older sediments of the Hindmarsh Clay, which is described as a layered sequence of mottled red-brown sandy clay and sand and gravel lenses. In a hydrogeological context together these units can be collectively described as clays containing lenses and discontinuous layers of silts, sands and gravels.

Interpretation of available lithological logs and drillers logs from the state Drillhole Enquiry System (DES) indicates the near surface sediments comprise discontinuous beds and lenses of clay, silt and sand. In a similar fashion to the site-specific data there is a high degree of variability in the logged sediments both laterally across the area, and vertically through the profile.

However, it was evident interpretation of the data is confounded by a lack of detail in the near surface interval in many of the logs. A geological cross-section, based on the logs from DES was prepared by Golder and Associates.

It illustrates the variability from west to east across the site, but also seems to indicate a relatively consistent clay layer sitting at a depth of around 20 m across the site.

Northcote in 'Natural History of the Adelaide Region' describes the dominant soils of site and its environs as permeable, alkaline, red brown soils/calcareous red pedal clays with a moderate to high bearing capacity and deficiencies in nitrogen, phosphorous and zinc.

Golder and Associates undertook a preliminary geotechnical investigation of the site, comprising the excavation of fourteen test pits and drilling of sixty-one bores. Test samples were taken from depths of 0.2 m and 2.8 m, and the soil types were recorded to a depth of up to 6 m below the surface. Soil chemical testing was undertaken of forty-five samples for sodic and saline characteristics.

Generally, the topsoil was clayey sand or sandy clay, with the plasticity of the fine fraction of the soil varying from low to high. Beneath the topsoil, the investigation encountered sand, clay, clayey sand or sandy clay.

Across the site there was variation in the composition, thickness of material layers, plasticity, depth, colour and proportion of calcareous materials disseminated in the soil, as calcrete gravels or both. Inferred calcrete was observed, but did not cause refusal.

No other rock-strength material was encountered; however, dense, possibly cemented, sand was found at 3.7 m at some test sites. Some boreholes were predominately sand, but these were scattered across the site and did not provide a geological pattern.

As the site drops below 10 m AHD towards the site's south-west portion, saline groundwater tables begin to influence soil profiles and productivity potential. As the land further drops away to the low lying coastal flats and associated with saline water courses the soils become poorly drained and the watertable is shallow and saline. In these areas the presence of land salinisation is recognisable either as saline subsoils or as surface seepage and the presence of salt tolerant vegetation.

5.1.3 Acid sulphate soils

Golder Associates investigated the presence of acid sulphate soils (ASS) on the site (Appendix 8).

Acid Sulphate Soils (ASS) are generally located at or below 5 m AHD, within the St Kilda soil formation. Golder and Associates identified where these conditions occurred on the site and rated locations as high, medium or low risk.

In addition to the test pits and bores installed as part of the geotechnical investigation, Golder and Associates also drilled an additional twelve boreholes as part of a targeted ASS investigation.

No Actual ASS, or Actual ASS indicators were found on the site.

Potential ASS (PASS) material was found in three boreholes in the southern portion of the site, and in a channel, located off the site.

PASS was not encountered within other parts of the site identified as high risk.

5.2 Hydrology and drainage

The Gawler River and Thompson Creek provide the majority of the site's natural drainage.

The site's surface water hydrology is largely controlled by the Gawler River. During the winter wet season the Gawler River can have large flows and flooding, but is largely dry during the drier summer months with only stagnant pools.

The Gawler River is a perched river system. It is higher than its adjoining flood plain, therefore, stormwater runoff from the site does not drain into the River, or the Buckland Park Lake system, as they are effectively located upstream.

The site is within the Gawler River flood plain.

The site drains away from the Gawler River in a south westerly direction, to the Thompson Outfall Channel at its south-west corner, carried by a system of natural creek lines, culverts and open drains along road sides.

The Gawler River's channel is 3 to 4 m below ground level, and flood flows can overflow the channel, spilling away from the channel towards lower lying areas in its floodplain. These flows generally do not re-enter the Gawler River channel.

Extending through north–south through the centre of the site, Thompson Creek is a shallow, intermittent watercourse that channels surface flows during the wet season and periods of flooding when the Gawler River overflows. It is likely this watercourse also acts as a shallow groundwater drain when the shallow watertable is elevated above the creek bed as a result of direct recharge during the wet season.

5.3 Groundwater and the aquifer

SKM investigated groundwater conditions under the site (Appendix 9). They found the site is underlain by a series of shallow aquifers that are hydraulically connected. These are composed of intercalated sands, silts and clays. Groundwater levels are typically shallow particularly where clay layers cause local perching. Salinity levels vary widely across the site but increase dramatically to hypersaline levels in the vicinity of the salt pans, in the site's south-west corner.

SKM drilled a series of eleven new monitoring wells to obtain site specific information within the site. All wells were sampled for groundwater levels, salinity, hydraulic conductivity and hydro-geochemistry. Results from these surveys were used to improve the conceptualisation of groundwater processes within and around the site which was used in the establishment of a numerical model.

Clays under site act as an impediment to downward movement of water and may result in the development of perched watertables. Depth to groundwater is generally shallow and varies from around 8 m in the north-east of the site to less than 2 m in the south-west. Problems associated with waterlogging and salinity are most likely to occur in areas where the depth to groundwater is less than 2 m below ground level. Groundwater flow is predominantly from the north-east to the south-west.

SKM investigated the aquifer beneath site (Appendix 10). They concluded the T2 aquifer has the potential to accept up to 50 ML/a without pressurising the aquifer, which would potentially result it impacts on all existing bores connected to the T2 aquifer.

5.4 Coastal and marine ecology

The site is located between 2.5 and 4 km from the Gulf St Vincent shoreline.

The site does not directly form part of the coastal plain's ecological systems.

The Cheetham salt pans and farming land separate the site from the natural coastal ecosystems. Buckland Park Lake and the Port Gawler Conservation Park are to the north and east of the site and are separated by the Gawler River.

Cooe surveyed the coastal plain (Appendix 11). They found the coastal and marine ecosystems support abundant flora and fauna. In general, the mangrove forest and samphire habitats found there are in good health, although there was signs of anthroprogenic impact and signs of gradual loss. The Cheetham salt pans have impacted on the coastal plain's land form and natural hydrology. They are blocking the retreat of mangrove forest and samphire habitats as sediment and detritus builds up.

All locations surveyed showed some degradation from feral animal grazing, weeds and general rubbish, however, much of the Conservation Park land appears to be in good condition.

Offshore, west of the site, are the Adelaide Dolphin Sanctuary, St Kilda-Chapman Creek Aquatic Reserve and the Barker Inlet-St Kilda Aquatic Reserve. These coastal habitats provide for many animals from nurseries to commercially significant fish and crustaceans, to shelters for migratory bird species.

Marine species of conservation significance or vulnerable identified include the Syngnathidae Family (Pipefish), the Clinidae Family (Weedfish and Snakebleeny) and the Apogonidae Family (Cardinal fishes) the Congolli, Common Galaxias or Jollytail, Mountain Galaxias, Flathead Gudgeon, Magpie Fiddler Ray and invertebrate species including the brown or black striated sea anemone and barnacles.

5.5 Air quality and noise

Air quality and noise assessments were undertaken by Connell Wagner (Appendices 12 and 13).

5.5.1 Air quality

Connell Wagner identified pesticide spraying of crops in the locality by aerial spraying or boom spraying from a tractor as existing sources of potential pollution. Aerial spraying is probably used infrequently in the area, given the small scale of horticultural activities and the use of glasshouses.

Jeffries demonstration farm and composting facility

Air quality investigations also considered the Jeffries composting facility, located 1.1 km from the site's southern boundary, including odour, bio-aerosols and dust factors.

Analysis of odour from the Jefferies facility found that under worst-case conditions, the minimum average 99.9th percentile odour concentration complied with the EPA's 2 Odour Unit Limit at locations 1.7 km from the facility.

The impact of dust generating activities and wind erosion from stockpiles at the Jeffries composting facility was assessed as part of the facility's 2003 *Public Environmental Report*. The analysis of the daily averaged PM10 contours showed that the 50 µg/m^3 NEPM guideline is complied within the facility's boundary.

5.5.2 Noise

Connor Wagner undertook noise surveys at and around the site to determine the existing ambient background noise levels.

Summarised results from the noise monitoring are illustrated in Table 5.1. A more detailed account of the findings is provided in the report (Appendix 13).

Table 5.1 Summary of background noise survey results (in dB/A)

Site.	Monitoring period	Day (7 am–10 pm)				Night (10 pm–7 am)			
		Leq	Lmax	LA10	LA90	Leq	Lmax	LA10	LA90
1	11–16 Dec. 2007	48	65	49	40	35	49	37	29
2	11–19 Dec. 2007	64	79	67	53	60	79	63	40
3	18–22 Jan. 2008	56	79	54	43	45	63	44	34

From the table it can be seen that ambient noise level at site 1 (at the corner of Legoe and Tippets Bridge Roads within the site)is low, and generally caused by sources such as wind (rustling of leaves), insects, birds chirping, distant traffic, surrounding agricultural and horticulture activities and, occasionally, light aircraft flying over the area.

Noise levels at site 2 (at the corner of Port Wakefield Road and Park Road) are mainly attributable to traffic along Port Wakefield Road. Noise levels at site 3 (at the Park Road boundary of the State Shooting Park) primarily result from traffic along Park Road, State Shooting Park activities and surrounding agricultural and horticulture activities.

In addition to monitoring at these three sites, attended noise monitoring was undertaken during outdoor clay target shooting activities at the SA Shooting Park (Saturday, 19 January 2008). The results of the attended noise measurements are summarised in Table 5.2.

Table 5.2 Results of gun firing noise survey at Shooting Park

Location	Description	Lpeak (dB)
1	Gun-firing noise from outdoor clay target shooting area	108–120
2	Intermittent local traffic (heavy vehicle) along Park Road	106–111
	Gun-firing noise emitted from outdoor clay target shooting area with no adjacent vehicle movement	101–106

Table 5.2 shows that gun-firing noise emitted from State Shooting Park at the boundary of the site next to Park Road was around 101–106 dB (Lpeak), and is less than noise resulting from heavy vehicle travelling along Park Road.

5.6 Terrestrial flora and fauna

5.6.1 Flora

Most of the native vegetation in the region and much of the site has been cleared.

Dr Bob Anderson undertook a field survey of the flora on the site, its environs and the region (Appendix 14).

There are areas of remnant native vegetation on the site, primarily in the northern and southern areas. Elsewhere, there are small to tiny remnant areas of the vegetation communities considered to have been present prior to European settlement, especially along sections of Thompson Creek. A few of the better quality locations are on public roadsides and are listed as RMS.

There are remnant, mature river red gum areas and individual trees along the Gawler River floodplain. These areas also contain some species with a listed conservation rating for the Southern Lofty botanical region.

There are scattered river red gums and a small area of black box woodland elsewhere in the northern portion of the site.

Two other areas of native vegetation are located in the south and centre of the site, namely:

- Chenopod low shrubland areas.
- Leafless cottonbush low shrubland and smaller areas of remnant native vegetation along parts of Thompson Creek.

Over 220 species of introduced plants have been recorded in the region. On the site, Proclaimed and environmental weed species such as bridal creeper, St John's wort, silverleaf nightshade, African boxthorn, Bathurst burr, Noogoora burr, three-cornered jack and caltrop are present. Species such as Coolatai grass (one roadside infestation) and Calomba daisy (isolated infestations throughout much of the site) are present.

No areas of *Phytophthora cinnamomi* (die-back fungus, cinnamon fungus) or Mundulla Yellows were recorded. However, some trees appear to have aberrant growths and canopy die-back, possibly as a result of drought or agricultural impacts, including exposure to agricultural chemicals or salinity.

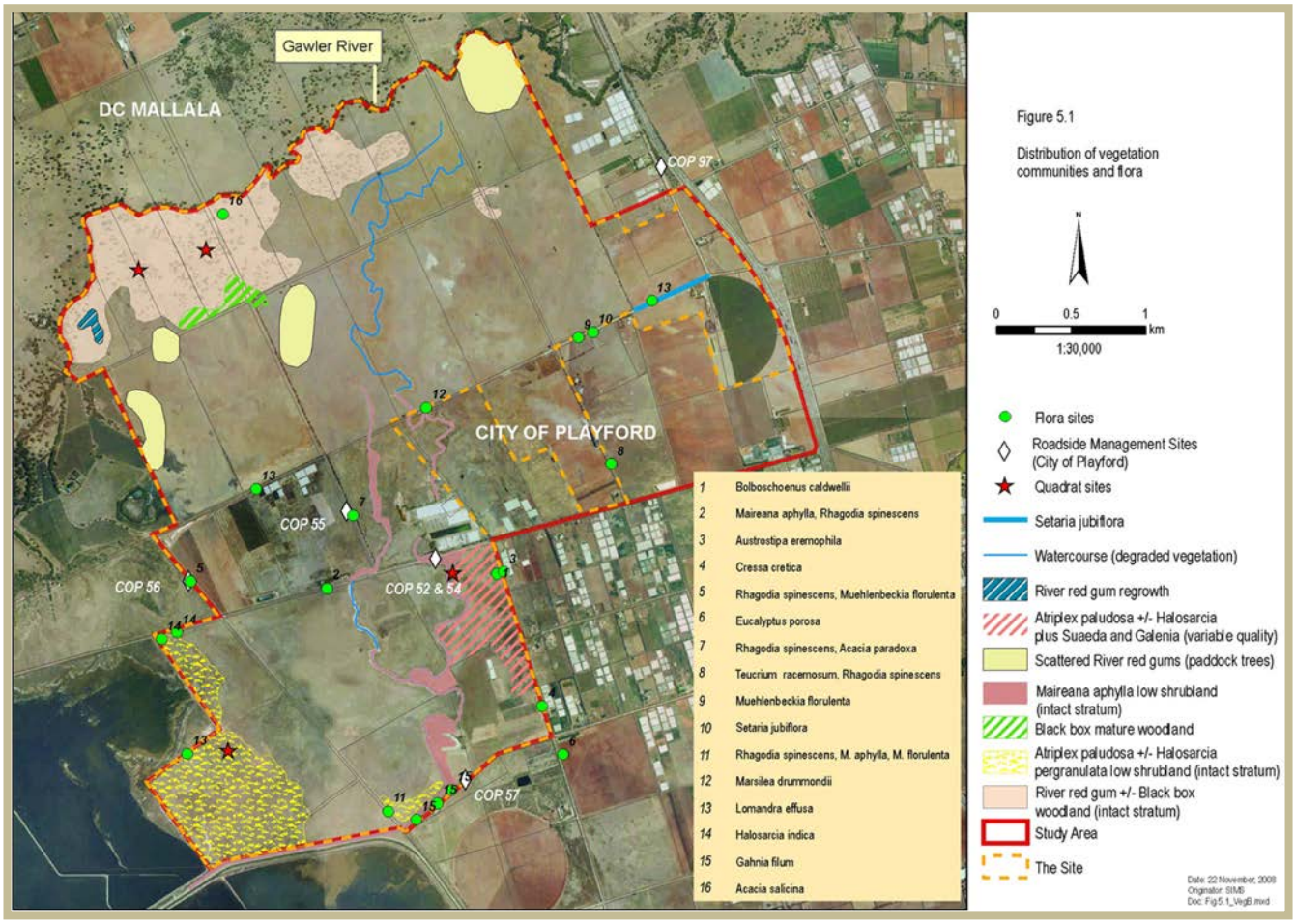


Figure 5.1 Flora survey

Source: Dr Bob Anderson

5.6.2 Fauna

Dr Bob Anderson undertook a field survey of the fauna on the site, its environs and the region (Appendix 15).

Fauna is mostly restricted to areas of remnant vegetation. Roadsides, revegetation sites and constructed wetlands have fewer habitats and lower species numbers.

Remnant habitat is variable in extent and quality. Much of it is associated with the woodlands, chenopod shrublands and aquatic areas, especially along the Gawler River and Thompson Creek.

The river red gum remnants along the Gawler River and its floodplain provide an important local and regional habitat for birds, bats and reptiles, with hollows in mature species critical for breeding of many species.

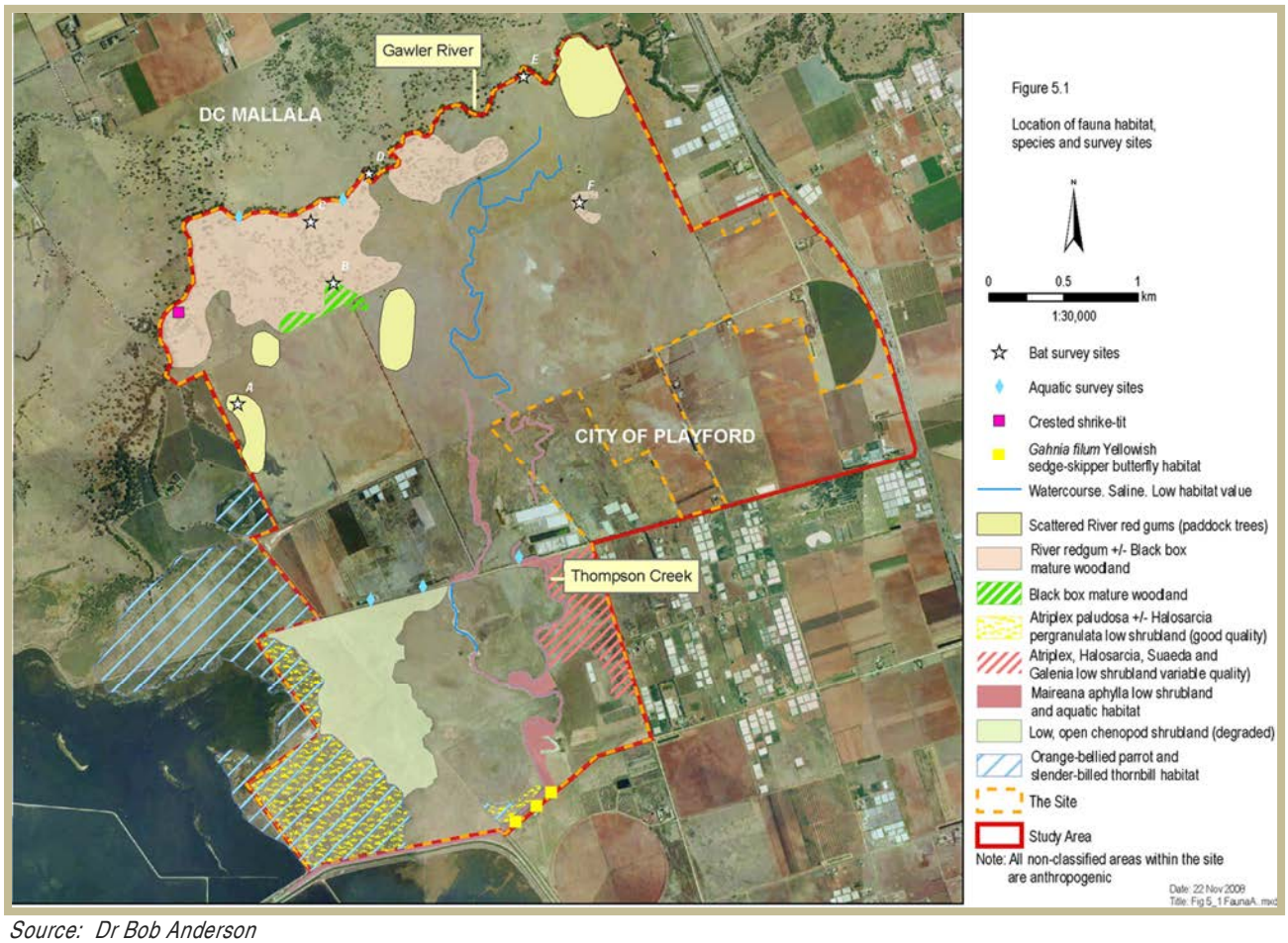
The Cheetham salt pans and Thompson Creek provide habitat for common aquatic birds as well as significant species such as the buff-banded rail and crakes. Small terrestrial bird species, such as fairy-wrens, scrub-wrens and small parrots also make extensive use of this habitat.

Cleared areas used for agricultural production are generally of poor quality as habitat with nil or a weed-dominated understorey providing limited resources to a number of common local fauna, mostly bird species.

Apart from two mammal species, both of which will be confined to the woodland areas, all of the species of national and state conservation significance known to occur within the region and site are birds.

There are:

- One species listed as nationally threatened under the EPBC Act, the orange-bellied parrot, which has been recently recorded as occurring in the region 4 km north-west of the site.
- 25 species listed under the EPBC Act under the *National Wildlife Conservation Plan for Migratory Shorebirds* occur within the region and parts of the site. These bird species are also listed under various international treaties or conventions to which Australia is a co-signatory. This represents 70% of all of the species listed in the Plan.
- Some 10 to 15 other species listed under international conventions or treaties to which Australia is a co-signatory and which are listed as being migratory, have habitat within the region and/or site or are conservation-dependent species.
- 31 species are also listed under SA legislation. Many of these species are also listed under the EPBC Act.
- 15 bird species which occur in the site are listed as part of a draft Regional Recovery Plan. These include buff-banded rail, crested shrike-tit, pallid cuckoo, peregrine falcon, red-capped robin, red-rumped parrot, sacred kingfisher, slender-billed (samphire) thornbill, tawny frogmouth, tree martin, whistling kite, white-browed babbler, white-fronted chat, yellow-rumped thornbill and yellow-tailed black cockatoo. Eleven of these species are breeding residents or breeding visitors in the site or the adjacent section of the Gawler River corridor.



Source: Dr Bob Anderson

Figure 5.2 Fauna survey

Buckland Park Lake, 2 km to the site's north-west, is a particularly well established and important regional freshwater wetland. Bird life is prolific and the habitat is known to be a breeding area for many species. Birds such as Australasian bittern that are rare in south-eastern Australia have found refuge at this wetland during the current drought and may breed in this area. Other wetland sites, such as the Barker Inlet and Greenfields wetlands, 20 km south of the site, and the Cheetham salt pans have salt or brackish water and attract and maintain populations of migratory waders and other shorebird species. There is little doubt that the wider region has a wetland community of State and national importance.

However, these habitats are on the site only as small, ephemeral wetlands associated with Thompson Creek and are not significant as habitat. Migratory birds covered by international treaties (JAMBA and CAMBA) and birds of national significance do not appear to use these areas either at all or are occasional visitors in small numbers.

Along the Gawler River riparian corridor, white-bellied sea-eagle, a number other raptors, duck species and nankeen night-heron were recorded. These species and groups are classified as nationally threatened. A range of common aquatic species were also observed at this location, such as heron species.

5.7 General climate

The Adelaide coastal plain is characterised by a mediterranean climate, with hot, dry summers and relatively cool, wet winters.

As part of the air quality assessment, Connell Wagner selected 2001 as the most appropriate reference year for climate simulation purposes. This was based on comparison of 2001 conditions with long-term average conditions using publicly available data from the closest Bureau of Meteorology automatic weather station, located at RAAF Edinburgh. The long-term average meteorological data from this site is presented in Table 5.3 as representative of climatic conditions at the site (Appendix 12).

Rainfall

Local climate data provided by Golder and Associates give an average annual rainfall of 442 mm. This occurs mostly in the winter months, with average monthly rainfall between June and August of around 53 mm. The summer period (December to February) has a mean monthly rainfall of around 22 mm (Appendix 7).

There have been a number of wetter and drier cycles over the last 100 years, with the most recent wet periods occurring in 2000, the mid-1970s and the mid-1950s. These wet periods correspond to years of above average rainfall.

Table 5.3 Long-term meteorological data for RAAF Edinburgh

Data	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean daily max temp (°C)	29.8	29.9	26.9	22.9	19.2	15.8	15.3	16.5	18.8	21.9	25.5	27.8
Mean daily min temp (°C)	16.4	16.5	14.4	11.6	9.1	6.8	6.0	6.5	8.1	10.0	12.7	14.8
Mean 9 am wind speed (km/h)	14.2	11.7	11.9	12.8	12.1	11.9	13.1	15.5	17.7	18.5	16.3	16.0
Mean 3 pm wind speed (km/h)	23.1	21.0	20.6	19.1	17.6	17.7	18.9	21.3	22.5	22.6	22.6	24.0
Mean monthly rainfall (mm)	21.3	16.1	23.9	30.8	43.3	53.6	52.6	49.7	48.1	41.5	25.4	21.8

5.8 Winds

As the terrain is fairly simple and flat the meteorological conditions were not seen to vary significantly through the area used for modelling. The annual wind rose generated by Connell Wagner shows that the region is dominated by winds blowing from the north-east and the south-west quadrants (Appendix 12). Winds from the other cardinal directions are fairly negligible, with the exception of westerlies.

Analysis shows that more than 80% of winds occurring in the region have magnitudes less than 5 m/s.

5.9 Climate change

Parsons Brinkerhoff considered a report by the Commonwealth Scientific and Industrial Research Organisation, which looked at climate change projections throughout Australia, based on the latest (fourth) assessment report by the Intergovernmental Panel on Climate Change in 2007 (Appendix 16).

Climate change is expected to affect Adelaide's average annual temperatures, the frequency of hot days, over 35°, annual average rainfall, the intensity of rainfall events, the number of dry days, wind speed, and weather conditions conducive to fire.

Climate changes over the next decade or two will largely be determined by past greenhouse gas emissions. Accordingly, projections out to around 2030 are little affected by the emission scenario that eventuates. However, beyond 2030 the degree of climate change will increasingly be determined by the emission scenario.

It is important to note the difference between climate change and climatic variability. The climate in most of Australia has always been highly variable. The weather in any day, month or year will continue to be mainly determined by natural climatic variability, which cannot be easily predicted.

The Playford (City) Development Plan considers the impacts of climate change on sea levels. It is anticipated sea levels will rise by 0.3 m by 2050, and a further 0.7 m by 2100.

5.10 Visual amenity and landscape character

Swanbury Penglase have prepared a visual assessment (Appendix 17).

The character of the Horticulture (West) zone is distinguished by open rural areas, market gardens, vineyards, orchards and structured, open paddocks. These areas are supported by greenhouses, packaging sheds and residential rural living.

The site, and the area around it, is relatively flat with limited topographic features. The uniformity of the landscape diminishes the scenic amenity of the landscape.

Due to the low lying and flat landscape character, expansive views are experienced to the south of the site towards Port Adelaide and Outer Harbour. The scale of the shipping cranes provides a backdrop to a distant industrial character.

To the south, Cheetham salt pans and Buckland Park Lake form an associated visual element to the salt pans.

The coastal plain's visual character is defined by the low lying saltbush and samphire and dense mangroves closer to the coastal edge.

To the site's south, the State Shooting Park has periphery fencing and a vegetation buffer limiting views into the site.

A disused silo located on the Jeffries demonstration farm is a dominant visual element. The silo is elevated above what is a denuded flat landscape with limited topographic or vegetative features. The silo is located approximately 350 m to the south of the site boundary.

Virginia is characterised by a mixture of rural residential living, greenhouses and horticultural practices to the periphery and a small commercial, retail precinct along Old Port Wakefield Road. There is no visual connection between Virginia and the site.

Port Wakefield Road's infrastructural form delineates the rural living context of Virginia to the east and more intensive horticultural practices.

Port Gawler, approximately 2 km to the site's north is characterised by a small array of rural dwellings and associated farming equipment.

Infrastructural forms are scattered throughout the landscape, with major vertical and horizontal scaled elements such as transmission lines being collocated to road corridors, specifically Port Wakefield Road. The various scales of transmission lines (66 kV and 11 kV lines) aligned to various orientations, provides complexity to the skyline whilst traversing along road corridors.

Some isolated visual elements are present in the form of a telecommunication tower and the disused silo located within Jeffries demonstration farm.

The Port Wakefield Road provides fragmented views with existing verge plantings filtering the depth of visual field. Located along Port Wakefield Road are numerous tertiary roads which typically have greenhouses or isolated rural dwellings at the intersections.

The most dominant visual element within this landscape region is the Gawler River open space. The vertical scale of the remnant Eucalypts which align the riverbed provide a backdrop for views from the south and north. The meandering form of this vegetation corridor dissects the landscape providing a natural gateway to those travelling through the landscape and across the river on Port Wakefield Road. The river is ephemeral with limited flow in the summer months.

The Gawler River corridor is designated as Metropolitan Open Space (MOSS) recreation, providing a buffer of vegetation and open space, creating a defined character zone.

To the west of the site, there are some glimpsed views of the coast in and around Windamere Estate. The man-made levy banks to the salt pans limit the views across the horizontal landscape.

The site's dominant landscape character is defined by horticulture. Its visual character is bounded by the Gawler River corridor to the north. The river corridor provides a dense vegetation buffer, preventing more expansive views to the north or from the north of the site.

The site is denude of visually significant vegetation and has been intensively eroded by horticultural and grazing practices. The landform is flat with the exception of Thompson Creek which represents a dryland swale showing signs of erosion and infill from neighbouring farming practices.

Windamere has a rural residential dwelling and olive grove. Similarly a property on Buckland Road which bounds the south-eastern side of the side has associated olive groves.

The uniformity and intensity of the horticulture degrades the visual landscape. Expansive views to the south limit a sense of scale and visual interest. The lack of topographic variance also attributes to the lack of visual attraction.

Existing road corridors, particularly Port Wakefield Road, and the NEXY, introduce infrastructural elements and visual corridors which are transient by nature. As a result the landscape is predominantly viewed through the eyes of a moving occupant.

Figure 5.3 Greenhouses

Figure 5.4 Jeffries silo to the distance

5.11 Hazards and risks

The following hazards and risks have been identified:

- Flooding from the Gawler River will impact on the proposal, or the proposal will impact on flooding.
- Climate change induced sea level rise will exacerbate flooding.
- Acid Sulphate Soils will be uncovered during construction, releasing acid leachate into the marine environment.
- Groundwater conditions will be altered, or salinity in the groundwater will impact on the proposal.
- Stormwater discharged from the site via the Thompson Outfall Channel will impact on the marine environment.
- Significant flora and fauna on the site or the coastal plain will be impacted.

These potential hazards and risks are discussed in more detail elsewhere within the EIS.

Chapter 6 Need for the proposal

This chapter explains need for the proposal, the rationale behind its location and plans for its staged implementation.

6.1 Location, scale and staging

Guideline 4.1.1: Describe the need for the proposal, including the reasons for its proposed location, scale and staging.

6.1.1 Need for the proposal

The need for the proposal is described in detail in Chapter 2.

The proposal's key objective is the creation of a steady supply of housing allotments to support Adelaide's growth and economic wellbeing over the next 30 years, which is well served with the physical and social infrastructure needed to create a well functioning and sustainable community.

South Australia's Strategic Plan 2007 includes key targets for South Australia, including:

- Increasing South Australia's population to 2 million by 2050, with an interim target of 1.64 million by 2014.
- Increasing affordable home purchase and rental opportunities by 5 percentage points by 2014.
- Halving the number of South Australians experiencing housing stress by 2014.

The proposal can make a meaningful contribution to the provision of the housing required by the increased population.

Increased supply of housing land, with an Affordable Housing component will contribute to maintaining housing affordability in Adelaide.

The Planning Strategy seeks to ensure there is an adequate and appropriate supply of land for residential purposes.

The South Australian government is reviewing Adelaide's strategic planning. On 5 November 2008 the Minister for Urban Development and Planning initiated the *Growth Investigations Areas* project to ensure there is enough land to accommodate Adelaide's projected growth over the next 25 years.

The results of the project will become progressively available over 2009.

Coupled with the project is the Government's recently announced *Directions for Creating a New Plan for Greater Adelaide* which responds to current and emerging thinking on a vision to direct Greater Metropolitan Adelaide's growth.

Revised population projections indicate that up to 600,000 additional people could be living in South Australia by 2036. The majority of this population growth is anticipated to occur in Greater Metropolitan Adelaide.

This represents a 40% increase on the existing population, presenting considerable growth management questions for the Government.

Consequently, high population growth and an ageing profile could create a demand for almost 250,000 additional dwellings in Greater Metropolitan Adelaide over the next three decades.

The proposal will supply suitable land to accommodate 12,000 of the required 250,000 dwellings.

6.1.2 Location

The site's strategic context has changed over recent years. The changed circumstances included the following:

- Instigation of flood mitigation works associated with the Gawler River, which are anticipated to reduce flood risks in the area.
- Relocation of the 7RAR Battalion with 1,200 personnel from its current location in Darwin to new facilities within the Edinburgh Defence Precinct, including the construction of over $620 million of new facilities at Edinburgh. This in turn creates a significant demand for housing.
- Construction of the Northern Expressway (NEXY), a major piece of road infrastructure. It will improve accessibility to the northern suburbs of Adelaide as will the northern connector and consequently the regions ability to attract employment and support new urban areas.
- A decline in Metropolitan Adelaide's land stocks and housing affordability over the last 3 years.

The site's location relative to Greater Metropolitan Adelaide's other new and growing suburbs, including those that are either commenced, committed, proposed or under investigation, has been reviewed by Connor Holmes (Appendix 2).

The new and growing areas have been analysed against the following eight location indicators:

- Location within Metropolitan Adelaide Area as described in the Planning Strategy.
- Distance by road to:
  - Adelaide CBD.
  - Regional centres.
  - Major employment areas.
  - Major rail interchanges.
  - Major hospitals.
  - TAFE colleges.
  - Universities.

It was found that the site's relationship to these key urban facilities was:

- Superior to six of the eight comparable growth areas, on at least five of the eight location indicators.
- Superior to two of the four comparable growth areas within Metropolitan Adelaide on at least five of the eight location indicators.

The site relative to Greater Metropolitan Adelaide's other growth areas is strategically favourable. It is in close proximity to the greater number of Adelaide's economic growth areas and significant employment nodes, including key industry, Defence and technology sites. It is also accessible to rail interchange facilities at Salisbury and Elizabeth, tertiary education and major medical services.

Up to 250,000 new houses will be required to meet Adelaide's demands over coming decades. Connor Holmes predicts much of that demand will need to be met in Metropolitan Adelaide's northern region, which has more suitable, available land and considerably better access to employment, infrastructure, and future infrastructure (Appendix 3). As new suburbs are established in the northern region, they will draw in more infrastructure, employment and services, providing a catalyst for the creation of additional suburbs.

While the construction of 12,000 new houses in any part of Adelaide will have economic benefits, the economic benefits associated with the proposal will be enjoyed most particularly in Metropolitan Adelaide's northern region.

It could be argued Metropolitan Adelaide's northern region is more worthy of those benefits than other areas.

If the proposal does not proceed, those economic benefits will be lost to the region.

6.1.3 Scale

The proposal's Masterplan and Staging Plan and control by a single proponent, allows the implementation of a large proportion of Adelaide's required housing in an orderly and economic manner.

This is unique in Adelaide's experience of creating new suburbs.

The Masterplan sets out the location of transport, open space, stormwater management, centres, employment and mixed use precincts, relative to housing and the surrounding area.

Each of the proposal's stages will be progressively detailed and implemented, guided by the structure established in the Masterplan. The result will be a large, well serviced community.

Each of the proposal's stages will also be created with its required services.

The Masterplan and Staging Plan will guide each stage is effectively linked to past and previous stages, in terms of its road, transport, open space and utility networks, and in terms of its social and community networks.

The alternative to the proposal is the provision of Adelaide's required housing in smaller projects, located over dispersed areas which require an incremental approach to planning for infrastructure and services, which may be inefficient and uneconomic for service providers.

6.1.4 Staging

The proposal's staging is described in detail in Chapters 3 and 14.

For planning purposes, a yearly production of 480 allotments has been adopted, over a time frame of 25 years.

This rate of production is considered reasonable, but will be subject to variation over time as the result of market conditions for example.

Also production tends to be slower in the early years as an area becomes established, faster in the middle years as production and marketing are in full swing, and slower in the later years as the availability of allotments shrinks.

This affect is likely to be seen over the proposal's 25-year construction and occupation time frame, and on a smaller scale, over the time it takes to construct each of the proposal's stages.

Connor Holmes consider this issue in more detail in Appendix 3 and 5.

6.2 Supply and demand for residential development

Guideline 4.1.2: Outline current and predicted supply and demand for a range of residential development in the region; including affordable housing, aged housing and high needs housing.

6.2.1 Demand

Connor Holmes note that since emerging from the early to mid-1990s recession, demand for housing in Adelaide has steadily increased (Appendix 3). Today, that demand has reached a point where it cannot be met by the development industry, which is limited by a lack of available, suitably zoned land and limits on the ability to construct housing.

Some short-term relief to land supply is expected from Land Management Corporation (LMC) releases, and in the medium term from the recent inclusion of an additional 2000 hectares within the Urban Growth Boundary (UGB), which will, over time, be rezoned and developed for urban purposes.

However, the process of creating new suburbs on this land will be complicated, and for some areas, appears highly problematic. In this context, the proposal's delivery in a timely manner remains crucial to the uninterrupted supply of residential land to the Adelaide market.

Constraints on the construction of housing are likely to remain, even if land supply issues can be overcome. South Australia's labour shortages in key trades will continue as there is strong competing demand for skilled labour from a range of expanding industries.

The State Government endorsed population and dwelling projections for South Australia and Greater Metropolitan Adelaide being used to inform the *Growth Investigations Areas* and *Directions for Creating a New Plan for Greater Adelaide* show in 2008, population was growing at a rate two to three times faster than in the 1990s.

These growth projections anticipate the State's population will grow from 1.6 million in 2008, to 2 million by 2027. Greater Metropolitan Adelaide is projected to grow by 547,000 people and 250,000 dwellings in the 30 years from 2006 to 2036, excluding Murray Bridge.

To support this level of population growth, an average of 8,500 additional dwellings will be required in Greater Metropolitan Adelaide each year, for the next 30 years.

In a regional context, growth in Metropolitan Adelaide's northern region and the Barossa Region are expected to be strong and substantially above Greater Metropolitan Adelaide's overall growth rates.

Based on continuation of the levels of construction activity recorded in Outer Metropolitan LGAs over the last decade, it is assumed approximately 1,350 dwellings per annum will be provided in towns located in Outer Metropolitan Adelaide, Mt Barker, Barossa towns, Strathalbyn, Victor Harbor, and Goolwa.

There will therefore be a demand for approximately 7,150 dwellings per annum in Metropolitan Adelaide.

As an outcome of the Planning Review, the SA Government wants 70% of the new housing needed by 2036 to be provided in infill sites in established suburbs, with 30% provided in new suburbs.

The Planning Review predicates achievement of the 70:30 ratio of infill to new suburbs on the creation of Transit Oriented Development (TOD), which will see increases in residential densities around upgraded fixed transport nodes.

Demand for housing in new suburbs is expected to be approximately 80,000 dwellings over the next 30 years, even if new projects in Adelaide established suburbs delivers 70% of the total amount of new housing required.

6.2.2 Supply

The site has an area of 1,340 ha. Excluding land needed for roads, non-residential uses and environmental constraints, there will be approximately 600 hectares of residential land, capable of accommodating 12,000 dwellings.

Detailed planning of future stages will confirm yields, but at this stage in the design process, these figures have been adopted for planning purposes. The yield is generated from the neighbourhood types and densities described in Table 6.1.

Table 6.1 Dwelling types and yields

Location	Net area (ha)	Net residential density (dwellings per hectare)	Total dwellings
Low density residential neighbourhoods	77	10	700
Residential neighbourhoods	449	20	8,580
Medium density neighbourhoods	61	40	2,320
Mixed use precincts	13	40	400
Total dwelling yield	**600**		**12,000**

Source: Connor Holmes 2008.

6.2.3 Affordable housing, aged housing and high needs housing

The Masterplan

Given the diverse range of people seeking affordable housing, it needs to be provided in a range of styles and types, including:

- family homes as detached dwellings with three bedrooms and gardens;
- smaller attached homes with two bedrooms and small gardens; for example, villas and townhouses;
- apartments in secure buildings with one or two bedrooms, balcony outdoor space and secure parking for one vehicle.

The proposed staging is shown in Figure 3.11, while Figure 6.1 shows the proposed distribution of affordable housing across the Masterplan.

It is expected the delivery of affordable housing will be below 15% in the earlier stages, and will gradually increase as neighbourhood centres, a district centre and mixed use precinct are established and the range of facilities and services grows.

Up to 5% of the affordable housing allotments could be purchased by the Affordable Housing Trust for public housing supply at any stage, although this is unlikely to be an option until the community is better established, particularly community services. These sites would be available at current market value.

There are three concentrations of Affordable Housing throughout the Masterplan:

- >15%: areas where a wide range of housing types, including medium density housing and apartments could be supported when Buckland Park becomes more established, particularly around centres and close to public transport routes.
- 5%: - 15%: residential neighbourhoods comprising predominately lower density, detached housing, which will be progressively created across the Masterplan, and over time to 2036.
- < 5%: areas adjacent to the woodlands where allotments will be larger, to take advantage of landscape amenity and to accommodate requirements for tree retention. As these larger allotments will be necessarily more expensive it will be difficult to provide affordable homes. These areas are within the proposal's later stages.

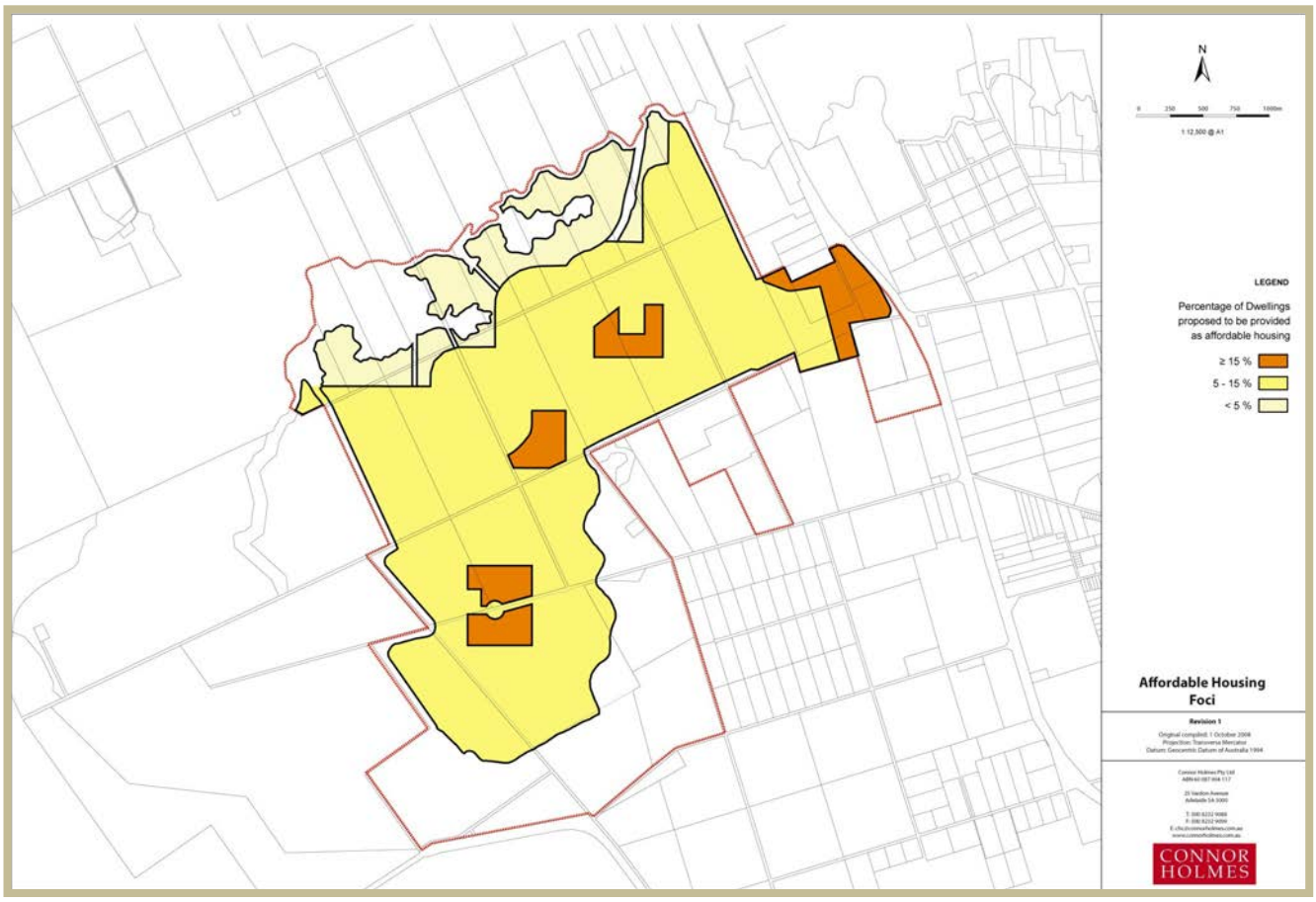


Figure 6.1 Distribution of affordable housing

As a deliberate consequence of this approach, it is expected the delivery of Affordable Housing will be below 15% in the earlier stages, and will gradually increase as neighbourhood centres, the district centre and the mixed use precinct become established, and the range of facilities and services grows.

The distribution of Affordable Housing has been planned considering the following:

- In the areas where <5%, or 5% to 15% of the new houses will be affordable, they will be spread throughout the residential neighbourhoods, integrated with other housing, as it is anticipated the type of households seeking affordable housing and other housing will be fundamentally the same so their housing should be located in the same manner.
- Areas where ≥15% affordable housing is proposed are located close to centres, with their associated services, facilities and public transport access. This affordable housing will be higher density, making it suitable for the required high needs component, as well as for smaller household seeking smaller dwellings. Some of these dwellings, particularly the small villas and apartments, may form part of retirement village or aged care projects within the proposal's later stages.

The Masterplan can accommodate both a retirement village and residential aged care or high needs care facilities at locations and times determined by demographic growth, availability of services and market demand. The location of these facilities is yet to be determined. Based on the projected age profile at 2036, demand for aged care beds is expected to be in the order of 150 to 200 beds (Appendix 5).

Table 6.2 Indicative Affordable Housing Mix

Dwelling type	Number of dwellings	Affordable housing (%)
Villa – large	12	<1
Villa – small	470	26.1
Cottage	360	20.0
Gatehouse	610	33.8
Mews dwelling	120	6.7
Apartments	180	10.0
Retirement/aged care	48	2.7
Total	**1800**	**15**

Stage 1

Stage 1 has 616 residential allotments and its Affordable Housing component is 10%. At such an early point in the construction and occupation programme, families with financial resources to support larger mortgages or private rental are less likely to require the community support services that will be difficult to provide.

Families requiring an affordable home may require more of these services. Therefore only 10% Affordable Housing is proposed, rather than the 15% required.

Some of the proposal's later stages will incorporate more than 15% Affordable Housing, to ensure the Masterplan's overall compliance with requirements.

The distribution of Affordable Housing within Stage 1 is shown in Figure 6.2.

While Masterplan can accommodate a range of affordable housing types, Stage 1 will include a relatively conventional approach, focusing on two types which will provide two and three bedroom options, as single storey detached dwellings.

More complex housing types are more appropriate for the proposal's later stages when its centres and services are established and can support medium density or shop top housing for example.

Figure 6.2 Distribution of Affordable Housing in Stage 1

6.3 The 'do nothing' option

Guideline 4.1.3: Assess the "do nothing" option.

Adelaide's required housing will be provided in smaller projects, located over dispersed areas which may require an inefficient, uneconomical and incremental approach to planning for infrastructure and services.

Adelaide requires a large amount of new housing over the next 30 years. A constrained supply of housing will have negative implications for housing affordability.

The Gawler River, where it passes the site, has the potential to be a major environmental asset, for the whole community. This potential will not be realised if the proposal does not proceed. This section of the river will remain in private ownership, and current grazing will continue.

While the construction of 12,000 new houses in any part of Adelaide will have economic benefits, the economic benefits associated with the proposal will be enjoyed most particularly in Metropolitan Adelaide's northern region.

It could be argued Metropolitan Adelaide's northern region is more worthy of those benefits than other areas.

If the proposal does not proceed, those economic benefits will be lost to the region.

Chapter 7 Water issues

This Chapter describes the approach to water supply and management adopted in the proposal. Wallbridge and Gilbert have considered all matters associated with water in an integrated manner. The proposal's water strategy balances storm and flood water, potable water, recycled water and waste water with the aim of minimising the use of potable water.

The whole of water cycle approach will contribute to the proposal's long term sustainability.

Ground water has been considered by SKM.

Geotechnical and soil conditions were considered by Golder and Associates.

Both Wallbridge and Gilbert, and SKM have considered the impact of sea level rise and climate change in their analysis.

7.1 Flood potential and management

Guideline 4.2.1: Determine the flood potential for the area, including flood plain mapping for a 1 in 100 year ARI storm, as a result of the restriction of the floodplain in the vicinity of the proposed development and taking into account the construction of a dam on the North Para River.

Wallbridge and Gilbert (Appendix 18) have identified the existing, pre-development potential for the site to be affected by a 1 in 100 year ARI storm event. The site is currently subject to flood water flows originating from breaches in the banks of the Gawler River during storm events exceeding 20 year ARI. Flood mapping prepared on behalf of the GRFPMA was used in Wallbridge and Gilbert's analysis.

The lower reaches of the Gawler River through Virginia, the site and its vicinity is an example of a 'perched river', as its banks are higher than the surrounding floodplain. When water breaks the banks of the Gawler River's lower reaches, water flows away from the river and enters the site at a number of locations.

The largest breakout from the Gawler River approaches the site from the east via Port Wakefield Road. During a 100 year ARI storm event, this flood flow is in excess of 100 m^3/s. The other breakouts from the Gawler River are relatively minor, however, they do pose some risk to the proposal and need to be managed.

Flows entering the site are relatively shallow in nature and in terms of Flood Hazard as defined by the Australian Government SCARM, *Floodplain Management in Australia, Best Management Practices and Principles*, the flood hazard is primarily in the low to medium category as they are relatively shallow, with low velocities.

7.1.1 Flood management strategy

Wallbridge and Gilbert have prepared a flood management strategy. In order to develop the strategy a number of concepts were considered. The use of levees to manage floodwaters caused by breakouts from the Gawler River were considered, however, from modelling it was found that the use of levees may force breakouts or create floodwaters to enter the site in other locations.

The use of a flood channel system through the site was considered as the most effective way of managing flood waters.

These channels have been incorporated in the Masterplan.

In addition to the flood channel system, fill will be required on the site adjacent to Port Wakefield Road to protect the district centre and mixed use areas shown on the Masterplan from flood water flows.

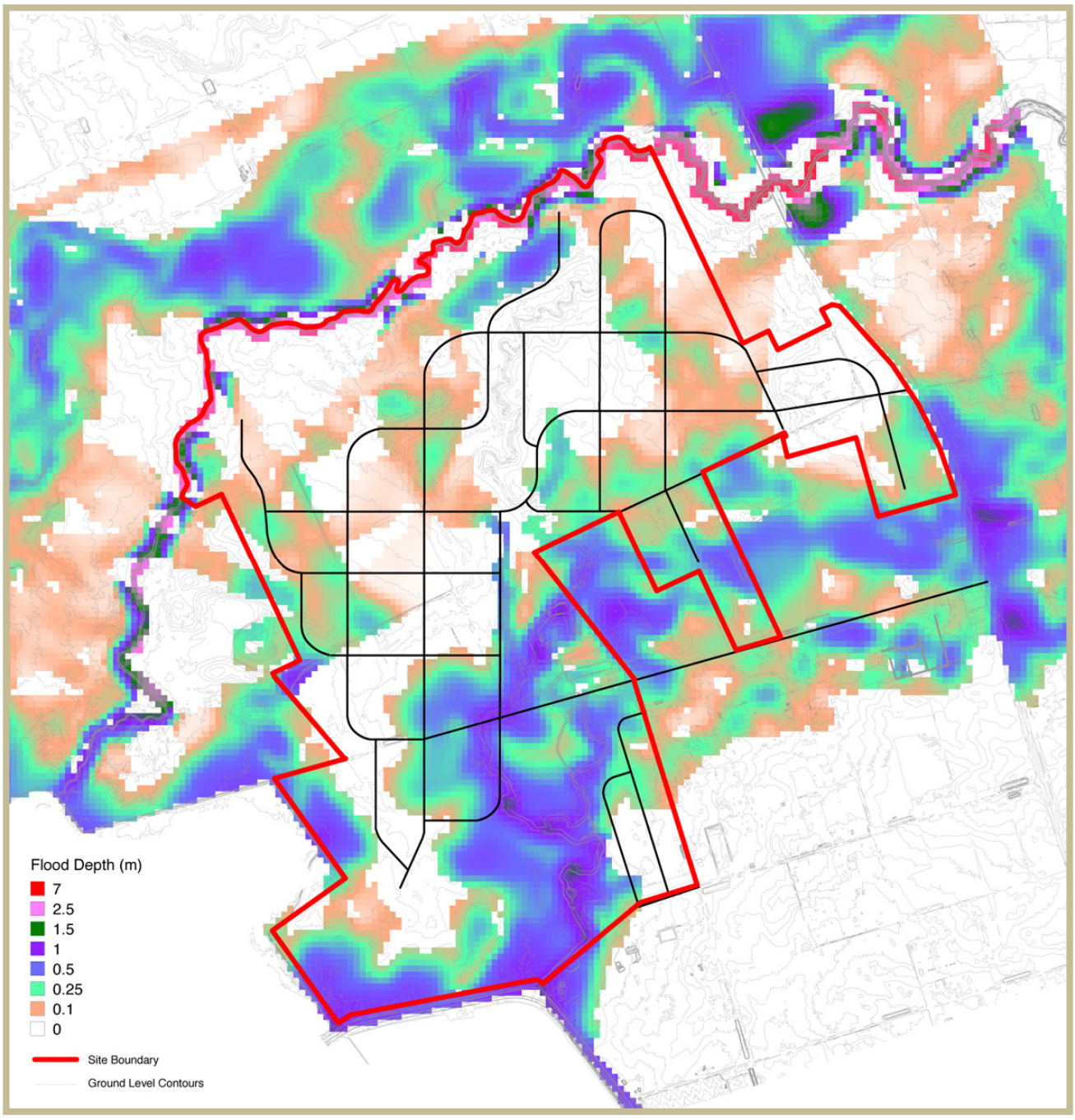


Figure 7.1 Current impact of a 1 in 100 year ARI event

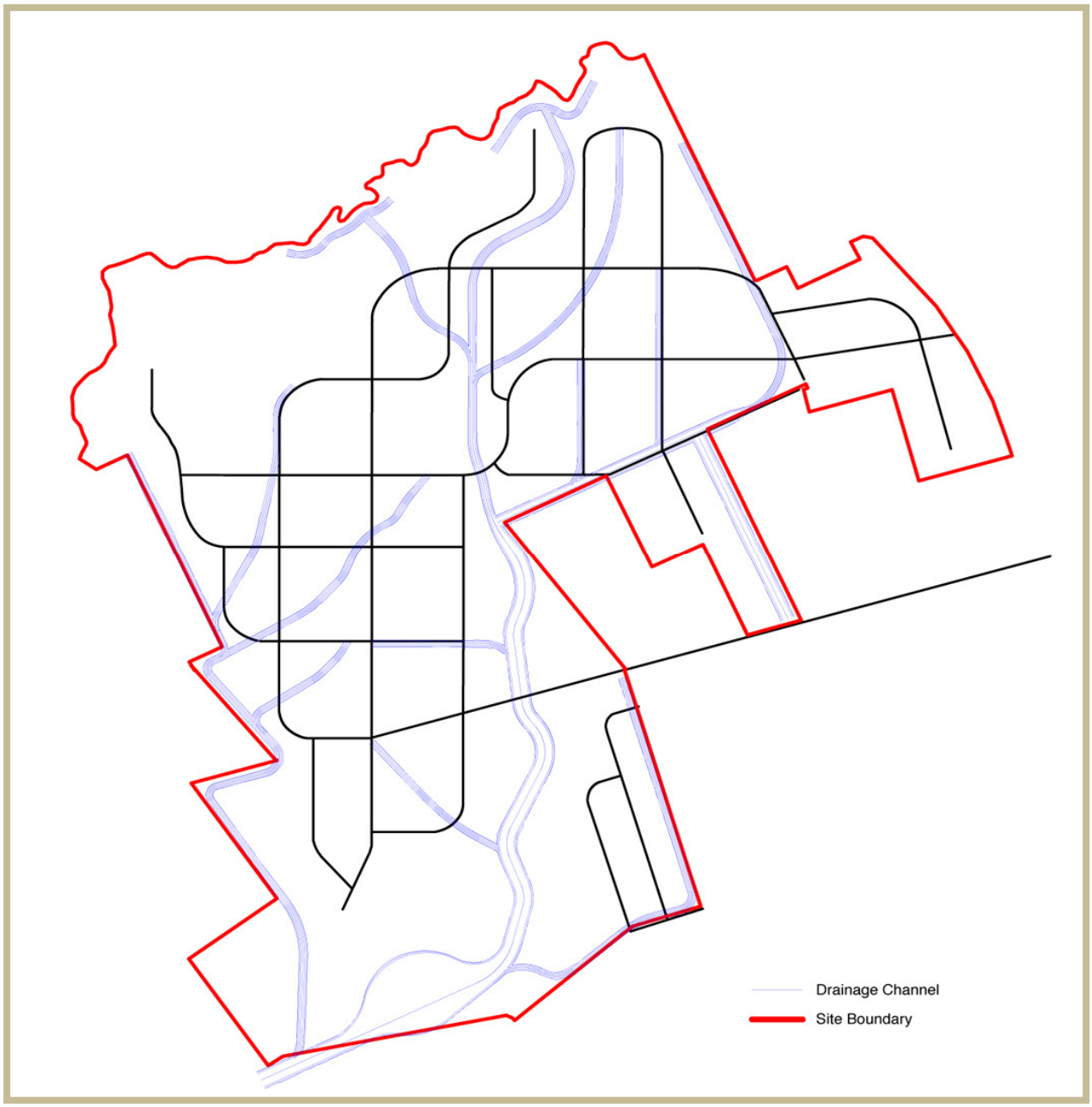


Figure 7.2 Proposed storm and flood management channels

Wallbridge and Gilbert considered filling on the downstream side of Port Wakefield Road could adversely impact on flood levels on adjoining and also upstream properties. From modelling it was established that filling on the downstream side of Port Wakefield Road will result in a negligible increase in the level of flood waters adjacent to the site.

Wallbridge and Gilbert modelled the impacts of a potential blockage within the Gawler River during a flood event, for example, from a fallen tree. It was found that 'The risk of blockage occurring in the Gawler River downstream of Port Wakefield Road has little to no impact on an increase in flood risk in the 100 year ARI event' (Appendix 18).

7.1.2 Compliance with coastal flooding policy

Guideline 4.2.20: Describe how the proposal will comply with the coastal flooding policy outlined in the Development Plan.

The Playford (City) Development Plan requires designs allow for a 0.3 m in sea level rise by 2050, and a further 0.7 m of sea level rise by 2100.

While the site is located several kilometres from the Gulf St Vincent and therefore outside the coastal zone, it is linked to the Gulf St Vincent via the Thompson Outfall Channel and would therefore be subject to tidal surge.

Wallbridge and Gilbert applied the Coastal Protection Board's recommended figures for required minimum site level (SL) and finished floor level (FFL) to prevent coastal flooding for design to 2050 and 2100, as outlined in Table 7.1.

Table 7.1 Minimum site levels

Recommended level	2050	2100
Minimum SL (m AHD)	3.30 m AHD	3.30 m AHD + 0.7 m = 4.0 m AHD
Minimum FFL (m AHD)	3.55 m AHD	3.55 m AHD + 0.7 m = 4.25 m AHD

Source: Coastal Protection Board SA 2008.

The recommended minimum site level is therefore 4.0 m AHD with minimum floor levels of 4.25 m AHD.

Areas within the residential and commercial precincts accommodated in the Masterplan where the ground level below 4.0 m AHD will be filled to achieve this minimum requirement. Further fill above this level will be required on site in order to create fall on the land and to achieve drainage and minimum road grades. The potentially affected areas are located in the southern part of the site.

As illustrated in Figure 3.11, these areas are in the proposal's later stages. Prior to the commencement of any works in those areas, detailed engineering designs for the required earthworks will be prepared, and detailed flood analysis undertaken.

7.1.3 Protection of significant conservation areas

Guideline 4.2.21: Detail how flooding of the Gawler floodplain will be managed to protect the development without damage to areas deemed to be of conservation significance.

Where possible, flood and stormwater management channels have been located to avoid areas of conservation significance. In particular, the eastern reach of Thompson Creek has been avoided, and is accommodated the Masterplan as open space.

Where avoidance is not possible, potential impacts on these areas will be mitigated by the following measures will be incorporated into the CMP's flora and fauna rehabilitation and management plans, to be implemented during and after construction of the stormwater management channels:

- Areas adjoining construction zones will be protected by fencing.
- Indigenous plants in affected areas will be salvaged by an ecologist prior to works commencing for use in revegetation on completion of works.
- Weed Management, Soil and Erosion Management, Water Management, and ASS Management Plans will be prepared as required and implemented prior and during construction works.

- Rehabilitation, Revegetation and Management Plans, will be prepared and implemented at the completion of works. All planting will be of indigenous species, and will include salvaged plants.

As illustrated in Figure 3.11, the affected areas are located in the proposal's later stages. Management plans will be prepared and approved by the relevant agencies, including Playford City Council, during detailed design for those stages.

7.2 Water, stormwater and wastewater management

Guideline 4.2.2: Outline the requirements for and likely location of water, sewage and stormwater management infrastructure.

Guideline 4.2.7: Describe the connection to water supply for the proposed development, the required upgrading or provision of pipelines and the implications for water sources, include information on the quantity of potable water required.

Guideline 4.2.8: Describe the proposed method of dealing with wastewaters.

7.2.1 Water provision

There is limited SA Water infrastructure installed in the area of the site. An additional 12,000 allotments will create a large, new demand for potable water.

In order to provide a reliable source of potable water, major new infrastructure works or upgrades will be required. SA Water has considered a number of potential potable water supply options, for the proposal's initial phases, and ultimately, when construction and occupation is complete. In the initial phases, demand for potable water will be considerably less than the ultimate demand.

Staging the implementation of infrastructure will reduce initial capital costs and will also potentially provide the site with a long-term backup potable water source. The full capacity system will then be installed as demand grows.

Water restrictions, and the ever-increasing need to conserve water resources, have made use of recycled water use for applications that do not require potable water a necessity. Recycled water is sourced from wastewater treatment systems and stormwater runoff, and is increasingly being used for non-potable applications within industry and in new residential communities.

Recycled water should be used for non-potable applications such as garden watering and toilet flushing as a means to reduce demand for potable water.

Meeting water demand

The proposal will use both recycled and potable water to meet its total water demand. This water delivery system is commonly referred to as a dual pipe system, with one set of pipes carrying recycled water and the other carrying potable water into each allotment.

Using a dual pipe system to meet the water demand within new residential areas has been adopted in South Australia for a number of projects, with Mawson Lakes being the largest example. The average annual water usage figures for allotments within Mawson Lakes were obtained from SA Water and are:

- Potable water 140 kL per service per annum.
- Non-potable water 160 kL per service per annum.

Using these figures as a guide, the expected annual demand for potable and non-potable water generated by the proposal was calculated.

Table 7.2 Annual water demand

Water type	Annual Demand (GL/annum)
Potable Water	1.7*
Recycled Water	1.9**

** This figure is purely based on residential use and therefore does not include an allowance for any water used for emergency services, increased industrial and commercial use etc.*

*** This value does not allow for irrigation of open spaces, maintenance of ornamental lakes etc.*

Potable water supply

Two potential suitable water supply sources were identified, the Barossa water treatment plant (WTP) and the Little Para WTP.

SA Water considered the Little Para WTP the best option. Barossa WTP was discounted, as the plant does not have sufficient capacity to meet the proposal's ultimate demand. Also, there may be potential for further residential proposals within Gawler and surrounding areas and these proposals are most likely to be supplied by the Barossa WTP.

Little Para WTP is located approximately 20 km south east of the site. In order to service the proposal a number of pipes will need to be installed to provide connections between the site and the existing infrastructure.

Figure 7.3 illustrates the long-term and short-term potable water supply options available to the proposal.

Short-term potable water supply options

SA Water outlined two viable, options to supply potable water to the proposal's initial phases. These options have limited capacity and will only be able to supply up to a maximum of 3,000 services.

Cost comparisons will need to be done prior to the commencement of Stage 1's construction in order to determine which option is the most economically viable for the proposal in the short term.

Table 7.3 Short-term potable water supply options

Option	Description	Comments
1	There is a 450 mm diameter DICL (ductile iron concrete-lined) main supplying potable water to the Virginia and Two Wells area. The main is located at the corner of Roberts Road and Angle Vale Road in Virginia (Figure 7.4) and has enough spare capacity to supply approximately 1,100 allotments.	A 250 mm diameter main, approximately 3 km long would be required to connect the existing main to the site. Any new residential allotments in Virginia and Two Wells would decrease the capacity for the existing 450 mm main to provide potable water to Buckland Park.
2	A 450 mm diameter water main was installed at Undo Road, Waterloo Corner in 2000 to provide water to the Bolivar WWTP. This is now redundant, making it available to provide potable water to the proposal. It has an estimated spare capacity of approximately 3,000 services. SA Water advises that once the capacity of this main is exceeded, it would be available to supply back-up potable water to the completed and occupied development; for example, when the new main feeder main was closed for maintenance or repairs.	Approximately 10 km of 600 mm diameter water main would need to be laid between Undo Road and the site to deliver potable water from the main.

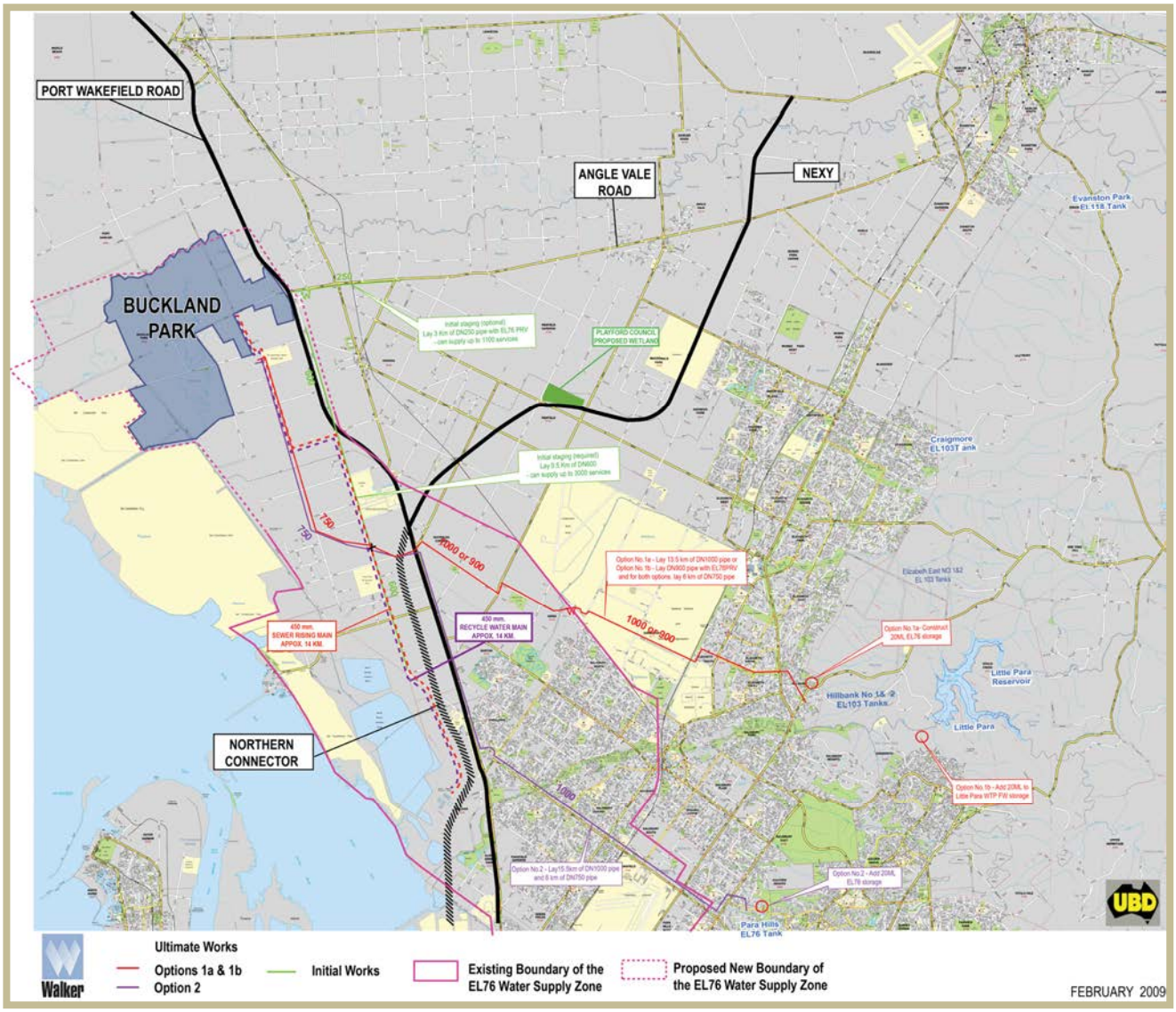


Figure 7.3 SA Water water supply options

Long-term potable water supply options

In considering long-term options, SA Water planned for 23,000 new service connections in the City of Playford and the City of Salisbury Council. This allows for a potential 11,000 new service connections in addition to the 12,000 created by the proposal.

The infrastructure was designed to meet the following demand criteria:

- Sufficient capacity to supply 70 ML/day.
- Instantaneous peak demand of 1,500 L/s.

SA Water outlined three options to supply the proposal with the predicted ultimate potable water demand from the Little Para WTP.

SA Water has advised the capacity of the infrastructure that provides potable water to the Para Hills EL76 storages and the Para Hills EL103 storage tanks may not be sufficient to supply the entire demand generated by the predicted growth in the area. However SA Water determined that the Para Hills EL103 storage tanks could be supplemented from the Anstey Hill WTP. This change in operation may require some infrastructure upgrade works.

Table 7.4 Long-term potable water supply options

Option	Description	Comments
1a: Supply via Hillbank EL76 storages	This option would require the construction of a 20 ML storage tank at the corner of Black Top Road and Bungarra Street in Hillbank. The storage would be located at an approximate elevation level (EL) of 76 m AHD and would be fed by water drawn from the Little Para WTP.	This option would require the acquisition of land in order to build the storage tank in the required location. 13.5 km of 1,000 mm diameter main would be laid in an existing easement running along Hogarth Road, Edinburgh Road, Wyatt Road, Mill Road and Curnow Road to deliver water from the storage tank to the Buckland Park. A further 6 km of 750 mm diameter main would be required along Curnow Road and Tozer Road.
1b: Supply via Little Para EL118 storages	This supply option would require the addition of a 20 ML storage tank at the Little Para WTP. The elevation level (EL) at the Little Para WTP is 118 m AHD. This option would have a pipe network that follows the same path as Option 1a; however, the diameter of the pipe located within the existing easement along Hogarth Road, Edinburgh Road, Wyatt Road, Mill Road and Curnow Roads would be reduced from 1000 mm to 900 mm.	The maximum pressure head allowed in SA Water distribution networks for domestic services is 90 m. As the ground elevations at the site range from between 3 m AHD and 11 m AHD, and the elevation of the supplying storage tank would be 118 m AHD, the pressure head in the pipe network would need to be reduced. This would be achieved by the installation of a pressure release valve (PRV), located in Wyatt Street, Direk, and would have an elevation set to 76 m AHD.
2: Supply via Para Hills EL76 storage tank	This option would require the addition of a 20 ML storage tank located at the Para Hills EL76 storage site. The Para Hills storage site is currently too small to accommodate further storage requirements. An additional storage site would be acquired in close proximity to the existing location to accommodate the new storage.	15 km of 1,000 mm diameter water main would be needed along Kings Road, Port Wakefield Road and Curnow Road to supply potable water from the Para Hills storage location. The main would then reduce in diameter to 750 mm, continuing along Curnow Road and Tozer Road to connect into the Buckland Park site.

Additional design work and cost analysis will be required to determine which of the options is considered to be the most suitable.

SA Water concluded that the site is capable of being supplied with potable water in an efficient and staged manner to coincide with the staged construction of the proposal.

Recycled water

There are two viable options for the provision of recycled water to the site.

SA Water has advised they expect sufficient treated wastewater will be available from the Bolivar Waste Water Treatment Plant (WWTP) via the Western Reticulation Systems Virginia (WRSV) pipeline or a new pipeline approximately 14 km long to supply the full non potable needs of the proposal.

The salinity of WRSV water is an average of 1,200 ppm, which is considered to be suitable for irrigation.

Captured and treated stormwater is another source of recycled water. This option is as described below, however there is only limited capacity of 50ML/a within the site's aquifer to store treated stormwater for reuse, and suitable locations for the required treatment wetlands are limited to the site's northern and central areas.

Stormwater

The volume of stormwater generated on the site post-development will be significantly higher than pre-development, therefore additional stormwater infrastructure will be required to manage the increased run off created.

A stormwater management strategy has been prepared by Wallbridge and Gilbert.A series of linear stormwater channels and concrete pipes have been designed to convey stormwater to the Thompson Outfall Channel. As external and internal flood events are not expected to occur simultaneously, channels for floodwater can also be used for part of the stormwater network.

A detention basin with a capacity of 250,000 m^3, will be located at the south west corner of the site to reduce the rate of discharge from the site to 10 m^3/s, as required by the Playford (City) Development Plan.

The stormwater strategy aims to capture and treat approximately 80% of stormwater generated within the site for reuse. Further detail on the potential re-use of stormwater is provided in Chapter 7.3.

7.2.2 Wastewater

The site is currently not connected to any formal waste water collection system and, therefore, new wastewater infrastructure will be required. SA Water has advised that a new rising main will be required to deliver sewage directly to the Bolivar WWTP, located approximately 14 km south of the site.

Wallbridge and Gilbert considered the following network types to determine the most efficient method of wastewater collection system:

- vacuum
- pressure
- gravity:
  - septic tank effluent disposal system (STEDS)
  - full sewer.

These three sewerage schemes were assessed based on their cost effectiveness, and the suitability of their design characteristics for the environmental conditions on site, particularly:

- high groundwater level
- highly saline groundwater
- acid sulphate soils.

Based on preliminary costings and the expected site environmental conditions, a vacuum system is recommended.

7.3 Water sustainability

Guideline 4.2.3: Describe the approach to water sustainability, including ways in which mains water supply use can be minimised or supplemented and opportunities for reducing and recycling water, particularly stormwater and wastewater from the Virginia Pipeline through Water Sensitive Urban Design (WSUD).

Guideline 4.2.4: Identify opportunities for the reuse of grey water.

To ensure potable water supply sustainability, the use of recycled water for all applications that do not require drinking water quality water is becoming more and more common in residential, industrial and commercial projects.

Cost is a particular incentive for consumers to use recycled water. Recycled water is cheaper than potable water as it usually does not require the same high level of treatment that potable water does.

Recycled water can be used for most applications where humans do not have direct contact with the water, such as:

- toilet flushing
- garden watering
- car washing
- irrigation.

Using recycled water for the above applications will significantly reduce the use of potable water. An annual reduction in residential potable water usage of 1.9 GL/a could be expected by using recycled water within the proposal for all applications that do not require water of drinking water quality standard. This is based on residential water use experienced at Mawson Lakes.

A Water Sensitive Urban Design (WSUD) approach has been adopted to the preparation of the stormwater management strategy's structure, which is accommodated in the Masterplan. The principles of WSUD will be applied to the detailed design of each stage, as they are progressively implemented.

There are two viable options for the provision of recycled water to the site-treated wastewater from the Bolivar WWTP and captured and treated stormwater.

7.3.1 Treated wastewater

SA Water has advised it is expected sufficient treated wastewater for the proposal will be available from the Bolivar WWTP to supply the full non-potable needs of the proposal via the Western Reticulation Systems Virginia (WRSV) pipeline or a new pipeline. The salinity of WRSV water averages 1,200 ppm, which is suitable for irrigation.

7.3.2 Stormwater

WSUD places an emphasis on stormwater treatment, peak flow mitigation, harvesting and reuse, while also ensuring that such practices adopt the multi-objective approach to stormwater management:

- Capture, treatment and reuse of stormwater runoff at the allotment level, and at the site level.
- Treatment of stormwater via wetlands, bio-filtration beds/rain gardens, and vegetated swales.
- Management of major storm events up to the 1 in 100 year Average Recurrence Interval (ARI).

The multi-objective approach includes features such as:

- Detain and slow the conveyance of stormwater through the site.
- Harvest and use stormwater as an alternative source of water to reduce the reliance on potable and ground water supplies.
- Use vegetation and landscaping to filter and treat stormwater.
- Integrate the stormwater management into the landscaping.
- Water efficient landscaping and the use of local indigenous vegetation species.
- Protection of the water related environments and their associated values.
- Protection and enhancement of recreational, social, and cultural values.
- Improved biodiversity, ecological and habitat outcomes.
- Community education and demonstration.

Wallbridge and Gilbert have prepared a preliminary stormwater treatment strategy that will be progressively designed for each stage as they are implemented.

The strategy employs the use of large lineal treatment swales and wetlands to promote natural water treatment processes to occur as the flows move through the catchment area. The stormwater layout will include trash racks, swales and two wetlands to treat the stormwater prior to its reuse, or discharge.

As stated in Section 7.2.1, the stormwater strategy aims to capture and treat approximately 80% of stormwater generated within the site for reuse. However, the opportunity to store and treat stormwater for reuse on the site is limited.

It is estimated that there is only 50 ML/a capacity within the aquifer for an aquifer storage and recharge (ASR) scheme to operate on the site. There is also limited ability to construct treatment wetlands, given the high water table.

Therefore, it is proposed to capture, treat, store and reuse stormwater up to the 50 ML/a limit set by the ASR potential. This water would be used for irrigation of reserves within the site, and to top up the wetland water bodies.

Two treatment wetlands are proposed in the central and north-western part of the site to treat stormwater prior to its storage in the aquifer.

For the remaining stormwater, a 'capture' basin would be created within the flood detention basin. This basin would be of sufficient size to capture approximately the volume of say a 1-in-3 month to 1-in-6 month flow, and incorporate the ability to pump that water off-site for treatment, storage and use by another party. Treated water could also be potentially returned to the site to provide a supply of recycled water for non-potable uses.

It is estimated the capture basin would require a volume of approximately 100,000 m^3 or 100 ML. It is expected that the basin would be located in the upper sections of the flood detention basin, where the groundwater levels are deeper.

At this time other potential users for the water have not been identified. However, Wallbridge and Gilbert expects that more users for this water will be found over the longer term. Playford and Salisbury Councils are likely recipients, as are horticulture business in the region. A scheme to supply additional water to the Western Reticulation Scheme Virginia could be considered, or the Greater Edinburgh Parks proposal.

Options for capturing stormwater and pumping it to other locations within the City of Playford for treatment, storage and then returning it to the site have been explored. The most suitable storage location is approximately 10 km west of the site and would therefore require installation of 20 km of new pipe.

7.4 Water quality

Guideline 4.2.5: Detail measures to minimise impacts and to protect the Gawler River and coastal environments during both the construction phase and on an ongoing basis.

Guideline 4.2.6: Identify the impact of possible erosion, subsidence or inundation as a result of flooding arising from construction on this low lying part of the coast.

Guideline 4.2.9: Describe measures to protect, maintain and monitor suitable water quality in waterways.

Guideline 4.2.10: Identify the potential effects of alterations of natural/current fresh and saltwater hydrological regimes on existing vegetation (including natural flooding).

Guideline 4.2.11: Outline measures to prevent soil, fertilizers, herbicides and pesticides derived from residential allotments and open space reserves from entering the waterways.

Guideline 4.2.12: Identify the potential effects as a result of stormwater runoff on the St Kilda–Chapman Creek and Barker Inlet-St Kilda Aquatic Reserves (nursery areas) ecosystem and fish breeding grounds.

The site is located approximately a minimum of 2.5 and 4 km inland from the coast, and is therefore not considered a coastal location. It is outside the area defined as coastal in the *Coastal Protection Act 1972*, its Regulations and the *Development Act 1993*.

The relationship of the site's hydrology with the coastal environment is limited. The Gawler River is a perched river system, as its banks are higher than the adjacent floodplain.

Stormwater runoff from the site does not drain to the Gawler River, nor to the Buckland Park Lake System as they are both effectively located upstream.

Storm and flood waters from the site currently discharge into the Gulf St Vincent via Thompson Outfall Channel, without any treatment to improve quality.

Storm waters from the site, post development, will continue to be discharged through the Thompson Outfall Channel, however, with treatment prior to discharge.

Post development flows, will not connect to the Buckland Park Lake system, hence the proposal will have no impact on the Buckland Park Lake system.

Wallbridge and Gilbert estimate up to 80% of stormwater from the site will be captured for reuse, as described in Chapter 7.2.1.

The stormwater management strategy intends to replicate the natural system as much as practical, with the exception that in stormwater events in excess of say a 1 year Average Recurrence Interval (ARI) flow result in increased volumes of water being discharged to Thompson Outfall Channel.

The net effect is expected to be approximately a 20% increase in annual runoff from the site compared to existing conditions, as it is not practical to capture the highest of the peak flows on an annual basis.

However, the site is approximately 1,340 ha of the 8,500 ha Western Virginia catchment which discharges to the Thompson Outfall Channel.

Therefore the net overall increase in runoff for the entire catchment is expected to represent about 3% to 5% of the overall volume.

Cooe assessed the likelihood of a risk event associated with stormwater runoff affecting the marine environment as low, as stormwater will be treated to meet the SA EPA (2003) *Environmental Protection Water Quality Policy – Aquatic Ecosystem ("Marine Waters")* criteria.

Using a MUSIC model, Wallbridge and Gilbert have assessed the proposal's stormwater system against the Criteria, and the CSIRO *Best Practices Environmental Management Guideline*.

Wallbridge and Gilbert found, "The analysis indicates the water quality discharging from the site is suitable for discharge to marine environments and water discharging from the two wetlands would meet the requirements for discharge to the aquifer." (Appendix 18).

Table 7.5 summarises the results of Wallbridge and Gilbert's analysis.

Once implemented in each stage, the stormwater management and treatment system will require monitoring and maintenance to ensure its ongoing effectiveness.

Community awareness regarding the appropriate use of garden chemicals and pesticides will be raised through education and "Welcome Packs". However, it is anticipated the use of these substances at within the site will be no different than experienced in other new or established suburbs. Continued improvement in these products, driven by state and federal government regulation, will ensure the environment surrounding all urban areas is better protected.

Table 7.5 Water quality results compared to SA EPA (2003) *Environmental Protection Water Quality Policy – Aquatic Ecosystem ("Marine Waters")* criteria

Pollutant type	Total phosphorus (mg/L)	Total nitrogen (mg/L)	Total suspended solids (mg/L)	Gross pollutants (kg/6 minutes)
Target value (mg/L)	**0.5**	**5**	**10**	**Not specified**
Catchment Identifiers				
1	0.011	0.122	1.15	0.00
2	0.0053	0.058	0.569	0.00
3	0.0093	0.105	1.00	0.00
4	0.0114	0.132	1.32	0.00
5	0.0117	0.132	1.26	0.00
6	0.0078	0.086	0.836	0.00
7	0.0101	0.114	1.09	0.00
8	0.0078	0.0865	0.84	0.00
9	0.0102	0.115	1.0	0.00
10	0.00797	0.0889	0.859	0.00
11	0.00921	0.116	1.02	0.00
12	0.0127	0.147	1.37	0.00
Wetland 1	0.00427	0.0708	0.447	0.00
Wetland 2	0.00402	0.0679	0.418	0.00
Outlet channel	0.00345	0.0468	0.457	0.00

During construction, stormwater will continue to be discharged from the Thompson Outfall Channel, minimising potential impacts on the coastal plain.

The CMP will include the Soil and Erosion Management and Water Management Plans will be implemented to ensure sediment from disturbed areas is not wash into the Gulf St Vincent.

7.5 Groundwater

7.5.1 Nutrient and pollution management

Guideline 4.2.14: Describe how nutrients that are present in the unconfined groundwater table in this area will be managed in the short and long term, so that their discharge to the sea is minimised and not compromise the recent environment improvement nutrient reduction works undertaken by SA Water Corporation at the Bolivar Wastewater Treatment Plant.

SKM have undertaken an analysis of the nutrient levels within the groundwater (Appendix 19).

Nutrient impacts to the shallow unconfined aquifer beneath the site as observed from the most recent groundwater monitoring event were limited to ammonia and nitrate, with each observed underlying different and distinct areas of the site.

Ammonia at concentrations in excess of the SA EPA (2003) *Environmental Protection Water Quality Policy – Aquatic Ecosystem ("Marine Waters")* criteria of 0.2 mg/L in groundwater were observed in two monitoring wells located

each located adjacent to the hydraulically down gradient site boundary and within close proximity of the salt pans. The highest concentration was observed at 0.65 mg/L. Previous exceedence of the Marine Waters criteria were identified is the same monitoring wells during the February 2008 groundwater monitoring event.

The presence of ammonia is considered to be associated with the operation of the salt pans and/or naturally occurring ammonia in the adjacent low lying coastal environment. This is further supported by the observation of ammonia concentrations beneath the balance of the site being below the Marine Waters criteria in all other wells sampled. Salinity levels as measured by the concentration of chloride ions clearly indicate the effects of the adjacent salt pans.

Total Nitrogen (predominantly present as nitrate) concentrations exceeding the SA EPA (2003) *Environmental Protection Water Quality Policy – Aquatic Ecosystem ("Marine Waters")* criteria of 5 mg/L in groundwater were observed in all but one instance in monitoring wells which were located on or adjacent to a hydraulically up gradient boundary. The highest concentration was observed at 67 mg/L in a well located immediately hydraulically down gradient of land, off site, which currently houses numerous glass houses. Nitrate concentrations within groundwater wells located along the hydraulically down gradient site boundaries reported nitrate concentrations below the SA EPA (2003) *Environmental Protection Water Quality Policy – Aquatic Ecosystem ("Marine Waters")* criteria.

The data suggests that the predominant source of nitrate impact to the site is from hydraulically up gradient sources and may represent a regional impact associated with broad scale intensive agricultural use. Potential on site sources may exist within the eastern-most portions of site where market garden and glasshouse production was undertaken, however the absence of nitrate within the hydraulically down gradient site boundaries indicates that any nitrate in groundwater migrating beneath the site is being attenuated prior discharge across the site boundary.

Total Phosphate concentrations in all monitoring wells sampled during the December 2008 groundwater monitoring event reported concentrations below the Marine Waters (Total Phosphorous) criteria of 0.5 mg/L.

The observations of the most recent groundwater monitoring event are that the site is not considered to be a source of any significant nutrient impacts to the underlying groundwater and what impacts have been identified are either the result of off-site influences or regional groundwater quality. Given the concentrations observed at the hydraulically down gradient site boundaries, the proximity of the site to the receiving marine environment and the previously observed low groundwater velocity it is considered that these observed impacts will most likely attenuate beyond the boundary of the site and therefore not pose a significant risk to the receiving marine environment nor compromise the environment improvement, nutrient reduction, works undertaken by SA Water.

Accordingly no remedial intervention is warranted, however ongoing annual monitoring of nutrient concentrations in groundwater beneath the site is recommended.

Guideline 4.2.18: Detail how pollutants other than nutrients present in the high unconfined groundwater water table (e.g. pesticides) in this area will be managed so that they do not compromise the health of the adjacent coastal and marine environment.

Heavy metals in excess of the SA EPA (2003) *Environmental Protection Water Quality Policy – Aquatic Ecosystem ("Marine Waters")* criteria in the form of copper and cobalt were each observed at monitoring wells located adjacent to the hydraulically up gradient site boundaries, hydraulically down gradient site boundaries and also from within the site. This distribution suggests that the observed concentrations may represent background concentrations for the region as well as potential contributions from on site sources. Copper is a common constituent of fungicides and cobalt is a common constituent of animal feedstock. Nickel concentrations in excess of the SA EPA (2003) *Environmental Protection Water Quality Policy – Aquatic Ecosystem ("Marine Waters")* criteria was each observed at monitoring wells located adjacent to the hydraulically down gradient site boundaries, suggesting a potential source(s) of nickel impacts from within the site or that nickel is accumulating within the more saline waters located towards the west and south-western boundaries of the site and potentially sourced from the adjacent salt pans. It is

considered less likely that the observed nickel concentrations are the result of the on-site application of nickel based fertilizers.

Given the relatively low concentrations of copper, cobalt and nickel reported, the proximity of the site to the receiving marine environment and the previously observed low groundwater velocity it is considered that these observed impacts will most likely attenuate beyond the boundary of the site and therefore not pose a significant risk to the receiving marine environment.

Accordingly no remedial intervention is warranted, however ongoing annual monitoring of nutrient concentrations in groundwater beneath the site is recommended.

Phenoxyacid herbicides in the form of MCPB and Dinoseb were reported within the centre of the site (MCPC only) and immediately adjacent the south western hydraulically down gradient site boundary. Both MCPB and Dinoseb are herbicides used to control broadleaf weeds and grasses. The source of MCPC in the centre of the site appears to be derived from activities, whereas the source of both MCPB and Dinoseb adjacent to the south western site boundary may be the result of spraying to control grasses and weeds within the adjacent drainage channels.

Given the relatively high concentration of MCPB and Dinoseb reported, further critical examination of the potential source and extent of impact is recommended, however given the proximity of the site to the receiving marine environment and the previously observed low groundwater velocity it is considered that these observed impacts will most likely attenuate beyond the boundary of the site and therefore not pose a significant risk to the receiving marine environment.

7.5.2 Potential increases

Guideline 4.2.15: Detail any potential increase in the discharge of nutrients to the marine environment that will be associated with groundwater disposal from the proposed development to the sea and how these concentrations and loads compare with any future plans by SA Water Corporation to reduce nutrient loads discharged from the Bolivar wastewater treatment plant to the sea.

Disposal of groundwater from the site is not proposed. Notwithstanding this the observations made in terms of the concentrations observed at the hydraulically down gradient site boundaries, the proximity of the site to the receiving marine environment and the previously observed low groundwater velocity, the migration of any nutrients in groundwater from the site and the corresponding risk of impact to the receiving marine environment is considered to be low.

7.5.3 Risk to infrastructure

Guideline 4.2.16: Describe the high unconfined groundwater water table(s) that exists in this area, including their predicted movement over the short and long term and the risk this represents to infrastructure, including housing stock.

Guideline 4.2.17: Identify what measures would be applied to manage these risks in the short and long term.

The groundwater table

SKM have described the existing ground water conditions beneath the site and its environs (Appendix 7).

The shallow groundwater system exists in Quaternary aged sediments associated with alluvial outwash deposits. Sediments comprise discontinuous beds and lenses of clay, silt and sand, with clay being the dominant soil type across most of the study area. The shallow groundwater system is assumed to be hydraulically continuous laterally, although with varying degrees of permeability. The modelled sequence is assumed to have a nominal thickness of 20 m, with the extensive occurrence of underlying clayey material acting as an aquitard.

Groundwater occurs variably in sand lenses between more clayey sediments and this may occur at multiple levels in the vertical dimension at any given location. However, these lenses of more permeable sediments are not continuous across the site and its vicinity.

In the context of SKM's modelling exercise, it was not realistic to attempt to fully define the soil lithology in three dimensions. Rather, the 20 m thick profile was nominally divided into the three layers of 0–5 m, 5–10 m and 10–20 m bgl. The available lithological logs for the site and its vicinity were then simplified by assigning a dominant soil type to each of these three intervals. A spatial interpretation of the dominant soil types for each layer was then used to define the soil hydraulic properties in the groundwater flow model.

The general groundwater flow pattern across the site and its vicinity generally mimics the shape of the land surface dropping down towards the coast. Groundwater flows from the higher land in the north-east and east toward the coast to the south-west and west.

Groundwater flow is controlled primarily by the permeability of the aquifer and recharge and discharge processes. Local variations in the flow pattern can occur in areas where additional recharge occurs from irrigation practices, water holding in unlined dams, or river flooding events. The flow gradients are steeper to the east where the topographic gradient is also steeper. The flow gradient is minimal on the low lying land near the coast. This condition is probably influenced to some extent by the presence of Cheethams salt pans adjacent to the southwest of the site, which are held at a level above that of the surrounding groundwater.

The primary source of recharge to the watertable aquifer in the site and its environs is infiltration of rainfall during periods when rainfall is in excess of evapotranspiration in the winter period. This concept is supported by historical water level gauging data from nearby existing wells which show seasonal fluctuations in groundwater levels consistent with an aquifer that is fed by diffuse rainfall recharge. In a temperate to semi arid climate, like that of the site and its vicinity, groundwater recharge is typically in the order of 2–5% of annual rainfall. With an average annual total of 442 mm, the estimated annual recharge could be expected to be around 9–22 mm/y.

Although the amount of actual recharge would also be affected by soil type, with more clayey soils slowing the infiltration rate of water and reducing the amount of effective recharge. This may well be the case at the site and its vicinity, where clay occurs extensively in the soil profile.

Additional recharge could be derived from high flows and overbank flooding of the Gawler River. Available information on the river flow regime indicates that this occurrence is somewhat irregular, but such events would provide a significant volume of water for recharge to the shallow aquifer.

Recharge derived from infiltration of excess irrigation waters or leakage from unlined irrigation water holding dams could also occur in localised areas. The extent or significance of this source is not clear, but some areas of local groundwater mounding are evident in the groundwater level data collected from the site.

Where the shallow groundwater flow system is laterally extensive, groundwater inflows can occur from up-gradient and off site. Given that lateral groundwater flow is predicted to occur from north-east to south-west there is likely to be zones of lateral inflow within the aquifer along the eastern and northern boundaries of the site.

Groundwater discharge from the watertable aquifer can occur by mechanisms including:

- evaporation directly from the watertable
- transpiration by plants
- lateral outflow along the flow gradient
- baseflow to rivers and drains and extraction by pumping.

Evaporation of groundwater occurs where the capillary fringe zone of the watertable intersects the ground surface. The height of the capillary fringe zone, also known as the evaporation extinction depth, above the watertable varies

with soil type, with clayey soils having a higher extinction depth than sandy soils. For their modelling exercise, SKM adopted a uniform evaporation extinction depth of 2.3 m across the site and its environs.

The site and its vicinity's climate is one in which potential evaporation exceeds rainfall for most of the year and the average annual potential pan evaporation of 1,860 mm exceeds the average annual rainfall by more than four times.

Given that a considerable portion of the site is at low elevations and groundwater levels are very shallow, there is likely to be significant discharge as a consequence of evaporation.

Transpiration of shallow groundwater by vegetation is an important mechanism of groundwater discharge, particularly where deep rooted plants such as native vegetation, orchards or lucerne are present. There are olive orchards adjacent to the western boundary's northern section in Windamere, old growth gum trees are scattered across the northern portion of the site, with highest density along the Gawler River, and irrigated agriculture (market gardening) in the central portion of the site and along the eastern boundary.

The concepts of evaporation and transpiration are often simplified and considered together as evapotranspiration. A single value is assigned to represent the effective rate of discharge due to these two mechanisms. SKM set evapotranspiration at 500 mm/y.

Where the shallow groundwater flow system is laterally extensive, groundwater outflows can occur down gradient and off site. Given that lateral groundwater flow is predicted to occur from northeast to southwest there is likely to be zones of lateral outflow within the aquifer along the western and southern boundaries of the site.

Base flow of groundwater into the Gawler River, Thompson Creek and the various drainage channels on and around the site is likely to be an appreciable component of groundwater discharge from the site during times when the watertable is elevated above the bed elevations of these features. Field observations made by SKM staff indicate this condition occurs variably across the site and is most common in the low lying areas where groundwater is naturally very shallow.

Extraction by pumping is assumed to be a negligible component of groundwater discharge because the watertable aquifer typically does not provide sufficient water volume or quality to warrant such usage.

The Gawler River is the main hydrological feature affecting groundwater conditions in the site's vicinity. The river is ephemeral and only flows following large sustained rainfall events through winter. During these times the river would act as a 'losing stream' meaning that water from the river would recharge into the shallow aquifers, the water levels of which are typically below the river bed. It is possible that there could be a period following sustained wet winter conditions that the river could become a 'gaining stream' for a short period as groundwater discharges from elevated levels in the shallow aquifer in the process of restoring the usual equilibrium.

Cheethams salt pans are managed features and are operated with pool levels above that of the surrounding groundwater levels. It is understood that the northern of the two lakes is held at a level of about 2.85 m AHD and the southern lake is held at about 3.25 m AHD. A network of surface drains surrounding the lakes is intended to provide some management of the ingress of this high salinity water onto the surrounding land.

Field observations by SKM staff indicate these drains are probably effective in intercepting some of the discharge caused by mounding beneath the salt pans, but the flow gradient in the drains is so low that it is unlikely that much of this water moves away from the area.

Sampling of monitoring wells installed on the site adjacent to the salt pans showed that groundwater is hyper saline in that area, and indicates that significant evaporative concentration of salt in the water is occurring. That is water is being discharged by evaporation but salt is left behind causing an increase in the concentration in the remaining water.

Field observations also indicate that Thompson Creek's bed has been deepened and enlarged in places to act as more of a groundwater drain for the surrounding low lying land. This was observed on the south west and south sector of the site.

Impacts

SKM conducted predictive scenario modelling, based on:

- A 50% reduction in recharge.
- A 30% reduction of the rate evapotranspiration beneath the proposal, as a result of the introduction of large areas of paving and the inclusion of new proposed drainage.
- A 0.3 m rise in sea-level as a result of climate change.

The results from this scenario indicate that there are limited impacts arising from either the proposal, or sea level rise associated with climate change. In particular the effects of a 0.3 m sea level rise do not impact on the proposal site and are largely restricted to the coastal zone and salt pans. A further 0.7 m rise in sea level to 1 m AHD is likely to result in increased groundwater levels moving further inland but probably no further than the salt pans. This additional hydraulic buffer may result in a decrease in the zone of groundwater level depression beneath the site.

The model estimates the proposal creates a decline in groundwater levels centred largely on an area south of the Gawler River. The decline in groundwater levels is attributed to the assumption of a decrease in recharge beneath the site as a result of paved areas.

Where paving exists surface water cannot recharge the groundwater and hence the overall volume of recharge is reduced. Reducing recharge leads to a minor fall in groundwater levels. This is partly offset by the decrease in evapotranspiration that occurs when an area is paved.

Modelling was conducted on the assumption that parks and suburban gardens will, to some extent, create additional evapotranspirational losses due to the different water use between the current vegetation (largely grassland) and suburban vegetation (with an increased number of deep rooted trees and other species).

The net effect of this is an assumed 30% reduction in the maximum evapotranspiration rate.

If suburban gardens and parks are over-watered there is the potential for recharge to increase and this may change the results. However, current water restrictions are likely to continue into the future and excess recharge due to overwatering is not viewed as a problem.

The occurrence of the groundwater declines in close proximity to the Gawler River may result in decreased flows within the river as there is an increase in the potential for the stream to lose water due to the increased difference in head between the river and the groundwater.

The degree of change beneath the proposal is minor and therefore, while the potential exists for reduced winter flows in the Gawler River, it is unlikely that the groundwater level decline will impact significantly. Surface water/groundwater interactions were not explicitly modelled in SKM's study.

Risks and management

There are a range of engineering issues relating to impacts of specific activities on groundwater conditions at the site during the proposal's construction and operation.

As the proposal's future stages have not been designed in detail, it is difficult to assess in detail the likely impact on groundwater. However, it is possible to make some general statements relating to the impacts from the construction of infrastructure and buildings accommodated in the Masterplan.

Groundwater flow is from north-east to south-west across the site and its environs. Changes to this groundwater flow regime may impact on the coastal environments and Gawler River. The likely cause of disruption to groundwater flow is considered to be from groundwater extraction for the purposes of deep trenching operations. This would entail extraction of groundwater in the trenching zone, lowering the watertable to enable trenching to occur coupled with water retention ponds. The impact of a falling watertable in the site and environs will greatly depend on the location of the fall.

Retention of groundwater in ponds is a likely adjunct to groundwater extraction as the groundwater extracted is likely to be of high salinity and hence inappropriate for discharge to either the Gawler River or the coast under the *Natural Resources Management Act 2004*.

This will require construction of retention ponds. There will be a degree of seepage through the base of the ponds that is dependent on their construction. Contingent on the location of the ponds high salinity seepage to the watertable may occur through build-up of a groundwater mound beneath the pond over the longer term and the development of a groundwater gradient from this mound causing groundwater flow and discharge to the river or coast. The resulting high salinity discharge to a receiving environment may impact negatively on these environments.

Impacts of this type may be diminished by the use of pond linings and careful selection of pond sites in relation to the riverine and coastal environments.

The creation of wetlands and parks is element of the Masterplan. This will involve the construction of waterways and retention ponds which will have an impact on groundwater.

Storm and flood water management channels are also part of the proposal, through the centre of the site and along its western boundary.

Issues relating to the channels are similar to the construction of temporary retention ponds. However, rather than highly saline seepage these areas are likely to experience low salinity seepage shown in the stormwater retention spreadsheet monitoring. Any form of seepage will result in the development of a groundwater mound beneath permanent bodies of water.

However, in the case of low salinity water this may be seen as beneficial. Due to density differences low salinity water will float on top of high salinity water and form a groundwater lens. This freshwater lens may provide sufficient underground fresh water to support ecosystems that would not survive under the current high salinity groundwater regime.

In effect the ponds and wetlands may create a fresh water buffer surrounding them that supports trees and shrubs. Alongside this effect will be a concurrent rise in the water table in these areas. This will have the effect of forcing water away from the groundwater mound developed beneath the wetlands where it will appear as high salinity discharge to these water bodies. In addition the presence of the wetlands will contribute to rising water tables. In this area, with a shallow water table, any rise is considered likely to exacerbate already occurring dryland salinity problems as the water table enters the evapotranspiration zone and salts become concentrated in the soil profile near the land surface.

Small scale salt groundwater lowering schemes can be used to mitigate groundwater mounding. These schemes could involve using spear points to collect water and distributes the collected high salinity water to a disposal basin. A similar scheme might potentially be used along proposed waterways.

This may not be required if deep rooted perennial vegetation can be established in the fresh water lens developed along the waterways to mitigate the impact of lateral movement of saline groundwater on vegetation health.

Groundwater drainage is another option to be considered. The installation of a drainage network through an area would prevent the watertable from rising above the level of the drains. This would require the construction of a disposal basin for drainage.

A further method considered would be construction of a groundwater disposal scheme to actively induce a cone of depression beneath the site lowering water tables regionally and adjusting the groundwater flow regime. Such a system would be susceptible to seawater intrusion and baseflow losses from the Gawler River.

In all cases there is a need to dispose of high salinity water to a disposal basin. The location of a retention pond to concentrate high salinity water in the vicinity of the engineering works would be required.

Although there is the potential to negotiate the use of Cheethams salt pans as a disposal site it is considered unlikely an active groundwater disposal scheme will be required.

If a groundwater disposal scheme were to be developed this would require a separate application and environmental management plan to be developed.

Wallbridge and Gilbert have considered the impacts of the high ground water table on the provision of sewerage infrastructure, and have recommended the installation of a vacuum system, which is more resistant to incursions by ground water, in locations where this is likely to impact on infrastructure (Appendix 18).

Golders and Associates concluded saline water (greater than 5,000 mg/L) within 4 m of the surface should be considered in the design and specification of asphaltic concrete pavements and in-ground structures with regard to the grade of concrete and reinforcement specifications. Detailed ground water investigations and geotechnical investigations will be undertaken for each of the proposal's stages, and engineering designs prepared, commencing with Stage 1.

These will consider requirements for the management of groundwater and geotechnical impacts during construction and operation of the infrastructure and housing with the stage.

The CMP will include requirements associated with construction which will be implemented during construction.

Detailed geotechnical and groundwater investigations will be undertaken as part of each stage, and will be used to inform the design of infrastructure and buildings within that stage.

Guideline 4.2.24: Describe any special engineering requirements for infrastructure due to the expected high water table in this area including the costs of developing and maintaining infrastructure for saline and acid sulphate soils, seasonal variations in height and groundwater rise due to sea level rise.

Special infrastructure requirements for groundwater have been discussed above. Acid Sulphate Soils are considered in Chapter 7.8.

SKM considered issues related to salinity as part of their assessment of groundwater conditions (Appendix 9).

SKM's modelling to assess changes to shallow groundwater levels assumed that recharge across the whole of the development footprint will reduce due to the presence of large paved areas and higher water use from gardens and parks.

However, there is a potential for other impacts to occur if poor irrigation practices in residential and recreational areas were poor. Under this scenario excess irrigation water would percolate to the watertable causing a rise in levels or percolate downward to low permeability clay and form a perched layer of water. In either of these cases there is a risk of waterlogging and/or salinity problems.

The onset of salinity issues and their impacts can be exacerbated by changes to land use from agriculture which include changed irrigation practices and increased areas of housing and pavement.

Urban salinity occurs throughout Australia in areas where dryland or irrigation induced salinity is prevalent. Potential impacts from urban salinity include:

- declining tree health and tree death;

- loss of vegetation and replacement with more salt tolerant species, such as sea barley grass, samphire plants or salt bush;
- poor plant growth including the development of bare patches in lawn areas, including playing fields;
- rising damp in houses and deterioration in concrete paths and paved areas;
- fretting of bricks and mortar and a deterioration in house foundations;
- corrosion of underground services and deterioration of road infrastructure.

SKM's modelling assumed recharge will reduce across the proposal's footprint, due to the large paved areas.

In the context of residential areas, the relative risk of urban salinity is provided by the combination of groundwater depth in the regional watertable aquifer and the occurrence of subsurface clay in the upper 4 m of the soil profile.

SKM adopted an approach which categorised five levels of urban salinity risk on a scale grading from low to very high, with a corresponding level of management response. The logic behind the five risk levels is summarised as:

- *Low:* Groundwater is below the threshold level of 4 m bgl and a clay layer does not occur shallower than the 4 m bgl threshold for perched groundwater potential. The resulting risk of urban salinisation is low and this would be the land most suitable for development from an urban salinity perspective.
- *Moderate:* Groundwater is below the threshold level of 4 m bgl and a clay layer is present in the upper 4 m of the soil profile. While regional groundwater is not a concern in these areas, there is potential for perched groundwater to develop on top of the clay layer, which presents a considerable hazard to urban development. These areas have been assigned a moderate risk level because the hazard is relatively easy to manage with the installation of a suitable drainage system. Shallow regional groundwater on the other hand is much more difficult to manage and is therefore assigned a high or very high level of risk.
- *High(a):* Groundwater is 2–4 m bgl and the clay does not occur shallower than the 4 m bgl threshold for perched groundwater potential. In these areas groundwater is within the zone of concern for urban development and although not currently causing salinisation, poor water management could rapidly cause the onset of saline conditions.
- *High(b):* Groundwater is 2–4 m bgl and there is potential for perched groundwater to develop on top of a clay layer in the upper 4 m of the soil profile. In addition to the hazard of perched groundwater, regional groundwater is within the zone of concern for urban development and although not currently causing salinisation, poor water management could rapidly cause the onset of saline conditions.
- *Very High:* Groundwater is less than 2 m bgl. In these areas shallow saline groundwater is an immediate threat to urban development and some land may have already become salinised. The presence of salt tolerant plant species would automatically classify the affected land with a very high level of risk. Development in areas of very high level risk can only proceed if there is a rigorous management approach which responds to the liability presented.

SKM applied this urban salinity risk classification system to the site and its environs, and distributed risk classes across the site.

SKM produced this interpretation from the depth to groundwater information for the 2 July 2008 gauging event, overlain with the depth to clay information derived from the lithological data obtained from new and existing drill holes.

The interpreted salinity risk across the site is essentially defined by the depth to groundwater information. That is, risk levels are lowest along the Gawler River where the watertable is deepest and risk levels are highest on the low lying portions of the site, particularly in the south and west. The extensive presence of clay material in the upper

4 m of the soil profile increases the salinity risk across the site due to the potential for perched watertables to develop. This is particularly pertinent to areas where clay is in the subsurface and is overlain by a more permeable material such as sand or silt that could act as an aquifer.

Where clay is at or very near the ground surface, the potential for perched groundwater to develop and pose a threat might not be as significant because there is not enough overlying material to hold any perched groundwater. The output of the salinity risk assessment should be considered with this in mind.

While most of the built areas accommodated in the Masterplan were assessed to be at moderate or higher risk of urban salinity, it is likely the adoption of adequate salinity management measures will allow their development to proceed.

SKM have provided an overview of selected urban salinity risk management options (Appendix 9).

In all cases the promotion of good water management practices such as efficient lawn and garden watering and appropriate disposal of stormwater and grey water should be encouraged.

This would include stormwater management systems to ensure ponding and subsequent groundwater recharge do not occur in areas susceptible to perched or shallow groundwater. In the higher risk areas and particularly where shallow regional groundwater is a threat, efficient water use should be a key feature of the development.

Where the Masterplan accommodates land uses in very high risk areas, where shallow regional groundwater is a threat, detailed assessments and implementation of appropriate management and engineering solutions will be required.

Where there is potential for perched groundwater to develop the installation of a subsurface drainage system may be a required.

Management strategies will be concerned with maintaining groundwater at a safe depth below ground level and efficient water use practices to minimise groundwater recharge. For example, imported clean fill may be used to elevate the ground surface above the groundwater capillary fringe zone. However, the potential for disruption to groundwater flow up gradient of the site must be thoroughly investigated and addressed with suitable drainage prior to implementation.

It must be stressed proper design and verification of all proposed salinity management strategies is essential to successful urban development in areas at risk of urban salinity.

Golders and Associates concluded saline water (greater than 5,000 mg/L) within 4 m of the surface should be considered in the design and specification of asphaltic concrete pavements and in-ground structures with regard to the grade of concrete and reinforcement specifications.

Detailed ground water investigations and geotechnical investigations will be undertaken for each of the proposal's stages, and engineering designs prepared, commencing with Stage 1.

These will consider requirements for the management of groundwater and geotechnical impacts during construction and operation of the infrastructure and housing with the stage.

The CMP will include requirements associated with construction which will be implemented during construction.

The water management practices applicable to each stage will also be assessed, but at this time it is considered likely water restrictions, combined with the use of drought tolerant landscaping in homes and the public domain will reduce potential for poor irrigations practices to affect salinity.

7.5.4 Waterways

Guideline 4.2.22: Describe the short and long term effects of constructing waterways for detention purposes on land and/or groundwater quality and movement, especially salinity.

The construction of wetlands and parks is part of the proposal involving the construction of waterways and retention ponds which will have an impact on groundwater.

A storm and floodwater management system, comprising two wetlands, channels and a detention basin is proposed through the centre of the site and along its boundaries.

SKM note these areas are likely to experience low salinity seepage.

Any form of seepage will result in the development of a groundwater mound beneath permanent bodies of water.

However, in the case of low salinity water this may be seen as beneficial. Due to density differences low salinity water will float on top of high salinity water and form a groundwater lens. This fresh water lens may provide sufficient underground fresh water to support ecosystems that would not survive under the current high salinity groundwater regime.

In effect the ponds and wetlands may create a fresh water buffer surrounding them that supports trees and shrubs. Alongside this effect will be a concurrent rise in the water table in these areas. This will have the effect of forcing water away from the groundwater mound developed beneath the wetlands where it will appear as high salinity discharge to these water bodies.

In addition the presence of the wetlands will contribute to rising water tables. In this area, with a shallow water table, any rise is considered likely to exacerbate already occurring dryland salinity problems as the water table enters the evapotranspiration zone and salts become concentrated in the soil profile near the land surface.

Wallbridge and Gilbert have considered this potential impact when preparing the stormwater management strategy, and have accordingly recommended wetlands be confined to the northern and central part of the site, where ground water is deeper (Appendix 18).

Detailed ground water investigations and geotechnical investigations will be undertaken for each of the proposal's stages, and engineering designs prepared, commencing with Stage 1.

These will consider requirements for the management of groundwater and geotechnical impacts during construction and operation of the infrastructure and housing with the stage.

The CMP will include requirements associated with construction which will be implemented during construction.

7.5.5 Monitoring and management of impacts on groundwater quality

Guideline 4.2.23: Describe the measures to be taken to monitor and manage impacts on groundwater quality.

It is proposed for immediate and further works to be undertaken to determine the extent of phenoxyacid herbicide impacts identified in two of the twenty four current monitoring wells.

The general absence of any further impacts and the absence of any significant risk of adverse contaminant impact to the receiving marine environment no current remedial or active management works are proposed in respect of groundwater quality.

It is recommended that groundwater quality continues to be monitored at least on an annual basis and a groundwater management plan or remediation intervention plan be determined if the results of the annual monitoring indicate an increase contaminant impacts and/or an increase in risk to the receiving marine environment. This ongoing assessment of risk will need to take into account the nature of any development or change in the surrounding physical environment including any influences from adjacent off site land use, for example, the salt pans.

7.6 Impacts on Cheethams Salt Pan operations

Guideline 4.2.13: Identify the potential effects of the proposal on the adjacent salt operations (intake water quality issues) such as storm water discharge, nutrients management, sewage management, waste management, water pollution from littering and illegal dumping, oil and fuel spill management, wash down runoff and toxic seepage.

The Cheetham salt pans adjoin the southern end of the site's western boundary. Exact operational details for the pans were not available; however it is understood the northern of the two pans is held at a level of about 2.85 m AHD and the southern lake is held at about 3.25 m AHD. The network of surface drains surrounding the pans are intended to provide some management of the ingress of salt water onto the surrounding land. To the north the drains discharge via pumping into the Gawler River channel. Flow gradients in the area are very low and the primary outflux is probably by evaporation.

The salt pans are used to concentrate seawater through a series of gravity fed evaporation ponds ultimately resulting in salt being harvested and stockpiled. The process uses ground and mains water to create saturated brine which is pumped to Osborne where it is processed into Soda Ash.

The salt pan's sea water intake is located 11 km north of the Thompson Creek Outfall. Wallbridge and Gilbert concluded the quality of stormwater discharged from the site would meet the SA EPA (2003) *Environmental Protection Water Quality Policy – Aquatic Ecosystem ("Marine Waters")* criteria.

Using a MUSIC model, Wallbridge and Gilbert have assessed the proposal's stormwater system against the Criteria, and the CSIRO *Best Practices Environmental Management Guideline*.

Wallbridge and Gilbert found, "The analysis indicates the water quality discharging from the site is suitable for discharge to marine environments and water discharging from the two wetlands would meet the requirements for discharge to the aquifer." (Appendix 18).

It is therefore considered the will be negligible or no impact on the quality of water entering Cheethams salt pans a result of the proposal.

Trespassing has been an issue at the Cheethams salt pans. An increase in the population may have two impacts:

- It could reduce trespassing by increasing the amount of passive surveillance from residents and users of the area, and increasing the presence of agencies such as the police. This impact will not be experienced until the proposal's later stages.
- It could increase trespassing by increasing the number of people living in the area. This impact is likely to be experienced in the proposal's earlier stages, before passive surveillance comes into play.

It is noted Cheethams operates salt pans down much of the coast, from the site to Port Adelaide. In the Salisbury LGA, the salt pans are as close to residential areas as the Buckland Park salt pans will be to the residential areas accommodated in the Masterplan.

The impacts of trespassing and human activities will be of a similar scale, and will be managed in a similar manner as in the Salisbury LGA.

7.7 Disposal of excavated materials for proposed waterways

Guideline 4.2.19: Describe the disposal of excavated materials for the proposed waterways.

It is intended the transport of spoil will be minimised by the re-use of excavated material in construction activities associated with the proposal wherever possible.

Detailed civil designs for each of the proposal's stages will establish the balance between cut and fill.

The CMP for each of the proposal's stages will include a Spoil Management Plan, which detail the following:

- Volume of spoil
- Locations for disposal or reuse of the spoil.
- Relevant quality standards for the proposed reuse of the spoil.
- Routes for transporting spoil.
- Measures for dust control including spraying and covering stock piles and truck loads.

The Spoil Management Plan will be implemented during construction.

7.8 Acid sulphate soils

Guideline 4.2.25: Describe management measures that would be required during construction and operation for acid sulphate soils, saline and sodic soils.

The issue of saline and sodic soils has been addressed in Chapter 7.5.3.

Golder and Associates undertook a preliminary investigation of potential impacts associated with acid sulphate soils (ASS) (Appendix 8).

They concluded there is a low risk of potential acid sulphate (PASS) materials being uncovered on the site, particularly if there is no excavation into the natural soil below groundwater, or dewatering in the St Kilda Formation.

However, the report recommends detailed ASS investigations and preparation of an ASS Management Plan, prior to commencement of:

- works involving excavation below groundwater
- works that may lower the water table around watercourses, or in medium or high risk areas.

Golder and Associates recommended a range of measures to mitigate any impacts associated with disturbing PASS materials including the use of appropriate grade concrete according to the situation, bulk treatment or selective treatment of disturbed soils with lime, and avoidance or limiting of dewatering.

Detailed geotechnical investigations will be undertaken for each of the proposal's stages, and engineering designs prepared, commencing with Stage 1.

These will consider requirements for the management of ASS to prevent leachate being exposed during construction, and measures to monitor or mitigate any potential impacts.

The CMP will include an ASS Management Plan which will be implemented during construction.

7.9 Management of land contamination issues

Guideline 4.2.26: Outline management measures that would be required during construction and operation to deal with land contamination issues.

Connell Wagner undertook a preliminary land contamination assessment (Appendix 20).

It was guided by a site history investigation and site survey which identified likely locations for contamination, also prepared by Connell Wagner (Appendix 21).

The purpose of the preliminary investigation was to determine the broad scale condition of the site and identify any contamination issues which would pose significant risk to the viability of the proposal. In broad terms, the scope of the preliminary investigation is sufficient to provide an understanding of potential contamination issues over the site, including a sufficient site history investigation and soil sampling to identify significant site constraints.

It was not intended to detect contamination issues affecting relatively small portions of the site.

The site history investigation suggested the primary use of the site has been for grazing and broad acre cropping, barley for stock feed, rotating over the majority of the site at different times. Any contamination associated with these uses would be broad and diffuse over a large portion of the site decreasing associated contamination risks.

The most significant risk areas are in locations where the Masterplan accommodates employment or commercial uses, where a significant proportion of the land within and surrounding these locations has been used for market gardening since the 1950s. These are located in the eastern part of the site, near Port Wakefield Road, and the southern parts of the site, adjoining Park Road.

As the Masterplan accommodates residential uses, the investigation guideline applied to soil samples was *HIL - Criteria A ['Standard' residential with garden/accessible soil (home-grown produce contributing less than 10% of vegetable and fruit intake; no poultry).*

This category includes children's day-care centres, kindergartens, preschools and primary schools.

Results of analysis were also compared to the NEPM *Ecological Investigation Levels (Interim Urban*) to determine whether site contaminant concentrations may pose a threat to ecological receptors.

The majority of contaminants identified on site were recorded at levels below the NEMP Health Investigation Levels (HIL) and Ecological Investigation Levels (EIL).

One sample recorded a reading for copper exceeded NEPM A HIL. Three soil samples exceeded NEMP EIL for Manganese.

No indication of contaminating activities was observed in these areas and it is possible these levels of metals occur naturally within the soil. However, further investigation is required in the area of the test pits where these samples were taken to delineate contamination of soil within the area.

The majority of soil samples were below adopted guidelines.

The results of this preliminary site contamination investigation indicate no major signs of contamination across the site. However, where the Masterplan accommodates a sensitive use, comprehensive soil and groundwater investigation along with the appointment of an accredited Victorian EPA auditor will be required during the detailed design of that stage.

Detailed soil investigations will be undertaken with each of the proposal's stages. This will be appropriate to the uses accommodated within that stage.

The CMP will include Remediation Management Plans which will be implemented during construction and audited by a Victorian EPA auditor.

Chapter 8 Coastal environment

This chapter describes the site's and the proposal's relationship to the coast environment.

The site is located between 2.5 and 4 km from the Gulf St Vincent coast line.

It is separated by a minimum of approximately 2 km from the eastern edge of the coastal plain. The area between the site and the coastal plain consists of anthropogenic areas, including Cheethams salt pans, and private grazing properties, as illustrated in Figure 8.1.

The proposal does not include any construction works or activities within, adjoining or near the coastal plain.

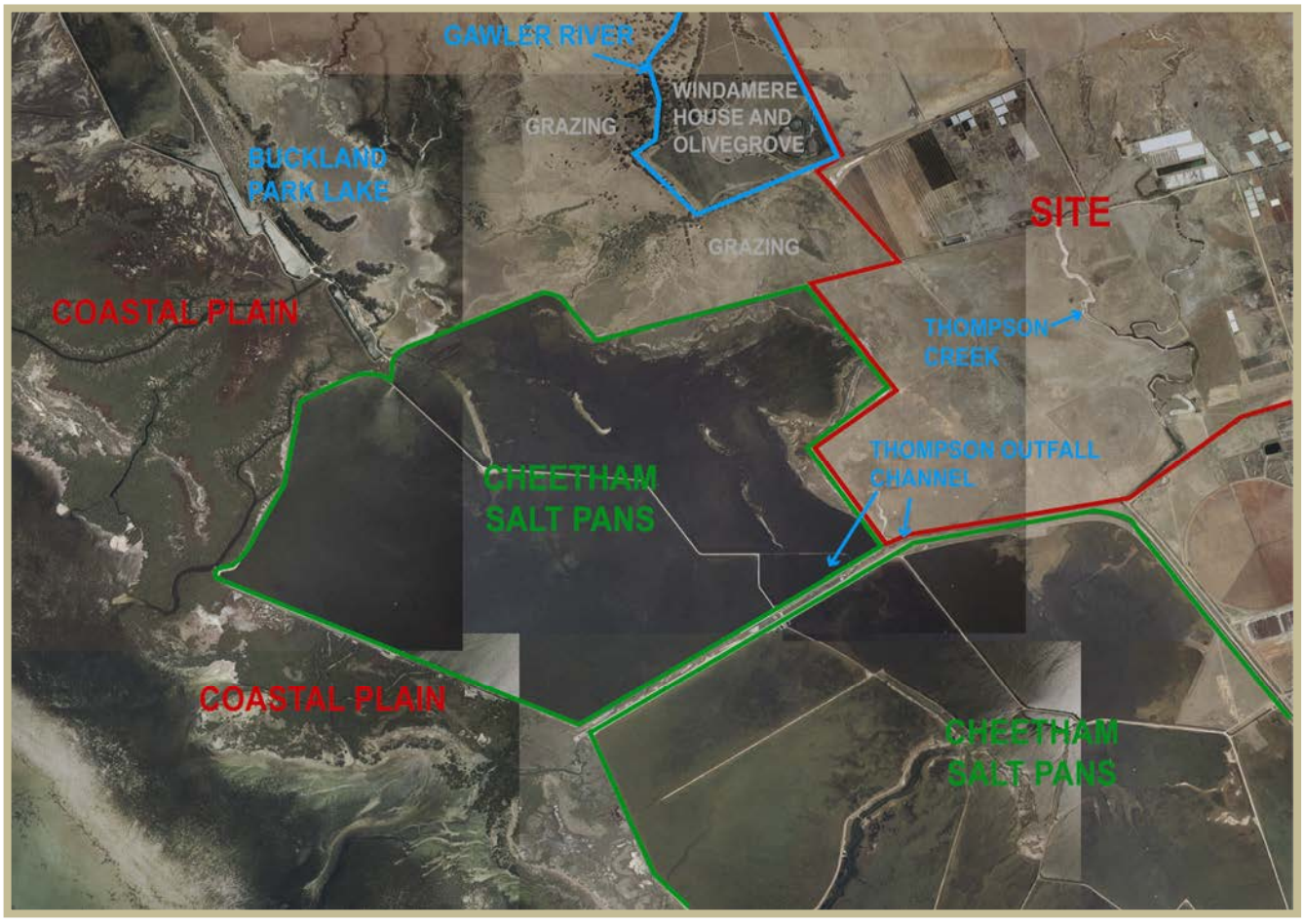


Figure 8.1 Site relative to the coastal environment

8.1 Impact on natural coastal processes

Guideline 4.3.1: Describe the effect on natural coastal processes in all potentially affected areas.

As described in Chapter 7, the site's hydrology is connected to the marine environment via the Thompson Outfall Channel. Stormwater discharging from the site does not enter the Gawler River, as it is generally higher than the site, so water is directed toward the Thompson Outfall Channel.

The proposed storm and flood water management strategy aims to replicate the existing hydrology system as closely as possible. Post development, storm and flood water will be directed away from the Gawler River to the Thompson Outfall Channel.

The net effect of the proposal is expected to be an net overall increase in annual runoff discharging from the Thompson Outfall Channel to the Gulf St Vincent compared to existing volumes of only 3% to 5%.

A detention basin with a capacity of 250,000 m^3, will be located at the south west corner of the site to reduce the rate of discharge from the site to 10 m^3/s, as required by the Playford (City) Development Plan and Playford City Council's requirement that peak stormwater post development flows discharged from the site are the most not exceed the pre-development rate.

The stormwater management plan will be implemented progressively as proposed by Wallbridge and Gilbert. It is therefore not expected that the proposal will have an impact on coastal processes.

8.2 Coastal and marine flora and fauna

Guideline 4.3.2: Describe the effect of the proposed development on mangrove stands, samphire flats (including coastal retreat), coastal dunes and associated shrublands, lignum shrublands (mostly adjacent freshwater stream channels) and on seagrass. Outline management and rehabilitation measures for these areas.

Guideline 4.3.3: Outline the effect of the proposed development on any native flora and fauna.

8.2.1 Impacts of the proposal

Cooe identified potential impacts on the coastal and marine environment (Appendix 11). They considered both the construction and operation phases of the proposal.

Cooe concluded most potential risks were minor, and manageable, as described below.

The risks which they found remain at a medium level after mitigation methods are applied are those which relate to human behaviour and expectations.

Coastal retreat

Cooe note the loss of extensive areas of seagrass along Metropolitan Adelaide's coast has caused the mobilization of exposed sediment (Appendix 11). Resuspended sediment moves northwards and is deposited on sand banks (such as Section Bank) off Outer Harbor and the northern beaches. The build-up of sediment and detritus around the mangrove pneumatophores appears to be causing the loss of mangroves on the shore front, the mangroves retreat further inland if suitable land is available.

Sea level rise, attributed to climate change, will increase the pressure on seagrass, mangroves and samphire communities to advance further inland, or retreat. This will become more pronounced along coastlines that are characterised as low gradient, such as the upper Gulf St Vincent.

However, in this location, the retreat of coastal vegetation as sea level rises is prevented by the Cheethams salt pans, which create a barrier at the eastern edge of the coastal plain.

As the salt pans are located between the coastal plain and the site, the proposal will not influence the outcomes of coastal retreat in this area.

Air quality

Petroleum hydrocarbon spills may generate offensive odours that may physically affect marine fauna or alter their behaviour.

Traffic and earth moving activities or wind on from exposed surfaces may generate dust that could cover vegetation and reduce biological production, with a subsequent loss of fauna habitat or nuisance to fauna.

However, future construction zones, and the residential precincts accommodated in the Masterplan, are located beyond 2 km from the coastal plain.

It is therefore likely any accidental petroleum spill occurs will be controlled before the spill reached the coastal plain (see Chapter 17.2 for more detail).

Dust will fall to the ground before reaching the coastal plain.

Noise

Construction machinery may generate nuisance noise and disrupt breeding patterns of coastal fauna. During the operational phase traffic and urban noise may generate nuisance noise that may disrupt breeding patterns of sensitive coastal species.

Most animals will recover with small loss in production, although a few birds may miss a breeding season.

However, construction noise is only likely to be heard within an area of up to 200 m of construction zones.

As all construction zones and the residential precincts accommodated in the Masterplan will be located beyond 2 kilometres from the coastal plain there is a low likelihood of significant noise reaching the coastal habitats from the site.

Stormwater

Stormwater runoff may contaminate the Gawler River estuary and the sea. Pollutants associated with urban areas include nutrients, oil/grease, detergents, particulate and soluble metals, organic chemicals, suspended particulates, turbidity, salinity and increased acidity or alkalinity. These pollutants affect coastal and marine vegetation and animal life, potentially causing a loss of seagrass beds, mangroves and associated ecosystems.

Turbid water reaching the Gulf of St Vincent would reduce available light for photosynthesis by seagrass and therefore reduce productivity. Precipitates from lime treatment of ASS may increase the level of turbidity in run-off water.

Nutrients may cause eutrophication in shallow pools that may result in the loss of fauna; nutrients at sea will increase the level of fouling organisms, increase the risk of algal blooms (red tide) and the loss of seagrass.

Cooe did not consider water temperature to be an issue because ambient water temperature from runoff would be similar to the surrounding surface water from the catchment area.

As described in Chapter 7, stormwater currently flows away from the Gawler River, and therefore does not enter the Buckland Park Lake system, as it is effectively upstream.

The proposed stormwater management strategy will mimic the site's natural hydrology, continuing to channel stormwater away from the Gawler River to the Thompson Outfall Channel.

With the proper implementation of the stormwater management strategy, it is projected stormwater will not enter the Gawler River.

All stormwater discharged from the site via the Thompson Outfall Channel must meet SA EPA (2003) *Environmental Protection Water Quality Policy – Aquatic Ecosystem ("Marine Waters")* criteria.

Wallbridge and Gilbert have modelled the quality of stormwater discharged from the site post development and found "The analysis indicates the water quality discharging from the site is suitable for discharge to marine environments and water discharging from the two wetlands would meet the requirements for discharge to the aquifer."

Educational literature will be provided to inform new residents on the proper use of fertilisers and how to properly dispose of organic matter. The proposed WSUD measures included in the stormwater management plan and wetlands will reduce the amount of nutrients washing off properties and buildings.

Groundwater

Prolonged dry periods caused by the reduction of water flow from either the interception or redirection of flow would result in the loss of coastal vegetation and dependent animals. Changes in salinity regimes would alter the composition of coastal vegetation, and may lead to the loss of mangroves.

Pollutants from urban occupation and acid leachate from disturbed acid sulphate soil can contaminate groundwater, polluting the marine environment with nutrients, synthetic compounds and heavy metals.

Nutrients, heavy metals, organic chemicals, detergents and hydrocarbons transported via groundwater to the coastal and marine habitats may result in loss of plants and animals or loss of productivity.

SKM undertook assessments of the groundwater and nutrient implications, and concluded the proposal will have negligible impact on groundwater in the site's vicinity, and the movement of nutrients and pollutants in groundwater.

Disposal of groundwater from the site is not proposed. Notwithstanding this the observations made in terms of the concentrations observed at the hydraulically down gradient site boundaries, the proximity of the site to the receiving marine environment and the previously observed low groundwater velocity, the migration of any nutrients in groundwater from the site and the corresponding risk of impact to the receiving marine environment is considered to be low.

More detail on groundwater and nutrients is in Chapter 7.

Wallbridge and Gilbert modeled the quality of stormwater discharged from the site and found it would meet the SA EPA (2003) *Environmental Protection Water Quality Policy – Aquatic Ecosystem ("Marine Waters")* criteria.

All waste water generated by the uses accommodated in the Masterplan will be transported to Bolivar for treatment. There will be no treatment of waste water on the site.

Pollutants

Acid and metals in runoff water may be toxic to some sensitive species, for example fish are very sensitive to copper or changes of 1 pH unit from background. Some species will die if exposed to rapid pH changes or increase in heavy metals. Other metals may accumulate in certain species such as cadmium in bivalves and even magnify up the food chain such as mercury in sharks or dolphins.

An acid pulse may sterilise small ponds and soil near the source. Metals will stay in seawater for a few months before they settle on the seabed and a few years before they become biologically unavailable in sediment.

Bottom dwellers are still exposed to metals for a few years until the contaminated sediment is covered by 'clean' sediment.

However, large dilution effects combined with precipitation of many metals by seawater will limit the distribution of metals to a few hundred meters to kilometres of the site.

All stormwater runoff discharged from the site will meet the SA EPA (2003) *Environmental Protection Water Quality Policy – Aquatic Ecosystem ("Marine Waters")* criteria, as described in Chapter 7.

Land and soil

Vehicular access to the coastal plain would cause soil compaction and damage to the ecosystem, samphire flats and associated fauna habitat.

However, there are no direct public roads between the site and the coastal plain.

No activities related to construction are proposed in, adjacent or near the coastal plain.

Construction vehicles will not be permitted to drive onto the coastal plain, and there is no requirement for them to do so, as is not on any logical construction route.

It is unlikely the proposal's future residents would drive into the coastal plain, which is separated by Cheethams salt pans, and private property.

To reach Buckland Park Lake and the nearby coastal vegetation, vehicles would have to travel north along Port Wakefield Drive, across the Gawler River, and east along Port Gawler Road, and potentially through fenced and private property.

Chapter 8.6 discusses the issue of human pressure on the coastal plain in more detail.

ASS

Excavation of ASS may release acid and metals that contaminate soil and affect plants and animals, reduce water quality, damage estuarine environments, decrease wetland biodiversity, and reduce fisheries production.

Metals mobilised by acid leachate may accumulate in animals and move through the food chain. High nutrient loads will lead to eutrophication, algal blooms and loss of seagrass.

However, any impact from released leachate is likely to be confined to an area 100 m around the Thompson Outfall Channel discharge point, as water runoff and soil disturbed by construction would be discharged from the site via the Channel.

Golder and Associates identified PASS locations on the site, and recommended a management approach during construction. More detail is provided in Chapter 7.8.

In tandem with specific measures to manage PASS issues, construction will be guided by Soil and Erosion Management and Water Management Plans.

Pets and feral animals

The proposal may improve opportunities for marine or coastal plants and animals. Some plants and animals will benefit from improved resource opportunities such as insects and some reptiles.

There is significant evidence of deer, feral cats and foxes already damaging the coastal ecosystems.

Pets including dogs, cats, rabbits and other exotic animals will compete with or kill native animals, disrupt breeding patterns and destroy vegetation.

They can roam and hunt over a few kilometres around the residential areas.

However, the site is approximately 2 km from the coastal plain.

All new residents will be provided with educational literature on their arrival explaining the coastal ecosystem and function, and how they can help to maintain the balance and minimise disturbance of animals particularly during the breeding season. Community building will include events based on the natural environment, for example community planting days.

A component of any significant environmental benefit associated with the proposal may include the removal of feral animals currently impacting on the coastal plain.

Weeds

The introduction of weeds would degrade the vegetative cover and reduce the availability of some animal food sources and refuge in the samphire plains, replacing native species and degrading habitat resources for some animals.

However, appropriate species will be chosen for public gardens and open spaces within the proposal, and Design Guidelines will recommend appropriate planting in front gardens.

Annual weed control campaign to stop exotic plants from spreading into the samphire plains could be conducted.

During construction, Weed Management and Dust Management Plans will be implemented.

People

Human activities on the coastal plain may uncover and harm rare flora or fauna that were not previously recorded in the area or known to science. Ongoing pressure from small incidents caused by nearby human habitation could also harm significant species.

However, the proposal does not include any clearing or excavation beyond the site boundaries, therefore the proposal will not have a direct impact on the coastal plain.

The site is approximately 2 km from the coastal plain and there is no direct road access between the two areas.

Recreational fishing

Recreational fishing may result in over fishing of the mangrove habitat. General access to the coast may degrade the sensitive samphire habitat. The effect of physical disturbance from trampling and collecting throughout sensitive intertidal mudflats has been known to have a negative impact on both the faunal and floral communities' existing within these environments.

The boat ramp facilities at St Kilda and to a lesser extent Port Gawler are expected to experience an increase in boating activities the northern Adelaide coastal waters. Although this is not easy to quantify, it is likely to reduce fish, crustacean and shellfish population from increased fishing pressures. Anchors have been observed to damage seagrass meadows and razorshell beds.

Damage to intertidal zone from boat propellers particularly on an outgoing tide, and an increase in pollution levels traditionally associated with recreational boating and fishing, such as fuel spills, plastic bags, drink bottles and cans, and organic waste. Other activities such as crabbing, bait collecting or playing in the mudflats will also harm the habitat and harm native flora and fauna.

Operational management of the boat ramps cannot be controlled as part of the proposal, and is the responsibility of the St Kilda and Port Gawler boat ramp operators.

Fisheries in the northern Adelaide coastal waters are currently monitored by the Department of Primary Industries and Resources SA (PIRSA), who is responsible for fisheries in South Australia.

PIRSA currently distributes educational material to advise boat users how to behave responsibly to protect the marine and coastal environment. Bag limits and fishing seasons reduce the overall impact and provide protection to populations of target species.

Human impacts on Adelaide's coastal waters is not a direct consequence of the proposal, and would result from the population growth projected for Metropolitan Adelaide, regardless of where new houses are located.

Public amenities such as the Port Gawler boat ramp may need to be assessed for potential increase in capacity.

Commercial fishery

The Prawn Fishery established within Gulf St Vincent is reliant on the Port River, Barker Inlet and Gawler River estuaries as an important resource for prawn larval recruitment and as a nursery habitat. The Marine Scale Fishery also relies on these estuarine ecosystems as many targeted fish and crustacean species spend a part of their life-cycle within these estuarine environments.

Stormwater will be discharged from the site via the Thompson Outfall Channel, not the Gawler River. It will be treated prior to discharge to meet the with SA EPA (2003) *Environmental Protection Water Quality Policy – Aquatic Ecosystem ("Marine Waters")* criteria.

Rubbish

Rubbish consisting of construction and domestic waste may accumulate on the samphire flats, in the mangrove forest and eventually out to sea increasing the level of stress on these habitats and adversely affecting plant and animal life.

Conversely, rubbish dumping is currently occurring in the locality, facilitated by low residential densities and lack of passive surveillance. The introduction of an urban community, will increase surveillance, discouraging dumping, and will also bring services to the area, such as Council clean ups and maintenance programmes.

This is a community wide issue, and not directly a consequence of the proposal.

Consequently, government is taking action to reduce the level of waste and rubbish, for example banning plastic shopping bags is some areas, and public education campaigns aimed at waste reduction and the danger to the marine environment associated with garbage.

Management measures

A CMP will be prepared for each of the proposal's stages. The CMP will include the following to address these potential impacts:

- A Traffic Management Plan: All construction related vehicles will be parked and refuelled in a designated construction compound, properly sealed and drained to ensure any leaks are contained. The objective will be to ensure no spilt or leaked materials reach the coastal or marine environment.
- Construction routes will be identified which do not include any access to the coastal plain.
- Air Quality Management Plan: Most of the dust will fall out before reaching the coastal vegetation. If dust is generated to unacceptable levels, exposed surfaces will be immediately sprayed with water or dust suppressant and sealed or vegetated as soon as practicable.
- ASS Management Plan: Should acid leachate be detected and it is attributed to construction of the proposal, the exposed soil will either be removed to an appropriate landfill or treated in situ using neutralising material such as lime and covering the exposed soil with 1 to 2 m of clean topsoil. The proponent will replace dead or poor vegetation within one season of remediating the soil.
- A Soil and Erosion Management Plan: It will include measures to stop soils reaching the marine environment, including silt traps, settling ponds, drains and hay bales for example.
- A Weed Management Plan: It will include measures to remove weeds, either by hand or by safe herbicide should they become established on the site or in the coastal plain.
- A Flora and Fauna Management Plan: All land clearing and excavation activities during construction are to be carefully mapped, inspected and approved by the responsible authorities to ensure that the activities are not encroaching on coastal habitats.
- Waste Management Plan: It will include provisions for monitoring rubbish on the coastal and clean up procedures should rubbish be found.
- A Noise Management Plan: All construction equipment and vehicles will meet the relevant Australian Noise Standards.

8.3 Adelaide Dolphin Sanctuary

Guideline 4.3.4: Describe the effect of the proposed development on the Adelaide Dolphin Sanctuary.

The Adelaide Dolphin Sanctuary zoning incorporates the Port River and Barker Inlet including the Port Gawler Conservation Park, encompassing the coastline 2.5 to 4 kms to the site's west.

The proposal could potentially affect the Sanctuary through interactions such as stormwater discharge into the marine environment, pollution and human interaction.

The *Adelaide Dolphin Sanctuary Act 2005* states that the key habitat features such as the Port Adelaide River estuary and the Barker Inlet are maintained, protected and restored. The *Adelaide Dolphin Sanctuary Act 2005* also states that water quality within the region must be maintained for the health and wellbeing of the dolphin community.

The objects of this Act are:

- to protect the dolphin population of the Port Adelaide River estuary and Barker Inlet
- to protect the natural habitat of that population.

The Act further recommends threats of serious or irreversible environmental harm that are absent of scientific certainty will not be justified. Issues of litter and possibilities of entanglement through rubbish are also included within the Act.

Water will be discharged from the site via the Thompson Outfall Channel.

Wallbridge and Gilbert have modelled the quality of stormwater discharged from the site post development and found, "The analysis indicates the water quality discharging from the site is suitable for discharge to marine environments and water discharging from the two wetlands would meet the requirements for discharge to the aquifer."

Wallbridge & Gilbert used the SA EPA (2003) *Environmental Protection Water Quality Policy – Aquatic Ecosystem ("Marine Waters")* criteria for discharge to a marine environment. In addition, the CSIRO *Best Practices Environmental Management Guideline*.

8.4 Sea level rise policies

Guideline 4.3.5: Describe the requirements of the sea level rise policies in the Development Plan and how these would be achieved in undertaking this proposed development.

The Playford (City) Development Plan requirements for accommodating sea level rise are addressed in Chapter 7.1.2.

8.5 Impact of increased population

Guideline 4.3.6: Describe the impact of increased human presence on the coast, river and saltfields.

Population pressure is not an impact uniquely associated with the site and proposal. Wherever a new population is located in Metropolitan Adelaide, there will be an increase in the number and frequency of visits to the coast and water activities.

The potential impact of the proposal's new residents on the coastal plain is discussed in Chapter 8.2.

The potential impact of the proposal's new residents on the Port Gawler Conservation Park, adjacent Crown land and the Buckland Park Lake system is discussed in Chapter 8.6.

Cheethams salt pans are discussed in Chapter 7.6.

8.6 Impact on Port Gawler Conservation Park, adjacent Crown Land and the Buckland Park Lake system

Guideline 4.3.7: Describe any impacts on the neighbouring Port Gawler Conservation Park, adjacent Crown land and the Buckland Park Lake system.

Figure 8.2 shows the relationship of the site to the Port Gawler Conservation Park, adjacent Crown land and the Buckland Park Lake system.

There is no direct road access between the site and the Port Gawler Conservation Park, adjacent Crown land and Buckland Park Lake system.

The proposal's future residents could only access these areas by vehicle via Port Wakefield Road and Port Gawler Road. To reach these areas on foot would involve scaling fences and walking 2.12 km or more through residential areas, over private properties and crossing the Gawler River. Cheethams salt pans are a significant physical barrier.

It is considered that these impediments will reduce the potential for uncontrolled access into these areas.

The proponent will provide new residents with educative material on the importance of their natural environment, and community building events will include planting days focused on indigenous flora.

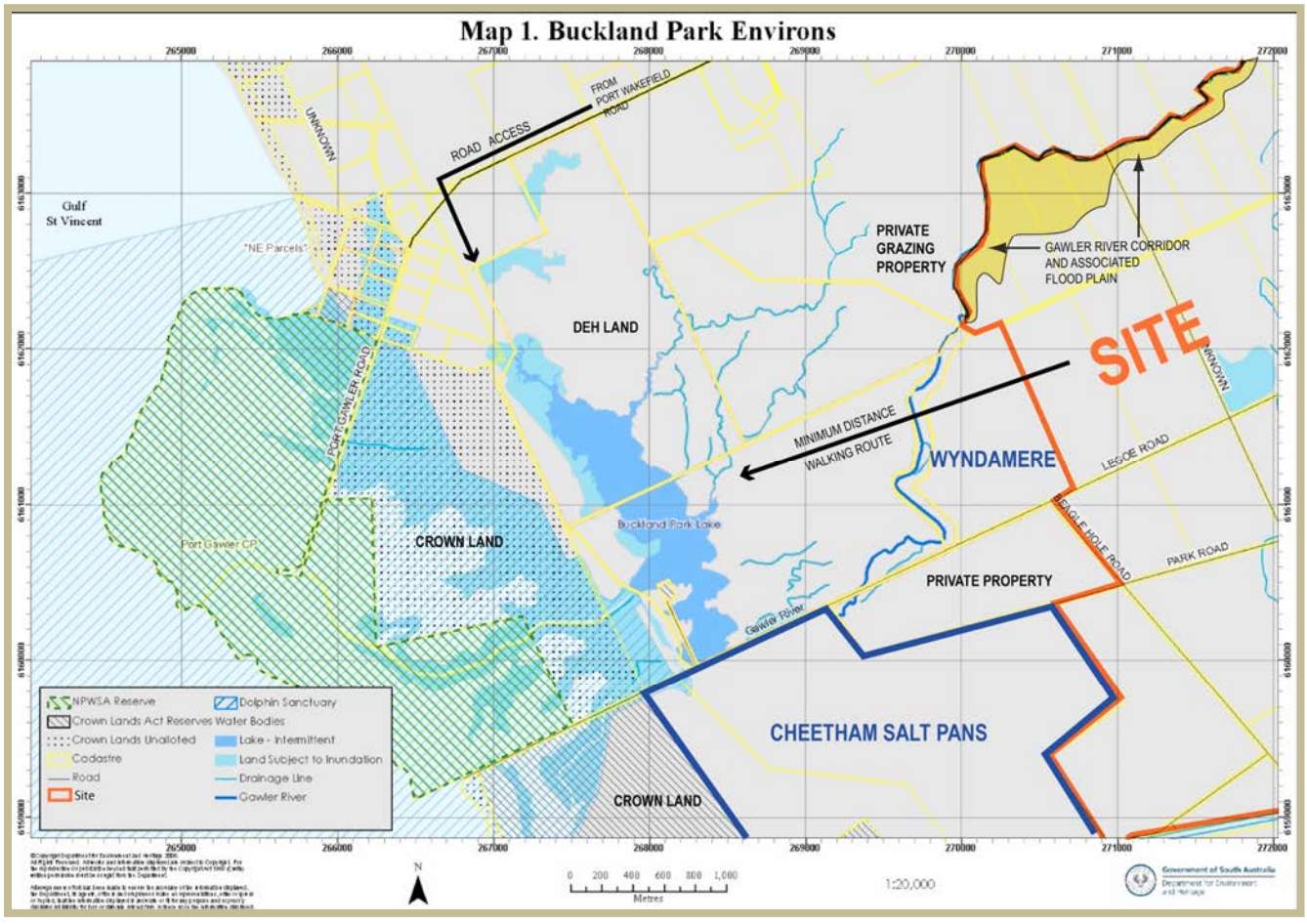


Figure 8.2 Port Gawler Conservation Park adjacent Crown Land and Buckland Park Lake system

The site's hydrology and hydrogeology direct water away from the Gawler River south to the Thompson Outfall Channel, and there is only limited interaction between these systems and the coastal environment.

The Gawler River corridor, and its associated flood plain in the north-west portion of the site are proposed for revegetation and rehabilitation (see Chapter 10) as part of achieving any required significant environmental benefit.

The removal of weeds and the reinstatement of natural vegetation will provide a natural connection to the Port Gawler Conservation Park, adjacent Crown Land and Buckland Park Lake system. Some of this area may be fenced to exclude people.

Wallbridge and Gilbert conclude flows from the site will not connect to the Buckland Park Lake system, hence the proposal will have no impact on the Buckland Park Lake system. They have also modelled the quality of stormwater discharged from Thompson Outfall Channel into the Gulf St Vincent will meet the SA EPA (2003) *Environmental Protection Water Quality Policy – Aquatic Ecosystem ("Marine Waters")* criteria, as well as the CSIRO *Urban Stormwater Best Practices Environmental Management Guideline*.

Chapter 9 Climate change and sustainability

The construction and occupation of the proposal is anticipated to result in a new population of 33,000 people living at the by 2036, accommodated in 12,000 new houses.

Construction of the land division and the buildings which will follow will generate greenhouse emissions. The people living in those houses and working in those buildings will generate greenhouse gas emissions. The operation of the infrastructure required to support the proposal will generate greenhouse emissions.

These greenhouse emissions would be generated no matter where in Metropolitan Adelaide the new houses were built, and therefore may not be considered a consequence solely of the proposal. Chapter 2 considers the site's strategic context, and demonstrates it is favourably located when compared to other suburbs in Metropolitan Adelaide, particularly in terms of distances from centres, services and employment hubs.

Many initiatives to improve urban sustainability and mitigate the risks associated with climate change, therefore cannot be applied only to a particular location or proposal. For example, households will generate waste and waste water requiring treatment and disposal, wherever the house is located. People will use electricity for lighting and air conditioning, this cannot be prohibited or controlled at a household level.

The South Australian government has projected a demand for 250,000 new houses to accommodate 500,000 more people in Greater Adelaide Region over the next 30 years.

This chapter describes how the proposal can satisfy part of that demand, in a more sustainable manner than other new suburbs.

In particular, the opportunity to apply measures over a large-scale community, rather than a potentially less efficient focus on individual allotments and buildings creates the ability to provide 12,000 homes in a more sustainable fashion.

9.1 Risk management

Guideline 4.3.8: Outline the potential effects of climate change from a risk management perspective, including adaptive management strategies.

Parsons Brinkerhoff has considered the potential risks associated with climate change effects, and nominated adaption measures which can be applied to the proposal (Appendix 16).

Parsons Brinkerhoff have noted however, not all adaptation measures identified can be applied to or resolved within the proposal directly or in its own right. A number of these adaptation measures will require coordination across government and in some instances inter-jurisdictional level of response.

Where applicable, these adaption measures have been incorporated into the Masterplan, infrastructure planning or design guidelines and themes.

The potential risks associated with climate change are applicable to all new and existing suburbs, and therefore cannot be considered unique to the proposal.

Table 9.1 Climate change impacts and adaption measures

Projected change	Likely effects	Potential impacts	Likeli-hood	Conse-quence	Overall risk	Adaptation measures
Average rainfall						
Decrease in annual totals	Reduced stream runoff	Reduced water supplies	A	MJ	E	Encourage household rainwater tanks for non-potable water use. Promote native landscaping. Incorporate grey water and recycled water re-use. Promote drought-tolerant plantings.
		Less flow in streams			NA	
		Reduced water quality in streams, lakes and wetlands	L	MD	H	Develop and implement a Local Biodiversity Conservation Strategy.
	More severe droughts	Stress on ecosystems	L	MJ	H	Develop and implement a Local Biodiversity Conservation Strategy.
		Degraded recreation/ tourism facilities	A	MD	H	Raise mowing heights to reduce need to irrigate playing fields.
		Changes in regional groundwater levels	P	MN	M	Investigate a stormwater capture and aquifer recharge scheme.
Temperature						
Increase in extremes	Longer and more severe heat waves	Heat stress on vulnerable people	A	MJ	E	Mandate insulation and passive design features in all buildings to improve thermal comfort. Develop Community Heatwave Emergency Response Plans. Provide air conditioning in public buildings as heat wave refuges. Monitor condition of at-risk individuals and groups during heat waves. Provide adequate shade and drinking fountains in public places.
		Increased UV and sun exposure in public places, work, schools etc.	A	MN	M	Implement a shade and sun protection policy for all public facilities.
		Increased electricity demand	A	MJ	E	Mandate design features that minimise need for air

Projected change	Likely effects	Potential impacts	Likeli-hood	Conse-quence	Overall risk	Adaptation measures
		for air conditioning				conditioning.
		Building damages from footing movements in dry soil	L	MD	H	Consider potential for footing/ foundation movement in buildings and infrastructure design.
	More fire risk	More frequent and severe bushfire risk	L	MN	M	Locate built up areas away from areas of high fire risk. Identify and control Fire Management Zones. Encourage fire adapted vegetation.
		Pollution of water supplies due to fires in catchments			NA	
	Heat effects	Accelerated degradation of roads and other infrastructure assets	L	MD	H	Investigate and apply materials and design features to reduce heat degradation of roads.
		Putrescibles wastes require more frequent collection and disposal	L	MN	M	Provide more frequent collection of putrescibles waste from restaurants etc.
Sea levels						
Increases in level and surge	Increased storm surge	Coastline accretion	U	MJ	L	Implement conservation and adaptation management plans for local coastal reserves.
		Increased coastal erosion	P	MD	M	Implement dune restoration programs as appropriate.
		Damage/ loss of private properties	U	MD	M	Locate built up areas away from areas of likely inundation.
		Damage/ loss of public infrastructure	U	MD	M	Locate critical infrastructure away from areas of likely inundation.
	Sea level rise	Damage loss of ecological habitats	P	MD	M	Protect buffer vegetation in shore zones.
		Saltwater intrusion into estuaries, wetlands and aquifers	P	MD	M	Facilitate change to more salt-tolerant plants.
		Reduced water quality in coastal rivers	P	MN	M	Ensure adequate tidal flushing by removing constraints.

Projected change	Likely effects	Potential impacts	Likeli-hood	Conse-quence	Overall risk	Adaptation measures
Storms						
Increased rainfall intensities	Heavier rainfalls	More frequent and severe flooding	L	MD	H	Locate all developments above design flood levels that allow for climate change to at least 2070. Plan road layout to avoid flooding disruption. Develop and implement a Floodplain Risk Management Plan. Investigate scheme to capture stormwater and store it for re-use.
		Surcharge and deterioration of drainage system	L	MD	H	Planning controls to minimise hard surfaces.
		Increased sedimentation and erosion in streams	L	MD	H	Ensure all excavated land and exposed stream banks are promptly stabilised to minimise sedimentation risks.
		More frequent sewer overflows	P	MD	M	Allow for increased rainfall intensities under climate change when designing new sewers or upgrading sewers.
		More frequent pollution of waterways	P	MD	M	Community education to encourage waste minimisation.
Increased wind speeds	More severe storms	More severe wind storms and hail storms	P	MN	M	Revise design codes to cope with projected increased wind speeds and hail loads.
		Increased demands on emergency services	L	MD	H	Increase council or government support for local emergency services.
General	More frequent storms	Increased costs to maintain essential infrastructure	L	MN	M	Incorporate adaptation features in all new or refurbished infrastructure to minimise long term maintenance costs.
		Increased building maintenance costs	L	MN	M	Show case Water Sensitive Urban Design in public buildings. Design public buildings to allow for adaptation modifications later on.
		Increased cost or unavailability of insurance	L	MD	H	Ensure building and landscape designs include all practical measures to minimise storm damages and losses.

Likelihood: *R=Rare, U=unlikely, P=possible, L= likely, A=almost certain or NA -Not applicable in this situation.*

Consequences: *I=insignificant, MN=minor, MD=moderate, MJ=major, C=catastrophic or NA=-Not applicable in this situation.*

Overall Risks: *L=Low – routine maintenance; M=Moderate – change standards or maintenance; H=High – detailed research or senior level planning; E=Extreme – needs immediate action or NA.*

Source: Parsons Brinkerhoff.

9.2 Travel demand

Guideline 4.3.9: Provide modelling of the expected travel demand associated with the project both during construction and in operation, and the preparation of a greenhouse gas emission reduction assessment.

9.2.1 Modelling of expected travel demand

Parsons Brinkerhoff have modelled the expected travel demand, for different mode shares.

Table 9.2 Annual internal based transport trips by car and truck

Year	Car			Truck			Car emissions			Truck emissions			Daily total	Annual total
	VKT	Vhrs	VKT/ Vhrs	VKT	Vhrs	VKT/ Vhrs	kg/km	kg	t	kg/km	kg	t		
2036	264,299	5,764	46	13,910	303	46	0.325	85,897	86	1.775	24,688	25	**111**	**40,364**
2031	215,653	4,574	47	11,350	241	47	0.325	70,087	70	1.775	20,144	20	**90**	**32,934**
2026	128,036	2,707	47	6,739	142	47	0.325	41,612	42	1.775	11,960	12	**54**	**19,554**
2021	49,924	1,051	47	2,628	55	47	0.325	16,225	16	1.775	4,663	5	**21**	**7,624**
2016	6,826	156	44	359	8	44	0.325	2,218	2	1.775	638	1	**3**	**1,042**

Source: Parsons Brinkerhoff

Table 9.3 Annual external based transport trips by car and truck

Year	Car			Truck			Car emissions			Truck emissions			Daily total	Annual total
	VKT	Vhrs	VKT/ Vhrs	VKT	Vhrs	VKT/ Vhrs	kg/km	kg	t	kg/km	kg	t		
2036	1,510,753	21,065	72	79,513	1,109	72	0.325	490,995	491	1.775	141,120	141	**632**	**230,722**
2031	1,246,341	17,205	72	65,597	906	72	0.325	405,061	405	1.775	116,421	116	**521**	**190,341**
2026	923,899	12,130	76	48,626	638	76	0.325	300,267	300	1.775	86,302	86	**387**	**141,098**
2021	442,858	5,771	77	23,308	304	77	0.325	143,929	144	1.775	41,368	41	**185**	**67,633**
2016	117,541	1,511	78	6,186	80	78	0.325	38,201	38	1.775	10,980	11	**49**	**17,951**

Source: Parsons Brinkerhoff

Table 9.4 Annual total transport trips by car and truck

Sector	Buckland Park internal trips	Trip into and out of Buckland Park	Total
	(t of GHG for sector)		
2036	40,364	230,722	**271,086**
2031	32,934	190,341	**223,275**
2026	19,554	141,098	**160,651**
2021	7,624	67,633	**75,258**
2016	1,042	17,951	**18,993**

Source: Parsons Brinkerhoff

9.2.2 Greenhouse gas emission reduction

The proposal incorporates measures to reduce greenhouse gas emissions, through sustainable transport solutions.

- The significant scale of the proposal, and site, allow the creation of a Masterplan which addresses physical connectivity by ensuring that bikeways, pathways and bus routes are effectively integrated and implemented over the widest extent of the site and into Adelaide's northern region. This is often not possible to achieve in smaller new suburbs, and can be difficult within infill projects in established areas.
- District centres and neighbourhood centre are located within the Masterplan to optimise their efficiency in servicing local community needs.

Effective systems for pedestrian, bicycle, public transport and motor vehicle movement are critical to build a strong community. While private motor vehicles remain the most frequently used transport mode, there are high social, economic and environmental benefits associated with reducing car dependency. These include:

- Reducing greenhouse gas emissions.
- Reducing car operating costs, improving household budgets.
- Increasing health benefits from physical activity, such as walking to destination or public transport, and cycling.
- Providing equitable access to transport for those unable or unwilling to drive for example, the elderly, the young, people with medical conditions, or stay at home parents in households with only one car which is needed for the partner's commute to work.

The Masterplan aims to reduce levels of dependency on travel by private car, particularly the necessity for households to purchase a second car, through a combination of:

- A network of on-street and off-street pedestrian and cycle paths to link residential precincts as directly as possible with centres and employment precincts.
- Inclusion of bus routes within the Masterplan that are within convenient walking distance of future houses.
- Encouraging the use of public transport, through installation of bus shelters, advocacy for public and school bus services and direct feeder bus services to local employment areas. The proponents have committed to providing a community bus service, from the occupation of the first houses. Having a pre-existing public transport service in a new community will reduce demand for private car ownership and travel as viable public transport alternatives already exist. A smaller bus will conduct initial public transport services until a full service is required. This action

will improve the greenhouse gas efficiency of the proponent's initial public transport solution and allow for higher frequency than could be financially justified with a larger bus.

- A high level of self containment within the Masterplan for day to day trips, in terms of services (schools, retail, social services, commercial etc), and higher levels of other employment than is typical in other new residential suburbs in Adelaide. This aim is met through inclusion in the Masterplan of:
  - a high end district centre near to Port Wakefield Road, integrated with a large mixed use precinct;
  - three neighbourhood centres located within the residential precincts, supported by other light industrial/manufacturing employment in dedicated precincts;
  - a temporary Neighbourhood Centre within Stage 1 which will provide services to the first residents occupying the proposal;
  - six schools comprising, including four primary schools and two high schools.

The modelled mode share statistics (Tables 9.2, 9.3 and 9.4) report relatively high levels of internal travel within the site from 2016 through to 2031 by walk/cycle and public transport modes (total mode share of some 50%). These high levels of non car mode shares are reflective of lower car dependency levels (and trip containment where these modes are convenient for local travel).

The Masterplan will guide the proposal's creation over a 25 year period, ensuring workable pedestrian, bicycle and bus routes are progressively implemented to connect all of the predominant land uses, and are efficiently connected between stages.

The integrated approach to transport and land use planning, applied over a proposal and site of this scale and implemented over 25 years will facilitate achievement of sustainability measures.

9.3 Greenhouse gas emissions

Guideline 4.3.10: Identify all sources and levels of greenhouse gas emissions that are likely to be generated and climate change implications, including those from housing, transport and the operation of infrastructure.

Guideline 4.3.11: Describe measures to minimise, reduce and ameliorate greenhouse gas emissions, particularly alternative or renewable energy sources and off-sets, and identify barriers to implementation.

9.3.1 Sources, levels and implications of greenhouse gas emissions

Parsons Brinkerhoff (Appendix 16) considered potential sources of green house gas emissions associated with the proposal. Importantly they noted the South Australian government's projected demand for 250,000 new houses to accommodate 500,000 more people in Greater Adelaide Region over the next 30 years.

New housing for the proposal's ultimate population of 33,000 people will generate greenhouse emissions from construction, construction of related infrastructure and services, and operational use. These greenhouse emissions will be generated no matter where in metropolitan Adelaide the 250,000 new houses are built, and therefore may not be considered a consequence solely of the proposal.

One of the most influential factors greenhouse gas profiles is the distance between housing and primary sources of jobs, services and shops. Therefore it is expected the proposal's early stages will have slightly higher emissions than Metropolitan Adelaide's average, reducing as its centres become established.

The following sources of greenhouse gas emissions associated with the proposal's construction and operational phases were identified:

- Buildings, vehicles and waste management.

- Infrastructure, both on and off the site.
- Residential and commercial buildings and landscapes.

Parsons Brinkerhoff applied the National Greenhouse Accounts (NGA) factors to calculate greenhouse gas emissions for each of the aforementioned sources.

Parsons Brinkerhoff then:

- Applied researched residential energy and water results to the proposal's projected residential building makeup to evaluate the proposal's greenhouse gas emissions.
- Applied the construction staging to create an indicative, quantitative assessment of greenhouse gas emissions over time by source.
- Compared the proposal's greenhouse gas profile to the metropolitan Adelaide average for the annual operation of residential and commercial facilities. This comparison allows evaluation of the proposal's greenhouse gas profile with respect to the residential and commercial average.

At the construction stage, electricity infrastructure construction is the largest greenhouse gas emitter with 19,317 tonnes of greenhouse gas or 40% of the construction emissions total and provides the greatest opportunity to manage and mitigate greenhouse gas emissions.

At the operation stage, transport (62.5%), electricity (17.6%) and gas consumption (18%) are the largest greenhouse gas emission sources, and have the greatest opportunity for targeted mitigation measures.

9.3.2 Mitigation measures

Generation of green house emissions from the proposal will be mitigated through a range of measures.

During construction, green house gas emissions will be mitigated through the following measures, which are detailed in Parson Brinkerhoff's report, and its attached Sustainability Guidelines (Appendix 16):

- Assess energy (fuel/electrical) efficiency when selecting equipment.
- Maintain equipment to retain high levels of energy efficiency.
- Purchase accredited renewable energy (such as green power), in order to reduce greenhouse gas emissions associated with electricity production.
- Turn off vehicles and plant equipment engines when not in use or idling.
- Where economically feasible, use biofuels that are produced from waste products such as sugar cane or mallee scrub not food quality agriculture or non plantation timbers. Biofuels may include (biodiesel, ethanol, higher octane fuel, or blends such as E10 and B80), to reduce greenhouse gas emissions from construction plant and equipment.
- Investigate opportunities to alter the energy mix so there is a bias to more efficient sources, for example gas and renewable sources in preference to higher greenhouse intensive coal generated electricity from the national electricity grid.
- Minimise vegetation clearance, and replant vegetation where feasible.
- If vegetation must be cleared, consider beneficial reuse of this material, to offset other vegetation clearance activities, and ban on-site burning.
- Retain existing vegetation until immediately prior to construction to minimise erosion and top soil loss.
- Use local materials and local staff wherever possible, to reduce transport-related emissions.

- Use recycled and low greenhouse intensity materials, such as replacing cement with fly ash, using recycled aggregate, and recycled content in steel, to minimise the lifespan impact of greenhouse gas emissions in production. Intended material use will dictate applicability.
- Construct residential buildings to comply with the State Government's 5-star rated minimum standard.

These measures will be incorporated into the CMP.

During operation, green house gas emissions will be mitigated through the following measures, which are detailed in Parson Brinkerhoff's report, and its attached Sustainability Guidelines (Appendix 16):

- New houses and houses connected to mains gas emit less green house gases than older houses, which are not connected to mains gas. The proposal will comprise all new houses, connected to mains gas. Therefore, its residential component will generate less green house gas emissions than Adelaide's existing residential areas.
- Design the Masterplan so that the layout allows for houses and buildings to be appropriately oriented to maximise passive solar design opportunities.
- Investigate opportunities to assist community groups and businesses installing renewable or alternative energy sources such as solar thermal, photovoltaic or wind turbines in houses, commercial buildings and community facilities.
- Encourage installation of solar hot water systems with natural gas backup in all new residential and commercial buildings, through education and advice to purchasers. Solar hot water systems have the potential to generate energy and greenhouse gas savings of between 20–70%. Actual savings will vary as a result of site-specific characteristics such as shading and orientation.
- Encourage installation of energy and water efficient products and services in residential, commercial and community buildings, through local education programs and advice.
- Install commercially available energy and water efficient products and services in display homes. This could include 5-star white goods, efficient fixtures and lighting, rainwater tanks, drip irrigation, skylights, extractor fans, grey water reuse systems, compost facilities, native and drought tolerant gardens, solar hot water and pool solar hot water. These features should be supported and promoted by marketing material, and in the display village homes, and through community building programmes.
- Provide Sustainability Guidelines that encourage passive heating and cooling of buildings through design, orientation, thermal mass, ventilation, shading and glazing.
- Natural gas will be available to all homes. Natural gas produces 26% of the greenhouse gas emission per unit of energy compared to electricity (70.7 kg greenhouse gas/GJ to 272 kg greenhouse gas/GJ) referenced from (DCC page 13 and 16, 2008).
- Future residents will be encouraged to purchase 6-star solar water heaters, gas cookers, gas based air conditioning. This can be achieved through business arrangements between suppliers of solar hot water and natural gas based heaters and air conditioning and the proponent. A package could be offered to lot purchasers at below current recommended retail price. This has occurred in a number of eco-villages across Australia. It has been justified on sustainability and point of difference market niche. This will result in significant greenhouse gas emission savings at the residential level, as hot water and space temperature control are typically the largest source of greenhouse gas emissions in the house.
- Effective systems for pedestrian, bicycle, public transport and motor vehicle movement are critical to build a strong community. While private motor vehicles remain the most frequently used transport mode, there are high social, economic and environmental benefits associated with reducing car dependency. These include:

- Reducing greenhouse gas emissions.
- Reducing car operating costs, improving household budgets.
- Increasing health benefits from physical activity, such as walking to destination or public transport, and cycling.
- Providing equitable access to transport for those unable or unwilling to drive for example, the elderly, the young, people with medical conditions, or stay at home parents in households with only one car which is needed for the partner's commute to work.

The Masterplan aims to reduce levels of dependency on car ownership, particularly the necessity for households to purchase a second car.

This will be achieved through a combination of:

- a network of on-street and off-street pedestrian and cycle paths to link residential precincts as directly as possible with centres and employment precincts;
- encouraging public transport services, through installation of bus shelters, advocacy for public and school bus services and direct feeder bus services to local employment areas. The proponents have committed to providing a community bus service, from the occupation of the first houses. Having a pre-existing public transport service in a new community will reduce demand for private car ownership and travel as viable public transport alternatives already exist. A smaller bus will conduct initial public transport services until a full service is required. This action will improve the greenhouse gas efficiency of the proponent's initial public transport solution and allow for higher frequency than could be financially justified with a larger bus.

The Masterplan will guide the proposal's creation over a 25 year period, ensuring workable pedestrian, bicycle and bus routes are implemented to connect all of the predominant land uses, and are efficiently connected between stages.

- Retain all stormwater for the following purposes:
  - environmental flows to the coastal plain and sea; and
  - irrigation.
- A third pipe will be provided to all lots providing recycled water for non-potable use such as toilet flushing and gardening purposes.
- Stormwater will be detained, collected and channelled to a stormwater retention basin as described in Chapter 7. It will then be treated and stored off site and used for irrigation. The most likely location for off site treatment and storage is a City of Playford wetland. It is yet to be determined if the treated stormwater will be used on the site, or provided to another users. If used on the site, it will be piped back from the treatment and storage site. From a greenhouse gas reduction perspective it would be best to utilise stormwater on the site, and thereby reduce embodied greenhouse gas emissions with materials and energy consumption for construction.
- Install reticulated irrigation to all open space and civic gardens.
- Undertake significant tree planting in open space, biodiversity areas and civic gardens to help offset carbon emissions as a result of vegetation clearing.

9.4 Resource management

Guideline 4.3.12: Outline measures to minimise or reduce resources used during the construction and operational phases.

9.4.1 Construction phase

Waste avoidance

Waste avoidance techniques used during the construction includes:

- Ordering materials in sufficient, but no excess, quantities.
- Investigating the use of recycled products in construction works, where practicable.
- Balancing earthworks where possible, so that the volume of earth and rock that is excavated is equal to the volume of filling required, thereby minimising the transport and disposal of excess material and the importation of material.
- Ensuring that local roads affected by construction would where possible, remain intact to reduce the need for further, new paving materials.
- Erecting signs within the construction compound informing employees of waste minimisation and encouraging them to avoid and reduce waste wherever possible.

Re-use

The re-use of waste generated during construction includes:

- Chipping and mulching of cleared vegetation (excluding weeds and invasive species) and re-using the material for landscaping.
- Using vegetation for sediment control, to provide habitat and to prevent access to the construction site.
- Re-using wooden packaging materials, such as pallets as formwork for concrete.
- Preserving any topsoil and turf that is removed and re-using it to re-establish ground covering.

Recycle resources

Recycling of waste generated during construction includes:

- Providing on-site rubbish-sorting facilities, for concrete, wood, waste paper, metals, glass, plastic and oil where practical and identifying and negotiating collection or delivery to appropriate recycling facilities.
- Negotiating with suppliers of any oil and fuel used on-site to return empty drums or have them collected for recycling by a drum recondition facility.
- Collecting and delivering concrete, asphalt and similar material to crushing and recycling plants, where practicable.
- Training for all employees and sub-contractors regarding the Construction Waste Management Plan.
- Recycling demolition materials from demolished structures.

Construction Waste Management Plan

The CMP for each of the proposal's stages will include a Construction Waste Management Plan which will include:

- Identification and classification of major waste stream.

- Details of how and where waste would be re-used, recycled, stockpiled or disposed.
- Details of the receptacles for storing identified waste before re-use, recycling, stockpiling or disposal.
- Details of how waste would be transported between its point of generation, storage, point of re use, recycling, stockpiling or disposal.
- Methods for monitoring implementation of the Construction Waste Management Plan.
- Details of how to achieve the Waste Management Hierarchy shown in Objective 4 of the *City of Playford Environmental Care Goal Plan 2006–2011*.
- Compliance with relevant legislation, guidelines and approvals.

The use of Modern Methods of Construction (MMC) where possible

The implementation of Modern Methods of Construction (MMC) should be considered. MMC considers the prefabrication of the wall/roof panels and/or entire rooms offsite in a factory, as distinct from on-site fabrication. According to the UK Parliamentary Office of Science and Technology (2003) the use of MMC would offer significant energy efficiency improvements as a result of improved air tightness and insulation, and produce less waste on site as materials are less likely to be spoiled in a factory environment, and are more likely to be ordered to exact specifications.

The use of materials with high recycled content

In order to maximise the efficient use of materials recovered from the waste stream, and direct waste from landfill, the proposal should maximise the use of products with a high recycled content and/or reused materials.

9.4.2 Operational phases

A certain amount of waste will be generated on an on-going basis by households, commercial and industrial premises and the maintenance of community assets.

Householder waste

In order to meet or improve on the current recycling rates in the City of Playford, the following could be implemented:

- Provide storage and space for on-site treatment of household waste and recyclables within house lots and community facilities.
- Provide neighbourhood or household composting facilities for garden waste and organic (kitchen) waste.
- Extend the City of Playford's progressive waste management and recycling program to the proposal. This would include recycling of: paper, cardboard, bottles and cans, furniture, electronic goods, computers and printer cartridges, fridges and freezers, metals and batteries.
- Provide kerbside recycling boxes, wheelie bins, multi-compartment containers to each household to allow the segregation of waste, consistent with the requirements of the City of Playford Council.

Commercial waste

The most significant sources of commercial waste relate to the day-to-day business activities and cleaning maintenance. In order to maintain and improve on the current recycling rates in City of Playford, commercial property owners within the proposal should aim to:

- Develop internal building based co-mingled recycling systems (separating recyclable materials and organic material from remaining waste).

- Work collaboratively with cleaners and waste collection contractors:
  - combining waste and recycling services to offset any increase in the recycling costs against the savings in waste disposal, and pass savings onto customers;
  - incorporating contract clauses that require cleaners to support any recycling initiatives implemented in the building, or by individual tenants;
  - monitoring waste and recycling amounts – waste and recycling contractors should provide monthly feedback on the volume of material collected.
- Work collaboratively with tenants:
  - inform tenants of the intention to implement a building-wide recycling system;
  - using tenancy leases to motivate tenants to recycle.

The implementation of the City of Playford's existing waste management programmes in the proposal will have a positive impact on the reduction of waste.

9.5 Energy conservation

Guideline 4.3.13: Identify opportunities for energy conservation.

Opportunities for energy conservation are, to a certain extent the same as opportunity to reduce greenhouse gas emissions. These are described in Chapter 9.4.

New residents will be informed of products and building design and techniques available to reduce energy use in their homes, through the sales and marketing centre, including its showroom, and by individual builders within the display village.

The proponents are working with APA to develop gas air conditioning for domestic use. It is already applied in Australia in commercial buildings, but has not been used in housing.

The introduction of gas air conditioning has the potential to significantly reduce reliance on electricity for air conditioning.

All allotments will be connected to mains gas.

The proponents are working with APA towards offering new residents discounted gas air conditioners to encourage their installation.

9.6 Waste management strategies

Guideline 4.3.14: Outline waste management strategies for residential uses and commercial facilities and the potential for incorporating recycling and resource recovery.

Guideline 4.3.15: Describe how principles of the State Waste Strategy will be implemented and the ability of existing infrastructure to deal with waste and recycling streams.

Parsons Brinkerhoff identified likely sources of waste relating to the proposal. These are grouped by waste source. They:

- reviewed the current waste situation in South Australia and specifically in the City of Playford
- reviewed state and local government initiatives, policies and targets
- undertook an initial quantitative assessment of household waste during the operation stage

- undertook qualitative assessments of likely types of waste generated by activities during the construction and operation stages, and provide recommendations on reduction and mitigation measures.

9.6.1 Capacity of existing infrastructure

There are six major landfills servicing metropolitan Adelaide and there are a large number of smaller rural and regional landfills. The closest landfill facility to the site is at Balefill, Uleybury operated by Northern Adelaide Waste Management Authority (NAWMA).

Collectively these landfill sites receive about 1.28 million tonnes of solid waste every year.

However, South Australia is one of the best performing jurisdictions around the world for diverting recyclables (65%) from landfill.

The recycling participation rate in South Australia is relatively high.

The main drivers of waste generation in South Australia are economic growth, new dwellings in inner city and established suburbs, household formation trends (fewer people in more dwellings), under-provision of garden waste and other recycling services, and community attitudes.

Despite an increase in the number of people recycling, the amount of waste going to landfill is also increasing. According to the *Background Paper to South Australia's Waste Strategy 2005–2010* prepared by Zero Waste South Australia, the quantity of waste disposed in landfill from metropolitan Adelaide increased from 860,000 t in 1995–96 to 1,110,000 t in 2001–02.

This included approximately 328,000 tonnes of kerbside domestic waste, 169,000 tonnes of commercial waste, and 509,000 tonnes of building and demolition waste and waste fill.

The estimated total available landfill airspace provided by landfill facilities is approximately 60 million cubic metres.

At current rates of disposal, the capacity of Uleybury landfill is estimated to be sufficient for Metropolitan Adelaide's, and the proposal's requirements for several decades.

The Wingfield landfill ceased operation as a waste depot by 31 December 2004. With the closure of this facility, the annual intake of waste (about 700,000 t/a from households, some councils and businesses) needs to be redirected to other facilities.

Within the City of Playford, according to the Annual Report 2004-2005 prepared by NAWMA, 46,624 t of household waste was collected in 2004-2005. This is equal to 10.49 kg of waste collected per household per week.

The EPA has conducted a waste audit for the City of Playford. Food waste (34%) consumes the largest proportion of total waste generated within the City of Playford in 2002.

According to the NAWMA findings, the existing kerbside recycle collection service is being well utilised by local residents in the City of Playford.

The collection yield from the kerbside recycling system in 2004-2005 was 18,053 tonnes, which equals to 4.06 kg per household per week.

The City of Playford's waste management activities are generally aimed at household and community level. The Council works collaboratively with the NAWMA to provide waste management services in local area.

NAWMA currently collects and processes household waste from approximately 30,000 homes in the City of Playford.

The existing waste management facilities within the City of Playford LGA are as follows:

- Material Recovery Facility.
- Baling Plant at Elizabeth West.

- Balefill, Uleybury landfill.
- Andrews Road Waste Transfer Station.
- Virginia Horticulture Centre – recycling plastics waste.

Residents have access to three bins for kerbside waste collection of household rubbish, recyclables and garden waste. Further details are summarised in Table 9.5.

Table 9.5 City of Playford kerbside management system

Waste type	Bin type	Collection time	Where to dispose?
General household rubbish	140 litre bin	Weekly	Baled at NAWMA site Elizabeth West Disposed at Balefill Facility at Uleybury
Recyclable material	240 litre bin	Fortnightly	Materials Recovery Facility at Elizabeth West
Garden Waste	240 litre bin	Fortnightly	Andrews Road Transfer Station

Source: Environmental Care Goal Plan 2006 – 2011, City of Playford Council 2005

In addition, the City of Playford has been running hard waste collections since June 2002. A new hard waste collection service provided to City of Playford residents on an ongoing basis, commenced in January 2008.

Hard waste collection allows property owners a means of disposing certain items that are too bulky for the usual kerbside collection program. Residents have access to the Andrews Road Waste Transfer Station at Penfield on a user pays basis.

The NAWMA caters for growth in its future services to the northern Adelaide region, and has forecast a requirement for the provision of waste management services at Buckland Park, consistent with current levels of service provision within the City of Playford.

9.6.2 Proposed strategies for commercial facilities and residential uses

Parsons Brinkerhoff prepared proposed strategies for the management and reduction of waste within the proposal.

Environmental, social and economic effects associated with the management of waste and resources are outlined below to illustrate their broader significance for achieving sustainable outcomes within the proposal.

Poor waste management practices can lead to the pollution of surface and groundwater resources, air pollution, the generation of greenhouse gases (methane is a major greenhouse gas that is released by landfill sites), site contamination and the generation of odours.

The improper disposal of hazardous waste to landfill, stormwater drains, surface and underground water resources or sewerage systems can harm the environment and potentially cause injury or harm to humans and other organisms.

Recycling waste materials reduces the consumption of virgin materials.

A study undertaken in 2001 examined the financial, environmental and social costs and benefits of kerbside recycling in Australia. It found that by including an expression of the benefit to the environment in dollar-terms (based on conservative estimates) together with recycling and collection costs, an average net benefit of $42 per household per year was gained from kerbside recycling.

Effects on communities associated with the disposal of solid waste to landfill include reduced property values adjacent to landfill sites, the risk of fire, unsightliness, litter and nuisance associated with birds, dust, odours, pests and vermin.

Construction stage

There will be minimal demolition as part of the proposal's site preparation. There are only two lightweight sheds currently on the site.

It is anticipated that site preparation will include earthworks associated with the construction of the road network, with access to construction areas and infrastructure.

An estimate of the volume of spoil generated as a result of initial earthworks will be determined during detailed civil engineering design of each of the proposal's stages, but it is anticipated most spoil will be used on the site, or in its vicinity.

A summary of typical waste streams anticipated from the construction stage are listed in Table 9.6.

Table 9.6 Building waste generated during construction stage

Waste stream	Waste
Building waste generated during the construction activities	Concrete, Brick, Wood Timber, Structural Steel, Glass, Drywall, Insulation materials, Appliances and fixtures, cement bags, doors and windows, PVC products, polyethylene products, masonry scrap and rubble, soil, carpet, asphalt pavement, lighting fixtures and electrical components, cardboard packing and packaging.

A secondary waste stream is vegetation waste, generated from clearing and grubbing activities.

The total volume of green waste likely to be generated is difficult to estimate at this time, but for the purpose of undertaking a greenhouse assessment for the proposal in Chapter 9.3 Parsons Brinkerhoff estimated it at approximately 4,470 t.

Operational waste is comprised of waste generated from residential household and commercial activities.

A summary of typical waste streams anticipated from residential and commercial operation of the proposal are as listed in Table 9.7.

Table 9.7 Household and commercial waste stream

Waste stream	Waste
Household waste	Food, paper/cardboard, vegetation waste, hard waste, metal, glass, plastic, soil, wood/timber, vegetation/garden waste, metal, hard waste/bulk waste
Commercial waste	Food, garbage bags, soil, wood/timber, vegetation/garden waste, rubber/tyres, paper/cardboard, metal, glass, heavy metal, hard waste/bulk waste

Parsons Brinkerhoff prepared an initial quantitative assessment and estimated the amount of household waste generated per year, after 2036 when the proposal is completed and occupied of approximately 6,546 t of household waste per year.

Should the average household size increase to 2.75 persons per household by 2036 then the total waste generated per year could decrease by approximately 380 t per year to 6,168 t of household waste per year.

This is equal to approximately 0.55 t of waste per household per year.

Based on the findings from the City of Playford Waste Audit 2002 it is estimated that the following type and volume of household waste will be generated when the proposal is completed and occupied in 2036.

Table 9.8 Estimated household waste type

Waste type	%	Estimated additional household waste generated from Buckland Park	
		Per year (t)	Per household per year (t)
Cardboard	4	261.83	0.02
Newsprint	6	392.75	0.03
Other paper	5	327.29	0.03
Contaminated paper	0	–	–
CDL	2	130.92	0.01
Other recyclable	13	850.95	0.07
Non-recyclable metal/glass/plastic	6	392.75	0.03
Green waste	12	785.49	0.07
Food waste	34	2,225.56	0.19
Dust/dirt/rock/ash	4	261.83	0.02
Disposable nappies	4	261.83	0.02

Source: Parsons Brinkerhoff

In order to maximise residential and commercial recycling, the management and mitigation measures summarised below are recommended for implementation during the design, construction and operation stages of the proposal. The table describes how the *State Waste Strategy* will be addressed.

Table 9.9 Summary of management and mitigation measures

Stage	Legislation/target	Mitigation
Construction – Site preparation earthworks; infrastructure and roads; Commercial and Residential building Construction	South Australia's Waste Strategy 2005–2010: By 2010, construction waste recovery and re-use will have increased by 50% from 2004 weights	**Builders should:** • require all sub-contractors to submit a Construction Waste Management Plan as part of their tender documentation which outlines proposals to divert waste material from landfill; • provide an induction and education program outlining waste management objectives and procedures for all construction workers and sub-contractors. **Architects/Designers should:** • reduce resource waste by specifying the correct quantities and specification of particular types of materials, where appropriate; • choose to extend the useful life of a new building by designing with higher quality, more durable materials including flexibility in design for future refurbishing,

Stage	Legislation/target	Mitigation
		conversion or extension; • consider design for disassembly or relocation and re-use of components where possible as an alternative to simply demolishing the structure. **Supplier should:** • use less packaging and supply materials in the exact quantities required. **Builder or sub-contractor should:** • reuse soil and stone generated by earthworks, subject to suitability; • follow best management practice for soil conservation when stripping, handling, storing and replacing soils on site; • prepare and implement a Construction Waste Management Plan (CWMP) as part of their contract. The CWMP should consist of the following: • the volume and type of waste to be generated; • whether the waste will be re-used, recycled or disposed of; • building materials and design techniques; • consider using Modern Methods of Construction (MMC) where possible; • order construction material in optimal dimensions to minimize cut-off waste; • maximise the use of building materials with a higher recycled content for example: • recycled steel reinforcements; • recycled or plantation timber; • recycled concrete; • second hand bricks; • soil and fill.
Operation – Residential	South Australia's Waste Strategy 2005 – 2010: Increase the recovery, recycling and re-use of kerbside collected waste to 50% by 2008 (excluding food waste) Increase the recovery, recycling and use of metropolitan kerbside collected waste to 75% by 2010 (including food waste). Increase the recovery, recycling and use of	**Council encouraged to:** • provide waste containers such as kerbside recycling boxes, wheeled bins, multi-compartment containers for residential dwellings that facilitate the segregation of waste, in line with the requirements of the City of Playford Council. **The Designer should:** • provide adequate storage and, where appropriate, sufficient space to allow for on-site treatment of household waste and recyclable waste; • provide neighbourhood or household composting facilities for garden waste and organic kitchen waste; • prepare a Waste Management Plan outlining who will be responsible for maintaining and monitoring the waste

Stage	Legislation/target	Mitigation
	household waste in non-metropolitan centres through drop-off and kerbside collection services where appropriate. All councils to provide high performance kerbside or equivalent systems servicing householders throughout South Australia by 2010.	management system for residential proposals within the Master Plan – such as high density housing. **Householders should:** • place a 'no junk mail' notice on all letterbox.
– Commercial	By 2010, the recovery and use of materials from the C&I sector will have increased by 30% from 2004 weights.	**Council encouraged to:** • maintain the current kerbside collection levels of services in order to maximise the recovery of recyclables from commercial properties. **Commercial building owners within the proposal should aim to:** • develop internal building based co-mingled recycling systems (separating recyclable materials and organic material from remaining waste); • work collaboratively with cleaners and waste collection contractors – combining the waste and recycling services to offset any increase in the recycling costs against the savings in waste disposal, and pass savings onto customers; – incorporating contract clauses that require cleaners to support any recycling initiatives implemented in the building, or by individual tenants; – monitoring waste and recycling amounts - waste and recycling contractors should provide monthly feedback on the volume of material collected; • work collaboratively with tenants – Inform tenants of the intention to implement a building-wide recycling system; – Using tenancy leases to motivate tenants to recycle.

Source: Parsons Brinkerhoff

9.7 Project impact on existing buffers and land use

Guideline 4.3.16: Describe the impact of the proposed development on the buffers established for existing land users and implications of this activity on the activities of existing land users.

This issue is addressed in Chapter 14.10.

9.8 Sustainable design strategies

Guideline 4.3.17: Describe any design themes or guidelines that would be adopted to ensure sustainability.

Parsons Brinkerhoff (Appendix 16) has prepared 'Buckland Park Sustainability Guidelines. Themes have been incorporated into the guidelines.

Final Design Guidelines will form part of all allotment sales and will guide and direct purchasers on the design of their homes and businesses to achieve sustainability outcomes.

9.9 Management for long-term environmental sustainability

Guideline 4.3.18: Describe the arrangements to control and manage activities, particularly to ensure that the proposed development is environmentally sustainable in the long-term.

The proposal's sustainability vision is to:

Achieve an attractive and cohesive community embracing the ideals of housing choice, affordability, innovation and sustainability.

A key principle of the Masterplan is consideration its contribution to the achievement of this vision and of South Australia's *Strategic Plan's* sustainability and economic growth targets.

This can be achieved in the proposal through:

- Promoting energy efficient subdivision design and sustainability design guidelines.
- Reducing electricity consumption across the whole site by shifting toward a lower greenhouse emission intensive energy supply, for example, the use of gas powered air conditioning.
- Reducing potential emissions from transport through integrating land use planning for housing, employment, services with public transport.
- Reducing waste to landfill from construction and operational activities.
- Encouraging a shift toward low greenhouse emission modes of transport.
- Encouraging a whole of water cycle approach to water and wastewater collection, consumption and re-use.
- Protecting and managing existing local biodiversity.
- Aligning delivery of the proposal with provision of government and community services.
- Introducing a dedicated community officer to drive social inclusion and community building programs.
- Committing to establish a Neighbourhood Centre in Stage 1 of the proposal.
- Delivering diversity in housing types including a commitment to 15% affordable housing, estimated to be 1,800 dwellings by 2036.

The proposal's supporting design philosophy is based on the sustainability vision and principles and seeks to achieve the following sustainability outcomes.

Table 9.10 Sustainability outcomes

Community	A community with its own distinct identity and character, which provides a good lifestyle, and is integrated with its natural and rural setting.
Energy	Maximisation of the energy efficiency in all the Master Plan's built elements, and minimisation of demand for electricity resources.
Transport	Maximisation of accessibility to public transport, and commercial, employment and community services within Buckland Park and the region and minimisation of fossil fuel use.
Water use	Maximisation of the water efficiency of the proposal's built, landscaped and natural elements, and minimisation of water consumption.
Biodiversity	Protection and enhancement of biodiversity within the site and the region.
Resources	Minimisation of the proposal's ecological footprint by minimising waste generation, maximising the use of recyclable materials and sourcing local resources where possible.
Pollution	Minimisation of potential pollutants including stormwater, light, air quality and waste.

In response to the sustainability outcomes, the Masterplan incorporates a number of sustainable urban planning features including:

- A balanced mix of uses needed to provide a complete community, including residential, retail, commercial, community, industry, education and recreation facilities.
- Three neighbourhood centres, on proposed bus routes which will contain a range of facilities and services. These will be community focus points, accessible without a car.
- A fourth temporary neighbourhood centre, to provide services and facilities to the first residents when they arrive.
- Location of schools proximate to centres to minimise number of trips needed to undertake multiple tasks, and maximise the efficiency of public transport network.
- A district centre located to maximise public transport access, by allowing co-location of the Centre with a bus interchange, at the main entry for regional bus services, and the termination point for local bus services.
- Interconnected street networks designed to encourage walking and bicycling reducing the number and length of car trips.
- A broad range of housing types and price levels to attract a diversity of residents, including a component of Affordable Housing, which will contribute to Buckland Park's diversity, and will be located to ensure access to all facilities and seamless integration with Buckland Park's communities.
- Higher density residential areas located proximate to centres and public transport routes.
- An open space network which will provide passive and active recreation opportunities, and include links to encourage walking and cycling.

A preliminary climate change risk assessment for the proposal was performed based on the potential impacts of climate change at the site, identifying, assessing and ranking the risks. Potential mitigation and adaptation measures to address identified risks have been proposed, and embedded within sustainability guidelines for the proposal, and are addressed in more detail in earlier in this Chapter.

New housing for the proposal's ultimate population of 33,000 people will generate greenhouse emissions from construction, construction of related infrastructure and services, and operational use. These greenhouse emissions

will be generated no matter where in Metropolitan Adelaide the new houses are built, and therefore may not be considered a consequence solely of the proposal or its location.

The total anticipated greenhouse emissions over the proposal's construction period of 25 years, is estimated to be 47,956 tonnes of greenhouse gas.

At the construction stage, electricity infrastructure construction is the largest greenhouse gas emitter with 19,317 tonnes of greenhouse gas or 40% of the construction emissions total and provides the greatest opportunity to manage and mitigate greenhouse gas emissions.

The total anticipated emissions over the proposal's 25 year construction and occupation period is estimated to be 433,882 tonnes of greenhouse gas.

At the operation stage; transport (62.5%), electricity (17.6%) and gas consumption (18%) are the largest greenhouse gas emission sources, and have the greatest opportunity for targeted mitigation measures.

The proposal incorporates measures to reduce greenhouse gas emissions, through efficient engineering and resource utilisation, prudent use of materials during construction and operation, sustainable transport solutions and minimising vegetation removal.

The proposal also positively responds to The City of Playford's Environmental Care Goal Plan 2006–2011 – a local strategy consistent with the waste management targets identified in South Australia's Strategic Plan and South Australia's Waste Strategy.

9.10 Mosquito and insect management and control

The University of SA (USA) notes there are two types of mosquito communities in Adelaide, rangeland and urbanised mosquitoes.

Urbanised species originate from within urbanised areas, and rangeland species originate from samphire and mangrove vegetation communities located on the coastal plain.

The presence of mosquitoes varies each year and with each season. Climate change will have a neutral effect on potential mosquitoes, as it is expected that while the prevalence of some species will increase, theprevalence of others will decrease.

Rangeland species, such as *Aedes Vigilax* and *Aedes Camptorhynchus* are most likely to cause nuisance biting and disease. However, the role of these species as a disease vector in South Australia is unclear.

There is a 3.1 km separation between the nearest residential area accommodated in the Masterplan and rangeland species habitat in coastal samphire and mangrove areas. Figure 9.2 shows the location of mosquito habitats in relation to the Masterplan's built areas.

USA surveyed at six locations, mostly to the site's west, adjoining or within the coastal plain some kilometres from the site. They found rangeland species in abundant numbers, particularly the *Aedes Vigilax*. They found urbanised species in small numbers, as was expected given that the site and its vicinity is not urbanised.

The proposal's design builds in mosquito management methods. The Masterplan's western open space areas can include vegetation and fencing barriers designed to deter mosquitoes, and design guidelines for new houses can require screens for all new houses. These built in measures are difficult to retrofit in established areas within Metropolitan Adelaide with a similar relationship to potential mosquito habitat.

It is considered the ability to build in mosquito management will lead to reduced mosquito issues within the proposal, as compared to established areas.

It is projected the western residential areas accommodated in the Masterplan will be commenced in 2022, allowing the detailed design of built in management measures.

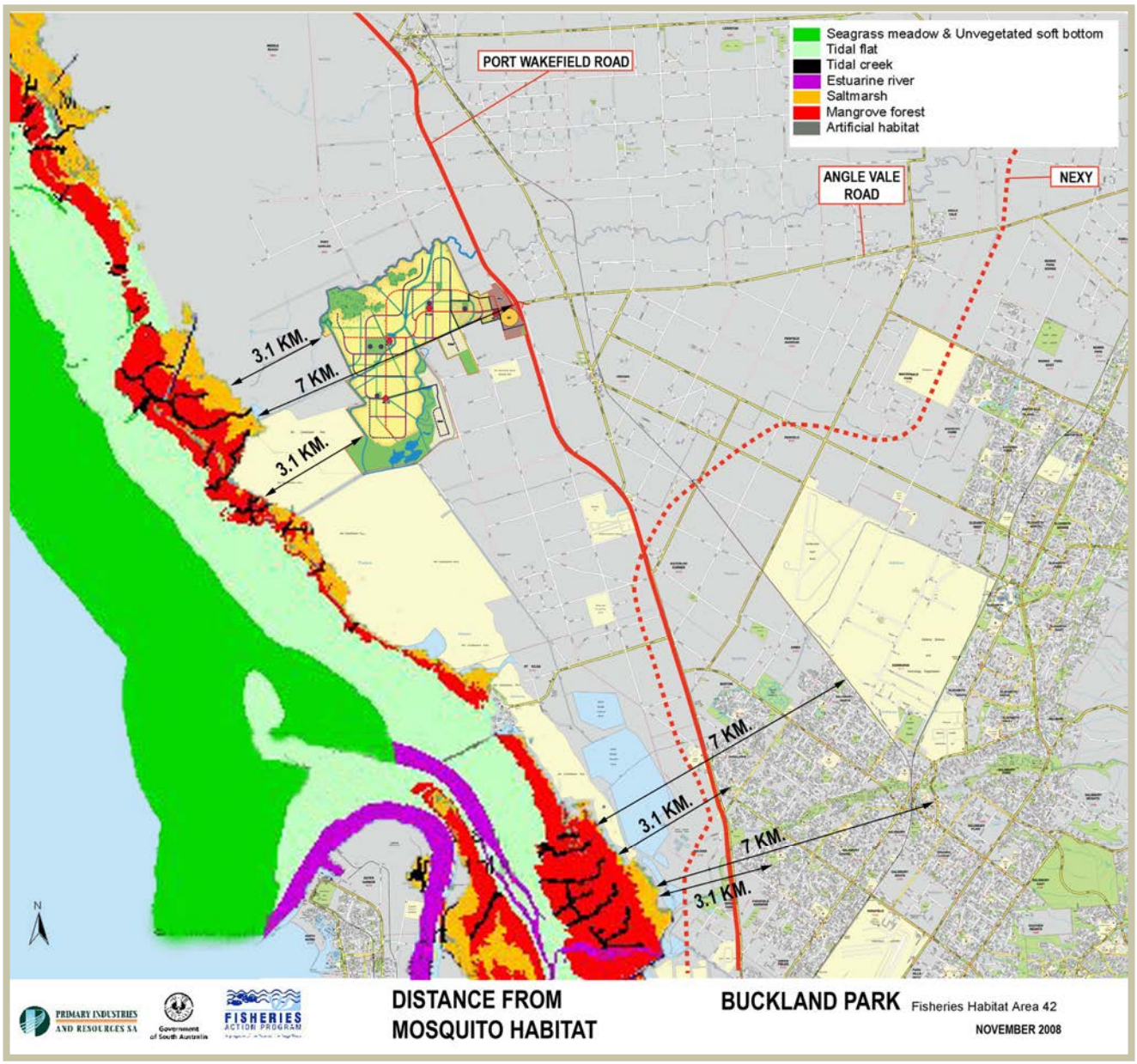


Figure 9.1 Urban areas and mosquito habitat

9.10.1 Management strategies

Guideline 4.3.19: Describe measures that may be undertaken to control mosquitoes in and near the site to reduce the possible health risks.

The proposal will be implemented over a 25-year period. The Masterplan's western residential, closest to mosquito habitat, will commence construction in 2022, with occupation commencing in 2024 and completed in 2036.

Monitoring and management measures will be minimal during the proposal's first decades, as residential areas in the western part of the site will not commence occupation until 2024.

USA recommended an integrated vector management strategy (IVMS) to enable management of mosquitoes near the site while minimising unintended impacts on the local ecology. This approach will involve State and local government, as well as the proponents. An integrated approach could also consider mosquito impacts on existing urban areas, such as Salisbury, rather than focusing solely on the site.

An integrated approach uses targeted, minimal pre-emptive action rather than broad scale remedial action, thereby minimising potential unintended impacts associated with management.

The proposal incorporates the following management measures:

- Mosquito barriers in the landscape.
- Mosquito barriers in house design.
- Education and information.
- Monitoring.
- Pre-emptive measures.
- Broad-scale control measures.

Mosquito barriers in the landscape

Mosquito barrier planting and fencing can be incorporated into the landscape design of the Masterplan's western residential areas. This barrier will block mosquito incursions from the coastal plain to the west of the site and reduce the need to treat mosquitoes at their source, within the coastal plain.

The barrier could comprise a combination of fences and hedges treated with appropriate insecticides to kill or deter mosquitoes before they reach residential areas.

Landscape barriers would be a practical approach, since fences are common elements in any residential area, for example boundary fences, or safety fences in parks and similar. Similarly, hedging is also common in gardens and local parks.

Appropriate plant species for mosquito barrier planting can be incorporated into the detailed landscape design of the proposal's future stages. Figure 9.2 shows indicative locations for the barrier.

Mosquito barriers in house design

Built-in measures can be incorporated in house design. Requirements for their provision will be included in the Design Guidelines. These guidelines will include requirements for the installation of mosquito screens for doors and windows.

Education and information

'Welcome packs' will be provided to new residents as part of a community-building programme. The packs will include information on the site's biodiversity and appropriate ways to interact with that biodiversity, including dealing with mosquitoes.

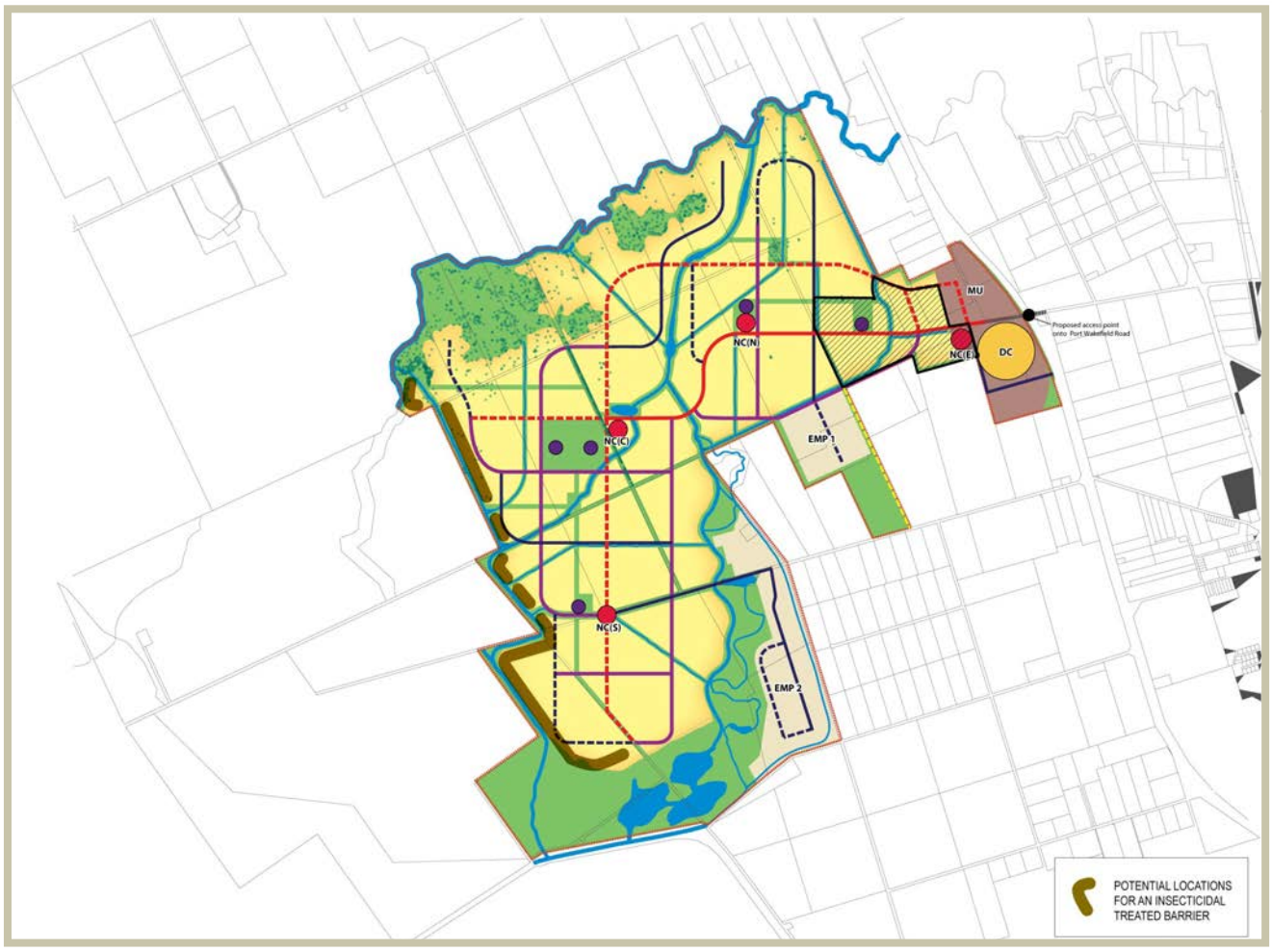


Figure 9.2 Indicative location for mosquito barrier

Monitoring

USA has recommended a programme of monitoring and information gathering to inform management actions. The programme would monitor:

- Weather and tide conditions, particularly in spring and summer, which are peak seasons for mosquito populations.
- Information produced by research.
- Disease notifications.
- Larvae numbers at key locations.
- Mosquito numbers at key locations.

Such a programme would be undertaken by a range of government agencies and ideally, would be integrated with a monitoring programme for all of north-eastern metropolitan Adelaide, in accordance with the *South Australian Integrated Mosquito Management, Strategic Directions Paper 2000* (Environmental Health Service 2006).

Pre-emptive measures

Informed by the monitoring programme, decisions on pre-emptive action can be made. Pre-emptive action will therefore be minimal, and targeted.

Pre-emptive action comprises the targeted and limited knockdown of larval populations in their habitat.

Broad-scale control measures

This approach includes broad scale knockdown of adult mosquitoes and is used as last resort in times when mosquitoes are affecting public health.

9.10.2 Impact of mosquito management on other species

Guideline 4.3.20: Describe how the mosquito control measures will impact on species that require insects for food.

Cooe (Appendix 23) has described two pathways by which an insecticide can affect coastal and marine fauna:

- The reduction of food source since mosquitoes (particularly larvae) are a source of food for fish.
- The introduction of potential toxic substances in the food chain.

The first pathway was considered to have a small to an undetectable impact on the marine fauna because no local marine species is thought to be wholly dependent on mosquitoes as a food source.

The second pathway is more likely to have an unintended impact on marine species, the extent of this impact is dependent on the insecticide used, the frequency of usage and concentration reaching the marine environment.

The inclusion of physical barriers in the Masterplan and within homes will reduce the impact of mosquitoes on residents, and therefore potential requirements for insecticide treatment. The monitoring programme will ensure management measures, are targeted and minimised, reducing the potential for impacts associated with insecticide use.

Impacts can be further reduced by targeting mosquito larvae in their fourth instar, leaving younger larvae available as a food source.

Cooe has reviewed the approach recommended by USA, and endorsed the recommended approach.

9.10.3 Impact of insect control measures on recreational fishing and local ecology

Guideline 4.3.21: Describe the impact of insect control measures on recreational fishing and local ecology.

Mosquito control measures will be targeted to fit the circumstances, reducing the possibility of ineffective measures being taken that may unnecessarily impact on other species. Therefore, ongoing monitoring will be required to inform decisions on control measures.

Potential off target impacts associated with the use of larvicides and adulticides are well understood, and therefore any pre-emptive or broad scale measures that may be required will be undertaken in a well-designed programme. Any mosquito control measure must be minimal and applied by trained vector control officers.

USA concluded ‘a well-designed and implemented mosquito control programme will largely circumvent any significant effects on local fisheries’.

Mosquito control measures are likely to be further refined over the next 16 years to target only mosquito populations. Better decisions regarding appropriate measures will be made at this time, when the proposal’s western stages are being designed.

9.11 Neighbourhood centre

Guideline 4.3.22: Describe the ecologically sustainable objectives of the neighbourhood/community centre and the approach and methodology used to achieve these objectives, particularly the Green Building Code of Australia and the green star rating that could be achieved for the proposed commercial component of the development.

The neighbourhood centre has been designed to a concept level. Accordingly, detailed plans for the buildings, including the display homes, have not been prepared.

The concept design however, includes the following features which will ensure the principles of ecological sustainability are met:

- Water efficient landscape design.
- Provision for connection to recycled water supply.
- Flexible building design to facilitate expansion of the building to meet demand.
- Display homes will meet the 5-star energy rating as described in the Green Building Code of Australia.

The principles of ecologically sustainable development described in earlier in this Chapter will be applied to the detailed design of the neighbourhood centre.

Should the proposal, as described in this EIS, be approved, detailed design of the neighbourhood centre will be undertaken, at which stage this guideline will be fully addressed.

The neighbourhood centre will be designed to accord with relevant design requirements embodied in the Playford (City) Development Plan and the Green Building Code of Australia.

The proponent is seeking an approval to develop the neighbourhood centre as described in Section 3.2.3 and requests the Governor reserve the decision on the detailed design of the neighbourhood centre as provided for by Section 48(6) of the *Development Act 1993*.

9.12 Energy efficiency

Guideline 4.3.23: Describe the measures associated with orientating the residential component (display village) for best possible energy efficiency, having regard to alternative or renewable energy sources, sustainable design and low emission design measures.

Guideline 4.3.24: Provide details on the elevations and plans of the energy efficient design elements (that encompass both the residential and commercial components) where alternative renewable energy options may be utilised.

The neighbourhood centre and display village have been designed to a concept level. Accordingly, detailed plans for the buildings, including the display homes, have not been prepared.

The concept design however, includes the following features which will ensure the detailed designs are energy efficient:

- Display Village allotments are oriented north south to allow houses to be built to take advantage of passive solar energy.
- The proponents will encourage builders and architects who focus on sustainable design to establish display homes in the village.
- The proponents will work with the suppliers of energy efficient appliances to install and promote their products in the village.

- The Design Guideline Principles outlined earlier in this Chapter will be applied to the design of buildings.

Should the proposal, as described in this EIS, be approved, detailed design of the neighbourhood centre will be undertaken, at which stage this guideline will be fully addressed.

The neighbourhood centre and display village will be designed to accord with relevant design requirements embodied in the Playford (City) Development Plan.

The proponent is seeking an approval to develop the neighbourhood centre as described in Section 3.2.3 and requests the Governor reserve the decision on the detailed design of the neighbourhood centre and display homes as provided for by Section 48(6) of the *Development Act 1993*.

9.13 Landscaping

Guideline 4.3.25: Provide details of all landscaping for the neighbourhood/community centre (including surface treatments, street furniture and lighting), including the contribution of the landscaping to Water Sensitive Urban Design (WSUD).

The neighbourhood centre has been designed to a concept level. Accordingly, detailed landscape plans and stormwater management plans have not been prepared.

The neighbourhood centre will be a focus for attracting new residents for many years. Accordingly, it will be well designed, well constructed and well maintained.

A concept Neighbourhood Centre Landscape Plan has been prepared by Swanbury Penglase. It demonstrates the principles that will be applied to the detailed landscape plan, including:

- The application of WSUD.
- The use of deciduous and evergreen trees to positively influence the environment around the neighbourhood centre.
- The mix of hard paved and soft landscaped areas.
- Potential for inclusion of indigenous plants.
- The use of water features for amenity, landscape character and to create a dramatic entrance to Stage 1 and the display village.
- The use of play equipment to increase the utility of the landscaped area for visitors and users of the neighbourhood centre and its community centre.

Should the proposal, as described in this EIS, be approved, a detailed design of the neighbourhood centre's landscaping will be prepared, at which stage this guideline will be fully addressed.

The neighbourhood centre, its stormwater management systems, and landscaping will be designed to accord with the principles of WSUD, as described in the report prepared by Wallbridge and Gilbert at Appendix 18 and relevant design requirements included in the Playford (City) Development Plan.

The proponent is seeking an approval for the neighbourhood centre as described in Section 3.2.3 and requests the Governor reserve the decision on the detailed design of the neighbourhood centre as provided for by Section 48(6) of the *Development Act 1993*.

Figure 9.3 Concept Neighbourhood Centre Landscape Plan

9.14 Commercial and residential waste management strategies

Guideline 4.3.26: Outline waste management strategies for commercial facilities and residential uses and the potential for incorporating recycling and resource recovery measures.

The neighbourhood centre has been designed to a concept level. Accordingly, detailed waste management plans have not been prepared.

Should the proposal, as described in this EIS, be approved by the Governor, a waste management plan for the neighbourhood centre's construction and operation will be prepared, which adopts the principles described earlier in this chapter.

Approval is sought to develop the Neighbourhood Centre as described in Section 3.2.3 and requests the Governor reserve the decision on waste management strategies as provided for by Section 48(6) of the *Development Act 1993*.

Chapter 10 Flora and fauna

This chapter examines the potential impact on existing flora and fauna on the site and adjacent areas and the management, mitigation and rehabilitation measures to be undertaken.

10.1 Local and regional context for native vegetation

Guideline 4.3.27: Describe the local and regional context for native vegetation including the identification of any rare or threatened species of flora and fauna.

Dr Bob Anderson notes all of the major vegetation communities originally present in the region are still represented there (Appendix 14). However, less than 4% of the natural vegetation communities remain on the Adelaide Plains and remnants are usually small, isolated and often degraded. For example, within the Playford LGA, no more than 1% of the original area of terrestrial, dryland vegetation remains on the plains. Historical data indicates about 260 native species were probably originally present within the wider region, of which 67 species are considered to be extinct and relatively recent records are available for 193 species in the region. Of this total, an unknown number may not now be present i.e. relatively recent extinctions.

The site is on the edge of two of the State Hundreds. It is in the northern most part of the Hundred of Port Adelaide, which contains 11.8% remnant native vegetation of which 4.3% is formally reserved. The Hundred of Port Gawler, north of the Gawler River and the site contains 15.3% remnant native vegetation of which 4.4% is formally conserved. This is considered to be a low remnancy status for each Hundred. Both Hundreds include LGAs other than the Playford LGA.

Most of the remnant native vegetation is located along the coast and there is a disproportionate representation of coastal samphire and mangrove vegetation communities in these totals. Based on analysis of regional data only about 1.2% of the original terrestrial, inland vegetation is present as remnant vegetation.

Since European settlement much of the river red gum woodland and forest and areas of black box woodland along the Gawler River have been cleared, leaving a ‘riparian ribbon’ of overstorey vegetation along the river and nil or a degraded understorey. These woodlands extended south in patches occurred between the Gawler River and the Little Para River in a mosaic.

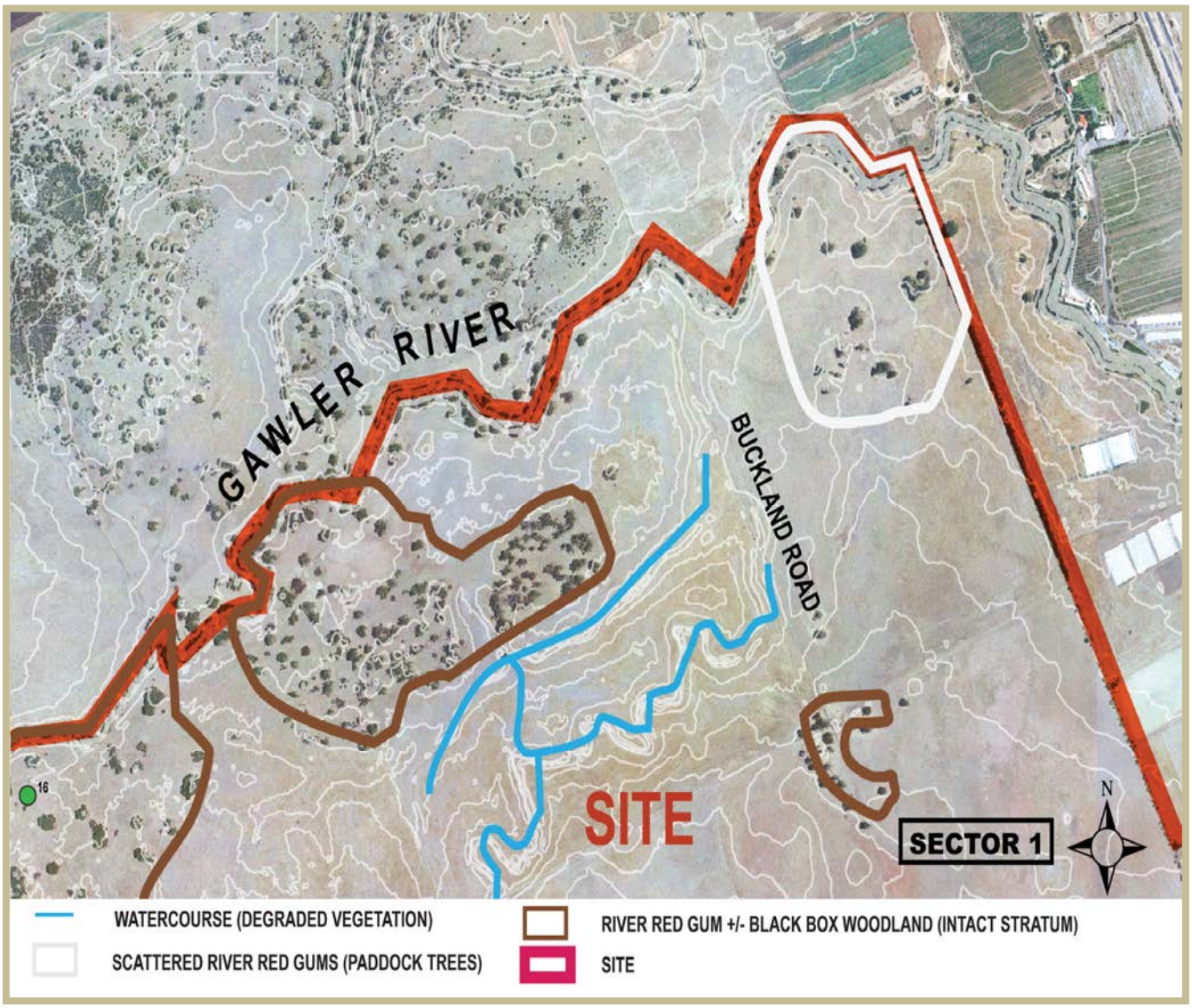
The site contains remnant riparian and floodplain woodlands, plus individual and small areas of scattered 'paddock' trees its northern areas. By observation of the extant trees and stumps, the original woodland was more extensive than currently recorded. Areas in the north west of the site are equal to or close to the extent of the tree density expected to have occurred in Pre-European settlement woodlands.

Occasional individuals of small trees and tall shrub native species occur as remnants in the site’s region, usually along roadsides and the Gawler River, and patches of tall grasslands and sedgelands dominated by *Cyperus gymnocaulos* (spiny sedge). Common reed, cumbungi, salt club-rush, spear grasses and wallaby grasses also occur along the river corridor.

Little remains of the original understorey and woody weeds dominate the shrub and under storeys of the communities, including the in-stream areas.

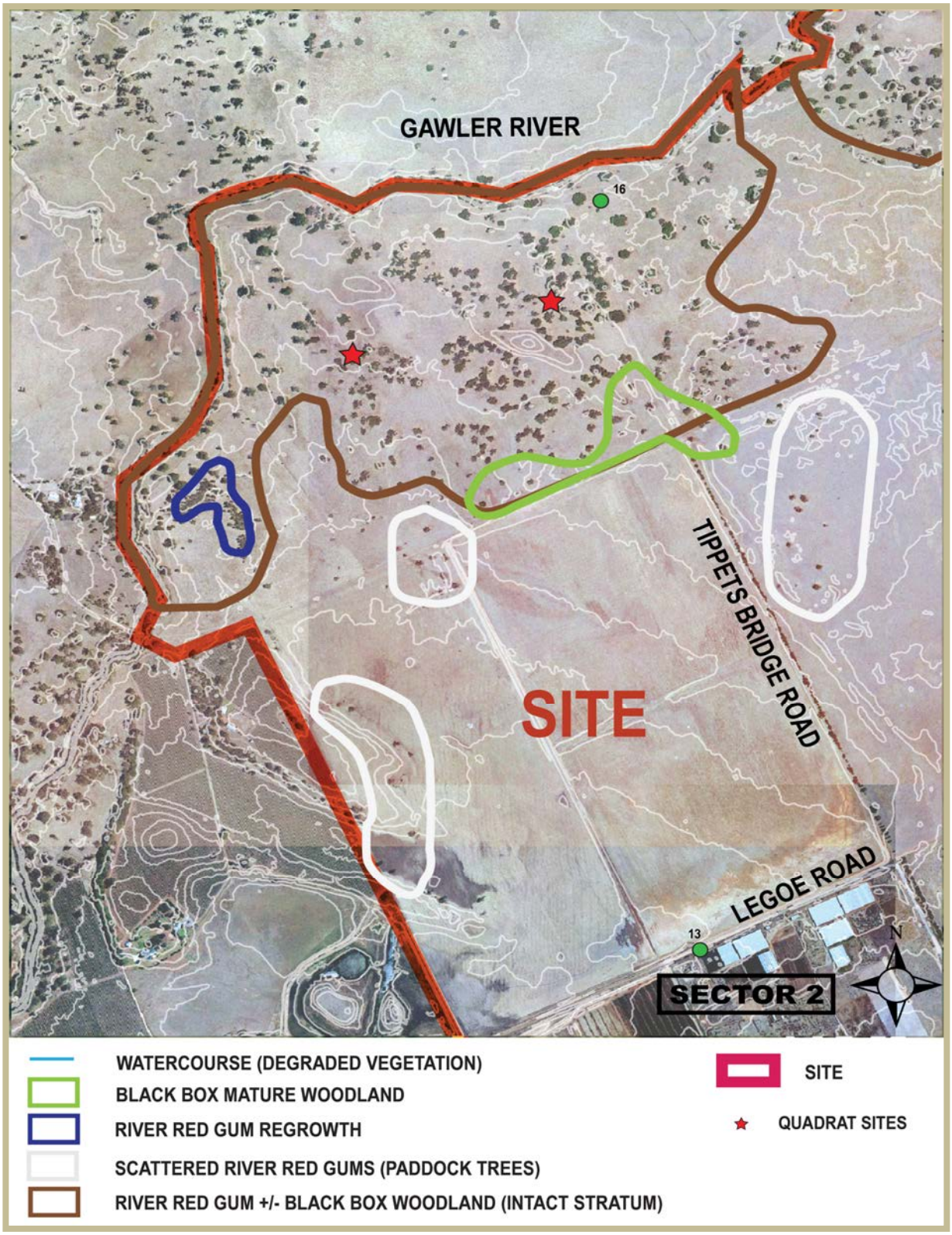
Remnant vegetation of the area south of the floodplain, which was primarily mallee box woodland, is now confined to roadsides and occasional locations on private land to the east of the site. Individuals of species from all storeys of vegetation are now uncommon to rare.

The diagrams below show the locations of significant vegetation found during a series of field assessments undertaken by Dr Anderson during 2008.



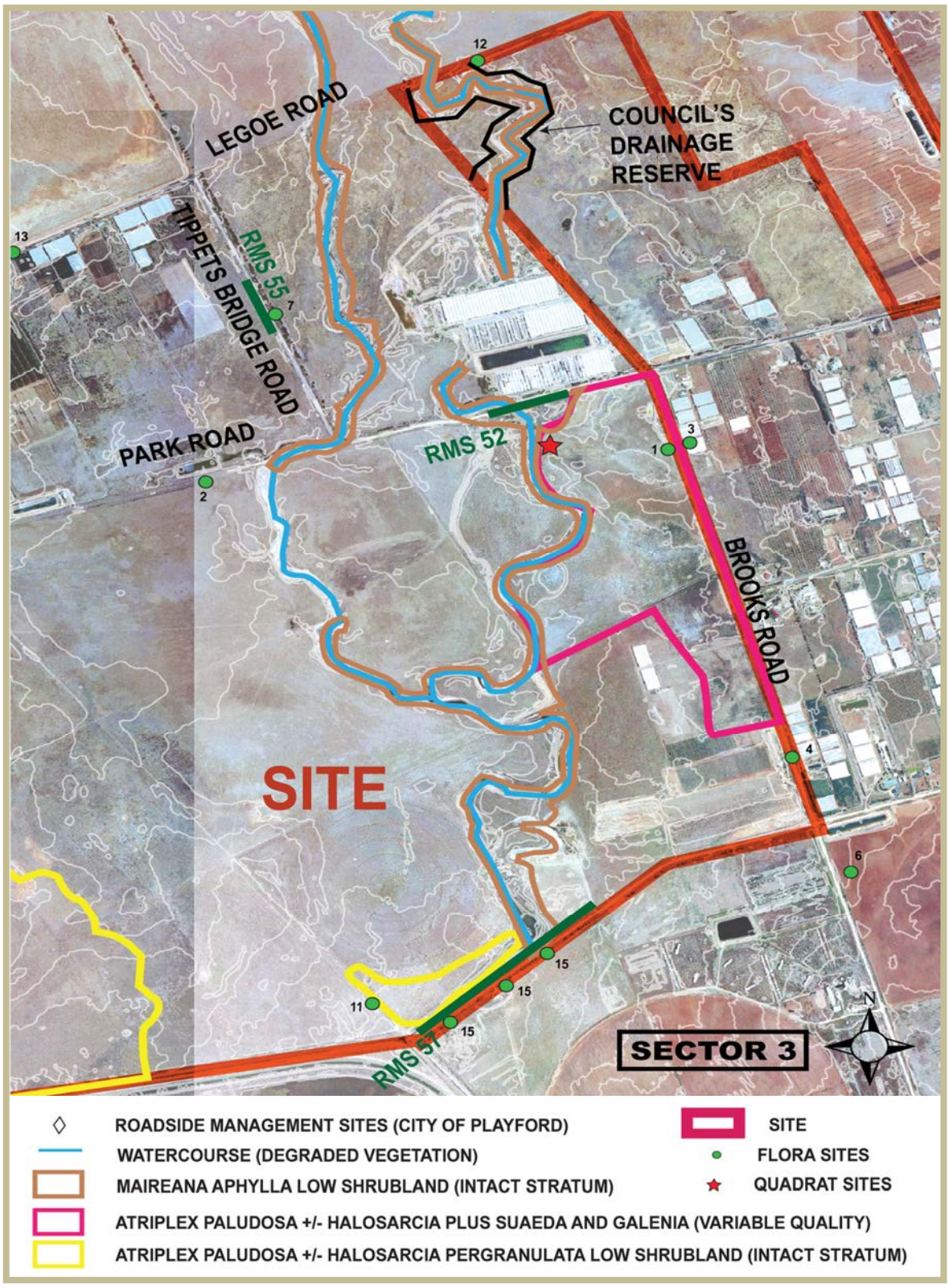
Source: Dr Bob Anderson

Figure 10.1 Flora in the Gawler River Corridor – East



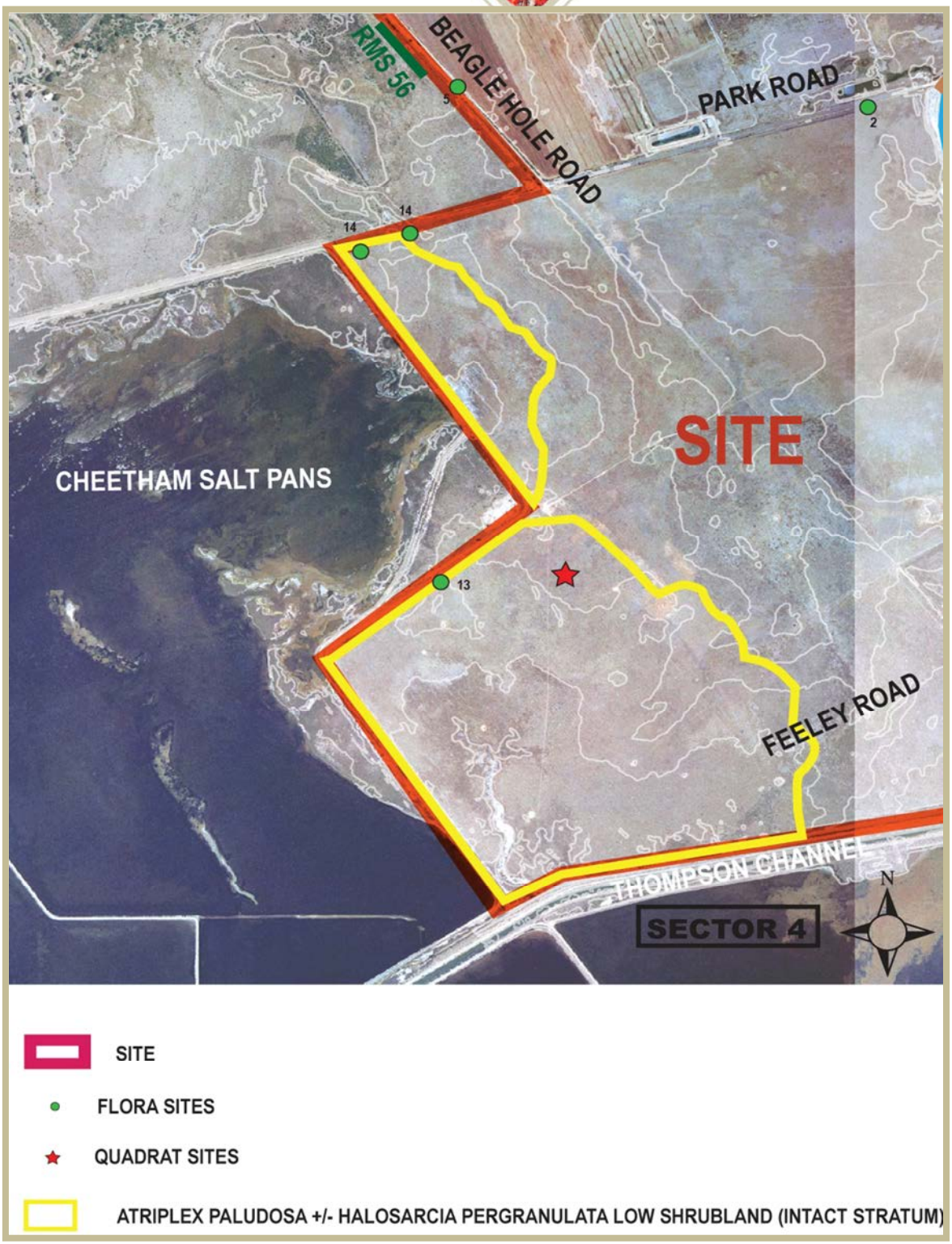
Source: Dr Bob Anderson

Figure 10.2 Flora in the north-west



Source: Dr Bob Anderson

Figure 10.3 Flora around Thompson Creek



Source: Dr Bob Anderson

Figure 10.4 Flora in the south-west

Other individual locations or particular species of native vegetation of regional conservation status include:

- Willow wattle recorded as one mature remnant tree.
- Irongrass at four locations, three of which are along roadsides and one on private property.
- Smooth cutting grass in three locations along the southern section of Thompson Creek.
- Areas of round-leaved wilsonia and rosinweed throughout road sides in much of the site.
- Areas along Thompson Creek and elsewhere in the site which include lignum and spiny saltbush.

Most of the region and the site is dominated by anthropogenic communities.

Source: Dr Bob Anderson

Figure 10.5 Flora within Stage 1

All remnant communities have a high conservation priority in the site's region, and the site contains areas with a relatively high diversity of plant species and areas of good quality fauna habitat. A number of these sites are currently being managed by Playford City Council through the Urban Forest Biodiversity Programme (UFBP).

All of the communities originally present the region and on the site are now considered to be threatened at a regional level.

However, none is formally listed under Commonwealth or State legislation or the Draft Regional Recovery Plan for the Adelaide and Mount Lofty Ranges.

The river red gum woodland on seasonally inundated flats is considered to be vulnerable in the region, and similar communities elsewhere in the State's pastoral zones are considered vulnerable.

However, the community is not listed as a priority target in DEH 2008 draft regional recovery report.

Iron-grass tussock grassland may have been present in small areas in the region but does not appear to have been present as a community on the site.

However, this community was recently listed as nationally endangered. The occurrence of individual plants on the site is rare and appears to be as a component of the understorey, rather than the nationally threatened community.

Based on all records and site assessments, a total of about 230 species have been recorded in the region and on site, of which about 75 are indigenous and 155 are introduced.

Table 10.1 lists those species with a conservation status recorded during the field assessment. Additional species are likely to be present following a year of average to above average rainfall.

Two nationally threatened orchid species potentially occur in the region:

- *Caladenia tensa* (greencomb spider-orchid, endangered).
- *Prasophyllum pallidum* (pale leek-orchid, vulnerable) which occurs in woodland and mallee communities.

However the site has been cleared and used for intensive farming, and, as a result, does not contain suitable habitat for either species. The likelihood of either of these orchid species occurring on the site is nil.

A third nationally threatened plant species may also potentially occur in the region *Halosarcia flabelliformis* (bead glasswort vulnerable). It is almost entirely confined to areas within 1 km of the eastern coastline of Gulf St Vincent, and there are relatively large populations of the species north of the site.

There is potential habitat for the species within the site, but despite extensive site assessment at the correct time of the year to detect the species, it was not recorded. The species is currently being reviewed for de-listing as a species of national significance.

Six flora species of state conservation significance have been recorded in the region.

Maireana decalvans (black cottonbush endangered), and *Juncus radula* (hoary sea-rush vulnerable), have been recorded at Bolivar on SA Water land about 15 km south of the site and west of the Port Wakefield Road. Neither was recorded on the site, although suitable habitat for both is present.

Aristida australis (wire-grass) occurs in the wider region about 9 km east of the site. Suitable habitat for the species is on the Gawler River floodplain.

Eragrostis infecunda (barren cane-grass) is present in the wider region, south of the site. The species is present on low lying areas over clay around Greyhound and Mill Roads and on SA Water land at Bolivar, all locations of which are well south of the site (13 km and 15 km respectively). Potential habitat for the species is present on the site.

Smooth cutting-grass has been recorded in the region. It was recorded during the field assessment as small populations along the southern section of Thompson Creek, including planted occurrences, and suitable habitat for the species occurs elsewhere in the site.

Rumex dumosus (wiry dock) was not recorded on the site or in the region, but it is present in the wider region, on the Salisbury Highway, about 20 km south of the site. The remaining four species were not recorded on the site and are unlikely to occur there due to the lack of suitable habitat.

Table 10.1 Indigenous flora species recorded or predicted to occur on the site and their conservation status

Family	Species	Common Name	Conservation status	
			SA	SL
Chenopodiaceae	*Maireana aphylla*	leafless cottonbush		V
	M. enchylaenoides	wingless fissure weed		Q
	M. suaedifolia	lax bluebush		R
	Halosarcia indica ssp. bidens	brown-head samphire		K
	R. spinescens	spiny saltbush		E
	Sclerolaena uniflora	small-spine bindyi		K
Convolvulaceae	*Cressa cretica*	rosinweed		V
	Wilsonia rotundifolia	round-leaved wilsonia		V
Cyperaceae	*Gahnia filum*	smooth cutting-grass	R	R
Euphorbiaceae	*Adriana quadripartita*	coast bitterbush		U
Gramineae	*A. elegantissima*	feather spear-grass		U
	A. eremophila	rusty spear-grass		U
	Enteropogon acicularis	umbrella grass		Q
Labiatae (Lamiaceae)	*Teucrium racemosum*	grey germander		T
Leguminosae	*Acacia ligulata*	umbrella Bush		K
	Acacia salicina	willow wattle		V
Liliaceae	*Lomandra effusa*	scented matt-rush (irongrass)		R
Marsiliaceae	*Marsilea drummondii*	nardoo		R
Myrtaceae	*Eucalyptus largiflorens*	black box		V
	Melaleuca lanceolata ssp. lanceolata	dryland tea-tree		U
Pittosporaceae	*Pittosporum angustifolia*	native apricot		R
Polygonaceae	*Muehlenbeckia florulenta*	lignum		R
Primulaceae	*Samolus repens*	creeping brookweed		U
Solanaceae	*Nicotiana maritima*	coast tobacco		R

Notes: SA = South Australia, SL= Southern Lofty botanical region, + = recorded, - = not recorded or unknown

South Australian Conservation Status – The codes are based on the Schedules of the National Parks and Wildlife Act 1972 as amended in 2008.

Regional conservation status - The botanical region as defined by the State Herbarium (Plant Biodiversity Centre).

T Threatened: likely to be either Endangered or Vulnerable but insufficient data available for more precise assessment.

V Vulnerable: rare and at risk from potential threats or long term threats that could cause the species to become endangered in the future.

K Uncertain: likely to be either Threatened or Rare but insufficient data available for a more precise assessment.

R Rare: has a low overall frequency of occurrence (may be locally common with a very restricted distribution or may be scattered sparsely over a wider area). Not currently exposed to significant or widespread threats, but warrants monitoring and protective measures to prevent reduction of population sizes.

U Uncommon: less common species of interest but not rare enough to warrant special protective measures.

Q Not yet assessed but flagged as being of possible significance.

Source: Dr Bob Anderson adapted by Walker Corporation

There is suitable habitat for two flora species with listed conservation significance for the Southern Lofty botanical region on the site, but they were not recorded during the site survey. Their significance rating is a guide only and does not have standing under legislation.

Rhagodia spinescens (spiny saltbush) is considered endangered in the region, and Teucrium racemosum (grey germander) is considered threatened in the region. These species may occur on the site, but were not recorded during the site survey.

10.2 Vegetation clearance

Guideline 4.3.28: Calculate the amount of vegetation clearance that would be required for the whole site and for individual vegetation association or ecological community types.

Guideline 4.3.29: Identify measures to minimise and mitigate vegetation clearance and to compensate for the loss of native vegetation and habitat and to deliver significant environmental benefit.

10.2.1 Vegetation clearance

Dr Bob Anderson has undertaken a flora survey of the site. The results of his survey are summarised in section 10.1. His full report is at Appendix 14.

Figure 10.6 shows the key vegetation areas identified by the survey affected by the Masterplan. The majority of the site is vegetated with species introduced since European occupation.

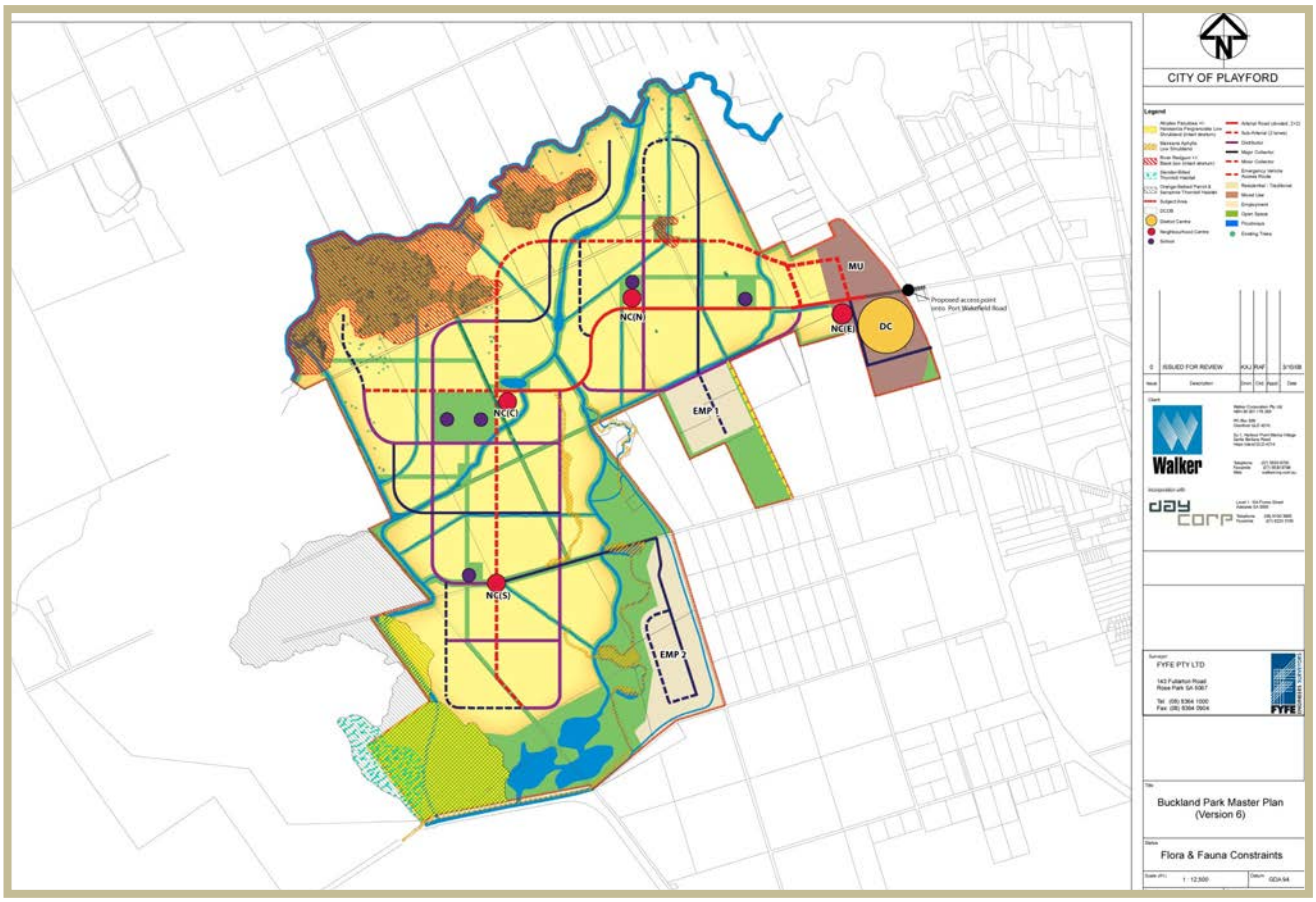


Figure 10.6 Masterplan over remnant vegetation

Table 10.2 Surveyed areas of vegetation potentially affected by the Masterplan – Flora area calculations

Description	Surveyed (ha)	Potentially impacted by future stages (ha)	Not potentially impacted by future stages (ha)
Blackbox woodland	6.37	5.74	0.63
Maireana aphylla low shrubland	78.39	19.77	58.62
River Redgum +/- Black box	127.94	41.65	86.29
Atriplex paludosa +/- Halosarcia pergranulata plus Suaeda and Galenia	103.66	30.98	72.69
Total	**316.36**	**98.14**	**218.23**

Source: Fyfe Surveyors October 2008

No trees or native vegetation will be removed as a consequence of Stage 1.

Approximately 98 ha containing remnant vegetation may potentially be affected in the proposal's later stages. It must be noted that this figure is based on preliminary field surveys, and the Masterplan.

It will be confirmed by detailed field survey, and detailed land division design of the proposal's future stages, as discussed below.

10.2.2 Measures to minimise, mitigate and compensate for vegetation clearance

The Masterplan

The first mitigation action was to inform the Masterplan design by identifying remnant communities and individual species through site assessment, and to validate the results by checking and consultation.

The proposal's planning and design phase started with the field assessments undertaken over 2007 and 2008. As far as practicable, these identified areas of remnant native vegetation and areas of native vegetation planted by local councils and others and the location of these areas has been recorded by GPS, in a database and mapped.

As far as possible, species in all site sectors were identified accurately, although there were some areas for which species identification has not been possible, due to the drought conditions during 2007/08.

This identification process, of both communities and species, was confirmed by independent review of existing reports, databases and sites provided by government agencies and individuals.

These areas were mapped (Figures 10.1 to 10.6 and Appendix 14).

This map was used to establish broadly open space areas required within the Masterplan and to the methods for achieving a Significant Environmental Benefit (SEB).

Adjustments were made to the Masterplan's residential areas in the site's north-west and the stormwater channel in the vicinity of Thompson Creek in response to vegetation constraints.

However, this identification is a 'work in progress'. Detailed survey will be required as part of the detailed design of the proposal's future stages, during both winter and spring to assess if additional areas or species of winter growing plants are present during a year of average rainfall.

This work will inform each stage's:

- Detailed land division plan.

- Detailed landscape design.
- Flora and Fauna Rehabilitation, Revegetation and Management Plans
- Requirements to achieve a SEB or comply with the significant tree provisions of the *Development Act 1993*.

Stage 1

Within Stage 1, no measures are required to minimise, mitigate or compensate for vegetation clearance.

However the Flora and Fauna Management Plan included in Stage 1's CMP will include the following provisions:

- Measures for identifying, collecting and transplanting indigenous grasses to landscaped areas in the public domain.
- Measures to minimise the spread of weed species outside of construction zones.

Design Guidelines for new houses within Stage 1 will include a range indigenous species for inclusion in gardens.

Landscape designs will include indigenous species for the public domain.

Community building programmes should include activities which educate and involve the new community in the biodiversity of their surrounds, for example, community planting days.

Gawler River floodplain woodlands

The Gawler River riparian ribbon is accommodated in the Masterplan in an open space area. It includes occurrences of a number of species of conservation significance. Removal of trees and areas of native understorey species in the Gawler River riparian corridor is not proposed.

The understorey along the corridor is dominated by weed species. Undertaking revegetation and rehabilitation works along the corridor to reconstruct the vegetation communities and habitat areas would have a potential for large, positive regional outcomes.

This approach should be formalised in Flora and Fauna Rehabilitation, Revegetation and Management Plans.

While the trees are of botanical interest as a vegetation community and most are significant trees as defined under the *Development Act 1993*, their particular value is as fauna habitat, especially for avifauna and some mammals, especially bats. This matter is discussed in detail in the Dr Bob Anderson's *Fauna Technical Report 2008* (Appendix 15).

These trees are old and relatively fragile. They will drop limbs during and following times of stress, such as drought or strong winds. The dropped limbs to be tolerated, and not removed, as they are part of the site's ecological values.

The Masterplan accommodates most of the Gawler River floodplain red river gum woodlands within open space areas. However, some of the woodland, the black box and areas with lower density trees are incorporated into the Masterplan's low density residential areas. The proposal's stormwater channels will also pass through the woodlands.

Potential impacts on the woodlands include:

- Removal of trees and parts of communities and their buffer areas.
- Fragmentation of communities and associated fauna habitats.
- Placement of buildings and gardens too close to woodlands, i.e. without an appropriate buffer.
- Inappropriate fire regimes (arson and bushfire).
- Damaging trees, especially damaging or removing tree canopies and roots during construction.

- Redirecting storm and ground water away from woodland areas and trees.
- Compaction of soil around trees during construction.
- Introduction and spreading of weeds.

In these areas it is proposed to:

- The detailed land division and landscape design for these stages will be informed by further flora survey work, focused on the potentially affected areas, to minimise vegetation clearance and tree removal, and allow for rehabilitation and revegetation of retained woodlands and their diversity.
- Scattered trees and small patches of trees will be incorporated into the stage's parks and detailed landscape design.
- Flora and Fauna Rehabilitation, Revegetation and Management Plans will be included in each stage's CMP. A construction approach is required which minimises the construction zones along the boundary of woodland areas and preserve and manage individual trees.

The Plans and landscape designs will require elements which ensure residents and the general public do not have uncontrolled access to these areas. These measures are required to protect people, but particularly to protect the trees and revegetated areas. Dropped limbs must be allowed to remain.

Thompson Creek shrublands, sedgelands and grasslands, and other aquatic communities

This is a complex of related communities, with the two dominant ones being:

- Marsh saltbush +/- black seeded samphire +/- Austral seablight low chenopod shrubland in the southern section of the site.
- Leafless cottonbush shrubland in the central geographic sections of the creek system.

Small areas of tall sedgeland and grassland dominated by cumbungi, common reed and salt clubrush are also present in a mosaic along sections of the creek.

Some areas of low chenopod shrubland and leafless cottonbush shrubland are within the Masterplan's residential precincts and stormwater channel. There is potential for current weed infestations of adjoining areas and the potential to introduce existing and new weeds during construction.

The area along and adjacent to the eastern reach of Thompson Creek is included in the Masterplan's open space areas and will not be impacted by construction of the stormwater channels.

Other locations of these communities are along the roadside areas, including the RMS, and no disturbance is proposed to take place in those areas which contain remnant native vegetation.

The detailed land division and landscape design for these areas will be informed by further flora survey work, focused on the potentially affected areas.

The CMP for these stages will include Weed Management Plans, and Flora and Fauna Rehabilitation, Revegetation and Management Plans.

Southern chenopod shrublands

These two areas are the most extensive native vegetation community on the site and contain a number of important plant species of regional significance.

They are of significant value as fauna habitat for nationally and state threatened bird species.

They are:

- A relatively intact community in the south west of the site adjoining the Cheetham salt pans, of which part is included within the Masterplan's residential areas, and some is potentially affected by the construction of stormwater channels. Channel construction could also introduce weed species into adjacent shrubland.
- Sparse and degraded areas of the community east of the relatively intact community. This area includes areas of round-leaved wilsonia and rosinweed as the understorey. Part of this area is included in one of the Masterplan's residential areas.

The detailed land division and landscape design for these areas will be informed by further flora survey work, focused on the potentially affected areas.

The CMP for these stages will include Weed Management Plans, and Flora and Fauna Rehabilitation, Revegetation and Management Plans.

A strict policy of revegetation using native samphire and chenopod species to rehabilitate the channel earthworks will be required. Additional areas within the site could be revegetated with these species. An example of successful habitat establishment in a similar environment is the Greenfields and Barker Inlet wetland complex.

Wilsonia and cressa

These occur throughout the saline areas, including roadsides. These areas are discussed above, under the Thompson Creek and southern chenopod shrubland communities.

RMS areas, other roadside native vegetation and Indigenous low grasslands

Detailed land division and landscape designs of the proposal's future stages will need to consider the location, retention and management of these areas. They could be included in open space, or road reserves as they are now. Their incorporation into larger, revegetated areas of open space will also be considered.

However, if the affected stages cannot be successfully designed around RMS, measures such as:

- Fencing.
- Salvage of plants or collection of propagating material, for use in revegetation schemes elsewhere on the site.

Most native grassland areas are along roadsides. The CMP for all stages will include Weed Management Plans, and Flora and Fauna Rehabilitation, Revegetation and Management Plans which will include provisions for the salvage and reuse of grassland species in public domain plantings.

Anthropogenic areas

As the anthropogenic areas of the site have little to no native vegetation, inclusion of these areas in the Masterplan's built areas will be unlikely to have an adverse combined or cumulative impact on native vegetation.

Landscape designs for the public domain including streets, parks and commercial and community spaces will incorporate indigenous plants.

The Design Guidelines provided to new residents with the purchase of their allotment which will encourage the use of indigenous planting in gardens.

Combined and cumulative impacts

The cumulative and combined impacts of urban growth on the native vegetation and fauna habitat throughout northern Adelaide needs to be considered in the State Government's strategic planning.

The South Australian government is reviewing Adelaide's strategic planning. On 5 November 2008 the Minister for Urban Development and Planning initiated the "Growth Investigations Areas" project to ensure there is enough land to accommodate Adelaide's projected growth over the next 25 years.

As well as the site, other areas in northern Adelaide are being considered, including Dry Creek, approximately 20 km south of the site.

Individual species

Detailed land division plans and landscape designs will consider the location and context of individual species on the site. They will be incorporated into open space where practical, or salvaged or replaced in a location as close as possible to where they are found.

Offsite impacts

The most likely adverse off site impact will arise from a large new population in a region that is currently sparsely populated.

The environmental pressures associated with people will likely be an increased incidence of use on the Cheetham salt pans, the coastal plain, the Gawler River corridor, Buckland Park Lake and Port Gawler Conservation Park. This will include both legal access and illegal trespassing. This issue is addressed in Chapter 8.

Other environmental pressures and risks will be in the form of illegal removal of trees and deadfall timber for firewood, arson, the use of unsuitable garden plants, and the illegal dumping of green wastes, especially from new houses adjacent to areas of high quality native vegetation. All of these activities will slowly erode the integrity of the native vegetation, both as communities and species.

Mitigation measures include:

- Fencing of biodiversity areas within the site.
- Educating new residents about the biodiversity around their homes, including creation of wildlife friendly gardens, control of domestic animals. This will be achieved, through 'welcome packs' and community building activities which focus on biodiversity areas, for example community planting days, walks and talks from ecologists. Playford City Council already undertakes such activities for its existing residents (see Chapter 14).
- Provision of adequate waste management facilities for residents (see Chapter 9).
- The Design Guidelines provided to new residents with the purchase of their allotment which will encourage the use of indigenous planting in gardens.
- Landscape designs for the public domain including streets, parks and commercial and community spaces will incorporate indigenous plants. Including, liaison with Country Fire Service and Metropolitan Fire Service authorities to establish fire management requirements.

Weeds

Throughout the region and site there is a wide range of annual and perennial weed species. About 220 species of introduced plants have been recorded in the region. Of these, about 54 species are of particular concern due to their impacts on agriculture and remnant native vegetation.

Most of the roadsides and many of the paddocks within the site are weed infested. The movement of soil and vehicles has the potential to transport weeds through the site, its vicinity and the region.

Earthworks and native vegetation clearance for the new stormwater channels also have the potential to introduce weeds, directly into adjoining, intact, retained vegetation.

Much of the site is anthropogenic and is likely to experience minimal environmental impacts. However, without suitable and stringent management actions, weed species will be transported from construction zones into adjacent areas, resulting in the degradation of the small areas of remnant native vegetation existing on the site.

The CMP for each of the proposal's stages should include a Weed Species Management Plan, prepared in accordance with the *Natural Resources Management Act* and the State's *Biosecurity Strategy*.

10.2.3 Significant environmental benefit

As part of the preparation of each future stage's detailed land division plan, detailed flora and fauna surveys will be undertaken of the significant areas. Vegetation and habitat proposed for removal will be identified. Requirements for compensation or mitigation to achieve a SEB will then be calculated.

Future detailed designs should consider new species, communities and threatening processes established by the Commonwealth and State governments in the future.

SEBs can be achieved through the following measures:

- Establish and actively manage new areas of native vegetation on the site and/or at an agreed area of the same or similar community(ies) in the region.
- Protect and manage native vegetation on the site, including formal protection by a Heritage Agreement.
- Establish a Heritage Agreement for other areas of native vegetation, with a Vegetation Managment Plan.
- Payment into the Native Vegetation Fund.
- A combination of the above management options.

The proposal provides for achievement of the required compensation and mitigation methods.

There are opportunities for SEB works to be undertaken in areas of conservation significance in the site's locality, such as the Gawler River corridor, or areas in the region, such as Buckland Park Lake, Port Gawler Conservation Park, or other areas of State owned land along the coast, shown in Figure 8.2.

Cooe found ecologically significant vegetation and habitat on the coastal plain to the site's west of the site has suffered degradation from feral animals and general rubbish. The impacts of Cheethams salt pans, with changes to land form and hydrology were also evident (Appendix 11).

Establishing an environmental improvement program in these areas would provide a suitable contribution towards achievement of a SEB. These actions could be part of the Draft Regional Recovery Plan for threatened species and ecological communities.

Works that could be undertaken by the proponent, or funded through the Native Vegetation Fund, include:

- Removal of feral animals.
- Removal of weeds and rubbish.
- Revegetation.
- Drainage and erosion control works.

These works would be subject to preparation of Rehabilitation and Revegetation Plans and Management Plans for the targeted land. Active participation in the Draft Regional Recovery Plan is a realistic contribution to the proposal's SEB.

A targeted weed management strategy for the Gawler River corridor would result in positive environmental outcomes, contributing a SEB. The river bed and its banks are densely infested with weeds such as African

boxthorn, briar rose, castor oil plant, Noogoora burr, fennel, prickly pear and olive, which are proclaimed or major environmental weeds in South Australia. Bridal creeper, a weed of national significance (WONS) also occurs along the River.

Weed infestations occur along the whole Gawler River length, east and west of the site. In order to be effective, an integrated management programme involving Councils and other land owners is required.

Rehabilitation, revegetation and management of other areas within the site with significant vegetation will make a positive contribution towards SEB, particularly:

- Along the Gawler River corridor and its flood plain in the north-west corner.
- Areas in the south-west corner.
- Thompson Creek's eastern reach.

All storeys of native vegetation will be used and the placement of these species in the landscape will, as far as practicable, accord with that which would have originally been present prior to 1836.

Landscape design for public domain areas will include a component of indigenous flora. To achieve this commitment, collection of propagating materials from different biotypes from the same species within the site and region will be required.

Species required for landscaping, revegetation or regeneration which are difficult to propagate from seeds will propagated from cuttings. The amount of seeds of each species (for direct seeding) and the numbers of plants required as tube stock (seedlings and struck cuttings) will be determined after the exact areas with particular soil characteristics and uses are identified during each stage's detailed design.

As part of each stage's detailed design, the stage will be surveyed on foot. Areas of native vegetation present will be assessed. If these are common species, such as a sparse occurrence of native colonising species (e.g. short-leaf bluebush or rough spear-grass), then no addition mitigation actions will be required.

If there are species that are unusual or threatened, even isolated plants or small clumps, then the species will be protected by collection, either of the plants, followed by transplanting into a secure area, or of propagating material (seeds or cuttings).

The CMP's Flora and Fauna Rehabilitation, Revegetation and Management Plans will include induction procedures to ensure all workers are briefed about the importance of native vegetation.

The project manager will be responsible for ensuring that compliance occurs or if it does not, then establishing remedial requirements. The key responsibility of all will be to avoid all areas of native vegetation marked on management maps and in the field.

The Management Plan will include requirements for the conservation and revegetation areas, such as watering and replacement of plantings and maintenance of all areas.

10.3 Edge effect on biota and ecological processes

Guideline 4.3.30: Describe potential changes in biota and ecological processes at the interface between the proposed development and existing vegetation, i.e. the 'edge effect'.

This issue is addressed in Chapter 10.2.2.

10.4 Impact of runoff on marine organisms and seagrasses

Guideline 4.3.31: Describe the likely effects on marine organisms and seagrasses, in the context of runoff from the proposed development into the river and out to sea potentially reducing the salinity and increasing nutrients, suspended sediments and pollutants, particularly heavy metals.

This issue is addressed in detail in Chapter 8.

10.5 Landscaping and revegetation

Guideline 4.3.32: Describe the use of amenity/landscape plantings and broad scale revegetation, including how these will enhance biodiversity through the use of locally indigenous species and how the planning and implementation will result in achieving ecological goals associated with a significant environmental benefit.

This issue is addressed in Chapter 10.2.3.

The use of indigenous flora in landscaping will be important to meet sustainable water use objectives, and to create an identifiable community identity, required to meet community building objectives.

10.6 Pests, insects, animals and diseases

Guideline 4.3.33: Describe how the spread of pest plants, insects, animals and diseases within and around the proposed development would be managed including species that may originate from gardens and landscaped areas.

This issue is addressed in Chapters 8, 7 and earlier in this Chapter.

Chapter 11 Other environmental issues

This chapter describes the potential environmental impacts the proposal may have on land uses within its locality, and the potential environmental impacts those land uses may have on the proposal.

11.1 Air pollution control and monitoring

Guideline 4.6.19: Describe the impacts to residents of the proposed development of any odour and fugitive emissions drift from the Jeffries composting operation on adjacent land.

Guideline 4.3.34: Describe how all potential sources of air pollution will be controlled and monitored.

Connor Wagner identified potential sources of air pollution and odour within the locality of the site (Appendix 12). These are:

- Pesticide spraying associated with horticulture businesses by aerial spraying, or boom spraying from a tractor. Aerial spraying is not likely to be used frequently in the area, given the small scale of horticultural activities, and the use of glass houses.
- Odours, bio-aerosols and dust associated with the Jefferies composting facility. The "strength" of odour was established from compost samples collected from compost windrows at the facility. The likely areas around the facility which may be impacted by odour where identified by modelling of local meteorological conditions.

  To establish the likelihood fugitive dust emissions and bio-aerosols from the facility impacting on the proposal, Connell Wagner reviewed the *Assessment Report for the Public Environmental Report for the Jeffries Garden Soils Organic Waste Treatment and Recycling Research Facility, Buckland Park,* prepared by Planning SA in November 2003.

  Microbial sampling in the facility's vicinity was also undertaken.

Connell Wagner concluded the proposal will not be impacted by odour, biological aerosols or dust impacts from the operations at the Jeffries Facility.

Nor will the proposal impact on the operations of the Jeffries Facility and does not impose any additional operating requirements on the Facility.

Below is more detailed discussion of each issue. Figure 11.1 shows the relationship of the Jefferies demonstration farm and composting facility with the Masterplan.

The creation of dust is a potential impact associated with the proposal's construction activities.

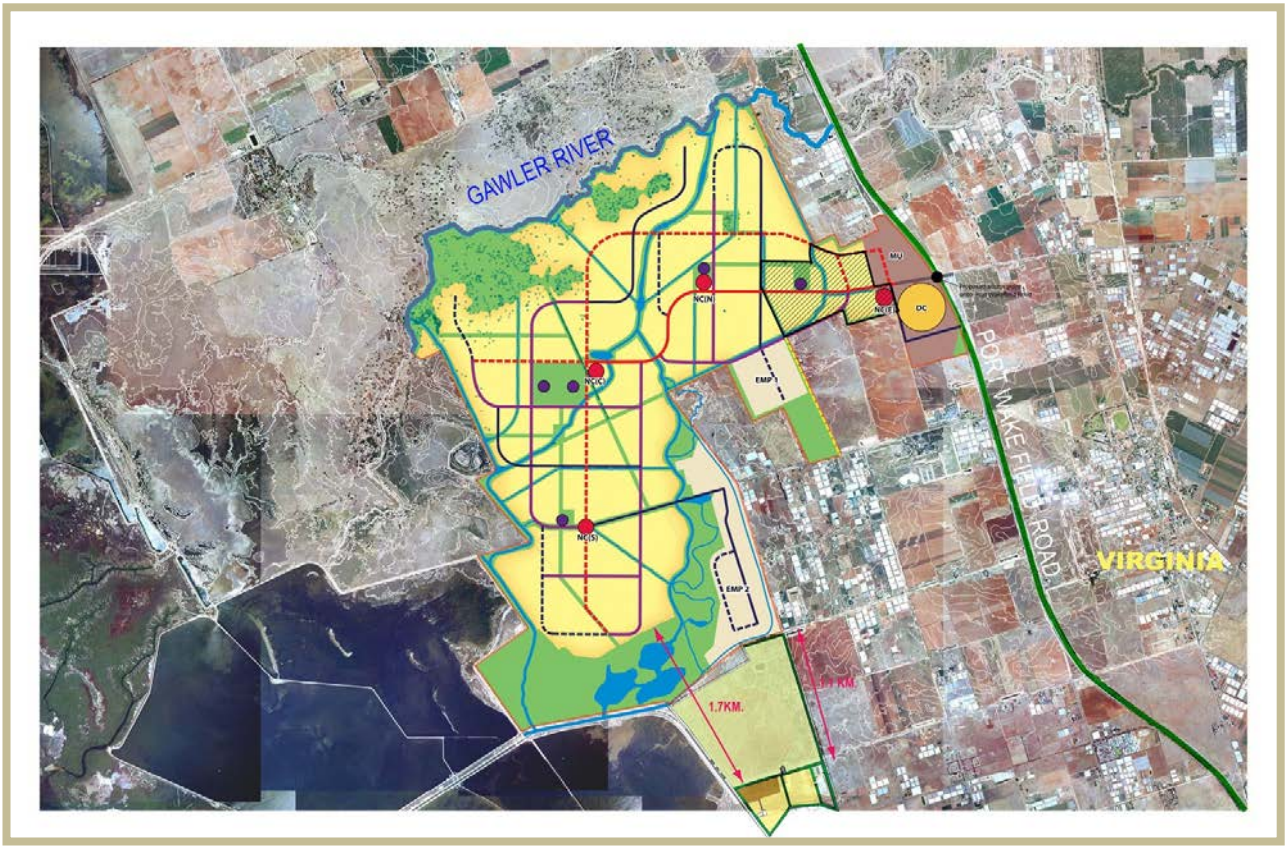


Figure 11.1 Jefferies demonstration farm and composting facility with Masterplan

11.1.1 Air pollution

Potential air pollution from spraying associated with horticultural activities is controlled and monitored in accordance with the EPA *Guidelines for Responsible Pesticide Use* 2005.

The locality's farmers should be currently applying the Guidelines, and will continue to do so into the future. In summary, the Guidelines recommend:

- Maintenance of careful records to avoid potential accusations of spray drift or chemical trespass.
- Discussion with communities to help determine their concerns, and identify any sensitive adjacent locations. This will allow the creation of Air Quality Management Plans which minimise damage potential. Management Plans should be iterative so that they can respond to complaints or discussions with the communities.
- The application of aerial pesticides on crops should be avoided during periods of heavy rainfall or following rainfall, to minimise potential off-target flow of pesticides through moist soils and waterways.
- The application of aerial pesticides on crops should be minimised during periods of mild temperatures, high humidity and low wind speeds that are blowing from the sensitive locations.
- The application of aerial pesticides on crops should be avoided during periods of calm wind speed conditions as drift is unpredictable during these periods.
- The application of aerial pesticides on crops should be avoided during periods of low humidity and temperatures are above 27°C as spray droplet size will decrease due to evaporation, leading to the exacerbation of drift. In

addition, volatile organic compounds could potentially vaporise and re-enter the atmosphere. This could potentially lead to conditions resulting in the creation of inversion layers and unstable atmospheric conditions, greatly increasing the probability and magnitude of drift.

Application of the EPA's Guidelines to any aerial spraying will minimise spray drift impacts on the site.

Connell Wagner's modelling established dispersion from aerial spraying from low flying aircraft is expected to lead to negligible levels of deposition of pesticidal compounds on the site, and in any case, unlikely to occur.

In respect of boom spraying from trucks, minimal dispersion of spray is anticipated.

Connell Wagner concluded spray drift from the application of pesticides on agricultural land will have negligible to zero impact on the proposal.

11.1.2 Odour

Analysis of odour from the Jefferies facility found that, under the worst case conditions, the 3 minimum average 99.9th percentile odour concentration would be compliant with the EPA's 2 Odour Unit limit at locations 1.7 km from the facility.

Accordingly, the Masterplan locates residential areas beyond 1.7 km from the facility.

The proposal will not impose any additional operating requirements on the facility. Jeffries already implements a management strategy designed to avoid the creation of anaerobic conditions in the composting windrows and formation of stagnant pools, thereby minimising odour emissions from the facility.

11.1.3 Dust during construction

The CMP for each of the proposal's stages will set out procedures for monitoring and controlling dust generation, including spraying exposed areas of soil during earthworks, particularly in windy conditions, and the secure covering of stockpiled materials and trucks removing soil.

CMPs will include provisions for the name and contact details of the project manager to be publicly available so residents can direct complaints regarding dust generation to the person responsible for rectifying any problems.

11.1.4 Dust after occupation

The impact of dust generating activities and wind erosion from stockpiles at the Jefferies composting facility was assessed as part of its 2003 Assessment Report.

The analysis of the daily averaged PM10 contours showed that the 50 µg/m^3 NEPM guideline is complied within at the facility's boundary.

At the site's boundary, the emission of dust from the Jefferies facility's is not expected to exceed the *Federal National Environment Protection Measure Guidelines*.

Jeffries have committed to a series of dust suppression, mitigation and control measures that minimise emissions and ensure the facility's activities do not lead to exceedances of the criterion. These include:

- Use of covered trucks for incoming material.
- Primary processing in an enclosed building.
- Windrow turning, grinding and tromelling operations are not conducted in extreme dry windy weather conditions if watering proves ineffective.
- Maintenance of windrows at their optimum moisture content (~40-50%).
- Watering of other operational areas with sprinkler systems in dry windy conditions.

- Use of water trucks in unsealed trafficked areas during dry windy conditions.
- Restrict vehicle speed within the site to 10 km/h.
- Monitoring of meteorology and dust concentrations on site, to be used to assist in dust control management.

The consistent implementation of these standard dust measures will lead to there being minimal air quality issues at the boundary of the residential areas accommodated in the Masterplan.

11.1.5 Bio aerosols

The microbial survey conducted at several sites adjacent to and at the Jeffries facility showed that microbial levels returned to ambient concentrations approximately 500 m downwind of their source. As the proposal's future residential areas are beyond 500 m of the facility, it is expected there will be no impacts on the health of the future residents.

11.2 Noise mitigation and attenuation measures

Guideline 4.3.35: Describe any noise mitigation or attenuation measures.

Connell Wagner identified all potential noise sources with the site's locality, and accommodated in the Masterplan. They then considered the potential for noise impacts on sensitive receivers in the site's locality, and within the Masterplan (Appendix 13).

11.2.1 Noise during construction

During construction residents in the site's locality and completed stages may hear noise from machinery and from additional, construction related traffic.

Some vibration may be experienced at sensitive receptors. This will be limited demolition associated with the proposal. Only 2 dilapidated glass houses will be demolished.

A CMP will be prepared for each of the proposal's stages which will include a Noise Management Plan with measures to ensure noise and vibration are monitored and controlled, in compliance with the SA *Environment Protection (Noise) Policy and Explanatory Report* 2007, and relevant guidelines such as the DIN 4150:1986 Part 3 *Structural Vibration in Buildings – Effects on Structures*.

Noise Management Plans include the following provisions:

- Provide advance notice to, and regular communication with, existing residents before and throughout any noisy construction activities.
- Install a temporary acoustic barrier/fence along the boundary of construction areas providing line of sight shielding to the nearby residents. The temporary barrier may be constructed of lapped gapless timber (e.g. 20 mm thick timber overlapped 25 mm or 25 mm thick plywood, or 6mm compressed fibre cement, or material with equivalent density). The barrier shall be impervious, continuous and have no gaps/holes/cracks over the entire length.
- Excessively noisy machinery should preferably not be operated before 9:00 a.m. and should be located as far as possible from the noise-sensitive premises. Where possible and practicable, noise machinery should have appropriate mufflers, silencers and/or enclosures fitted to reduce noise transmission.
- Avoid the coincidence of noisy plant/machine working simultaneously close together and adjacent to sensitive receivers.
- Where needed, obtain an exemption from the EPA to exceed the *Environmental Protection (Noise) Policy*. This will cost about $500 and take about 2 months from the date of lodgement to obtain. These are routinely issued to facilitate construction activities.

- Conducting noise and vibration monitoring when working close to potential affected sensitive receivers to ensure that the levels satisfy the EPA criteria. In addition, the monitoring will enable noise and ground vibration records to be kept and used for reference in the event of a complaint.
- As far as practical, all operations causing relatively high levels of noise and vibration should be carried out at a time to cause the least annoyance to neighbouring residents. Restrict construction time between 7:00 a.m. to 5:00 p.m. Monday to Friday and 7:00 a.m. to 1:00 p.m. Saturday with no work being carried out on Sundays.
- The use of light machinery (e.g. smaller excavators and rollers) during operation near the southern boundary (closest to the residential buildings).
- All construction vehicles and trucks will enter and leave the site in accordance with site entry controls. Avoiding heavy vehicle movement if possible along McEvoy Road and Thompson Road where there is a potential traffic noise impact to the residents along the road.
- Ensure all equipment is limited to a sound pressure level at 15 m of 85 dBA (under worst case operating mode), either by fitting silencers/shrouds to existing equipment or by using updated equipment (equipment should be no more than 5 years of age).
- Where possible, locate any stationary constant noise sources such as air compressors, generators, cranes etc. as far as possible from adjacent or nearby premises, and if necessary provide additional screening.

A Consultation Plan will also be in the CMP, which will include provisions to advise residents of up coming noisy activities, the project manager's details for complaints, and the maintenance of a complaints register.

11.2.2 Sensitive receptors within the Masterplan

Future sensitive land uses within the Masterplan are unlikely to be affected by noise from the SA Shooting Park as there is a minimum separation of 1.06 km between the Park and the nearest residential area within the Masterplan.

Generally future sensitive land uses within the proposal, particularly residential areas, will be separated from Port Wakefield Road by distances of over 600 m, mitigating the impacts of traffic noise.

Those sensitive land uses closer to Port Wakefield Road will be screened from traffic noise by buildings within the mixed use and district centre precincts accommodated in the Masterplan. These buildings are anticipated to be two storey, commercial buildings of a size and scale to provide effective screening.

It is concluded that the Department of Energy and Infrastructure's (DTEI) *Road Traffic Noise Guidelines* 2007 would be complied with, and therefore no further mitigation is required.

The detailed design of the proposal's stages will address the impacts of noisier activities on sensitive residential activities. For example, neighbourhood centres and schools can generate noise from traffic, machines and the activities of people.

Domestic machines, such as air conditioners, have the potential to create noise impacts within residential areas.

The detailed design of the proposal's stages will comply with EPA requirements, and Principles 70(b) and 142 of the Playford (City) Development Plan.

To ensure compliance provisions will be included in any future planning controls applying to the site, and included in the Development Plan.

11.3 Proximity to existing and potential mineral resource deposits and exploration and production tenements

Guideline 4.3.36: Describe the proximity to existing and potential mineral resource deposits.

Guideline 4.3.37: Describe the proximity to existing mineral tenements, including exploration as well as production tenements.

No existing or potential mineral resource deposits have been identified during the course of the proposal's environmental assessment.

The SA Department of Primary Industry and Resources (PIRSA) has provided information on existing and production mineral tenements. It is known that the site is covered by Geothermal Exploration Licence (GEL) 262, and Petroleum Exploration Licence (PEL) 120, issued under the *Petroleum Act 2000*. These are shown in Figure 11.2.

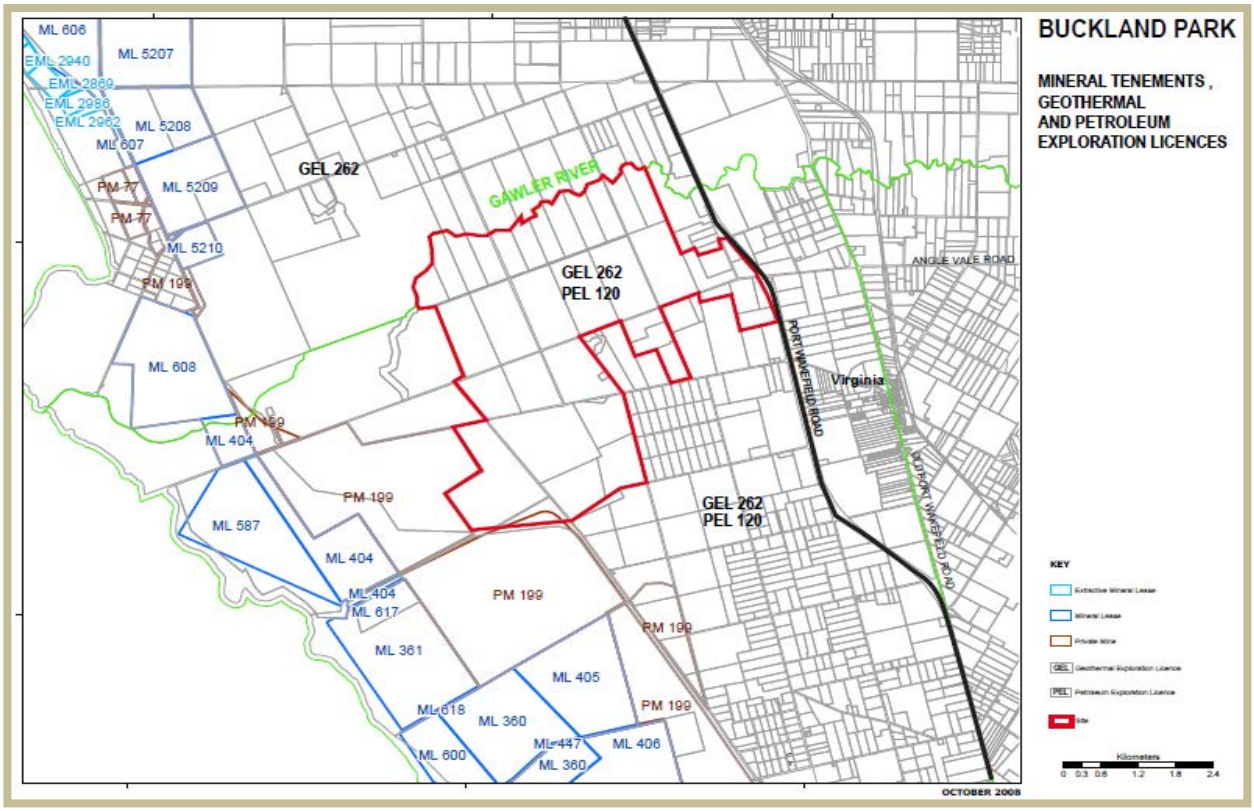


Figure 11.2 Mineral tenements and geothermal exploration licences

As the figure indicates, Private Mine (PM) 199 affects as small part of the site. PM199 is held by Cheetham (Dry Creek) Pty Ltd, and the product is industrial minerals, specifically, salt. PM 199 has a total area of 1,292.5 ha.

The area of PM199 within the site is negligible, given PM 199's total size. Cheetham does not use the area for salt production, and the registered owner is Vosporos Pty Ltd.

This part of the site is proposed for use as open space, combined with stormwater management facilities, as indicated in the Masterplan. Should the proposal be approved, construction activities in the affected part of the site will not commence for at least ten years. It is therefore concluded approval of the proposal will not affect Cheetham's operations within PM199.

The proponent has commenced consultation with Cheetham to confirm its plans, if any, for this part of PM199, and determine if its revocation is possible.

GEL 262 has an area of 296 km^2, and the site has an area of 13.08 km^2. The site comprises only 4% of GEL 262's area. GEL 262 gives the holder, Torrens Energy Ltd, the right to explore on the site, and elsewhere within the licence area. It expires in 23 January 2012, but can be renewed.

PEL 120 has an area of 9,601 km^2, and the site has an area of 13.08 km^2. The site comprises only 0.01% of PEL120's area. PEL 120 gives the holder, SAPEX Limited to explore on the site, and elsewhere within the licence area. It expires in 2 October 2011, but can be renewed.

Prior to commencing exploration in either licence area, approval must be obtained from the Minister for Mineral Resources Development. The Minister may classify this exploration as requiring a low level of supervision. However, it is considered likely that as the site is a Major Development Declaration Area and the locality is settled with horticultural activities, the Minister would classify such exploration as requiring a high level of supervision.

Torrens Energy or SAPEX would be required to submit a Statement of Environmental Objectives (SEO), after undertaking an environmental assessment, which, depending on the level of impact, may also involve provision of a Public Environment report (PER) or Environmental Impact Statement (EIS).

The Minister would or would not give his authority for the exploration to occur.

Torrens Energy or SAPEX would have to provide written notice to the owner of its intention to explore on the site, and compensate the owner for any exploration activities that impair the owner's enjoyment of the land.

It is considered unlikely Torrens Energy or SAPEX would seek to explore on the site, given:

- the small area of GEL 262 and PEL 120 affecting the site
- the environmental assessment process for obtaining the Minister's authority to explore on the site.

The site's status as a Major Declaration Area would potentially:

- increase the amount of compensation payable to the owner
- present a disincentive to the Minister to authorise the exploration.

The *Petroleum Act 2000* and the Development Act are two distinct entities. The granting of GEL 262 and PEL 120 therefore do not present any legal impediment to approval of the proposal nor, if that approval is forthcoming, the rezoning of the site.

11.4 Proximity to existing easements for infrastructure service provision

Guideline 4.3.38: Describe the proximity of the proposed development to current easements for infrastructure service provision.

Certificate of Titles for land included within Stage 1 are not burdened with any easements for infrastructure or service provisions. There are services within that part of Legoe Road proposed for closure in Stage 1.

Certificates of Titles for land included with the proposal's remaining stages are understood not to be burdened with any easements for infrastructure and services however, there are services and infrastructure located in the public roads.

Should the proposal, as described in this EIS, be approved by the Governor, negotiations will be commenced with service authorities for the relocation of services in Legoe Road which may be affected.

This process will be undertaken with each of the proposal's future stages.

Chapter 12 Traffic, parking and vehicle and pedestrian movements

The following factors will influence the proposal's future transport environment:

- Size of the proposal and geometry of the Masterplan's road layout.
- Density and number of proposed dwellings.
- Land use mix.
- Quality, capacity and mix of transport infrastructure.
- Level of transport demand.
- Relationship between the site and the external road network.

Parsons Brinkerhoff has prepared a traffic and transport assessment, focusing on these aspects (Appendix 24). The report took the following approach to define and assess the impact of the future transport environment:

- Definition of a preferred road hierarchy for the Masterplan.
- Preparation of an access strategy for construction workers and residents.
- Assessment of the impacts of traffic generated by construction workers and residents, as an input to the design of roads and intersections within the Masterplan.
- Assessment of external traffic impacts to enable the need for future road improvements to be determined.
- Provision of a staged public transport system to meet the travel needs of residents, providing access to centres, employment precincts and mixed use precincts within the Masterplan and to destinations in the wider northern region.
- Assessment of pedestrian and bike pathways within the Masterplan to meet local access needs between residential precincts and centres, employment precincts and mixed use precincts.

12.1 Construction and post-construction traffic generation and truck movements

Guideline 4.4.1: Outline the traffic generation and truck movements to and from the site and their hours of operation during the construction period and post construction when the proposed development is fully operational and developed.

12.1.1 Traffic generation – 2011–216

Construction traffic

Key site construction activities expected over the first six years are summarised below. This data reflects realistic estimates sourced from the proponent.

The assessment allows for ongoing civil works from January 2011 to December 2016, as follows:

- Construction of 1,660 homes to commence in December 2011, 32 of which will be display homes.
- Completion of 1,660 homes in five years; that is, by December 2016.

The cycle of allotment completion followed by home construction will continue throughout the 25 year construction and implementation process. Based on similar large-scale residential projects, and information provided by the

proponent, Parsons Brinkerhoff has made the following assumptions in determining the expected level of traffic generation during construction:

- Civil works and allotment completion:
  - average number of pieces of machinery on site per day = 8;
  - average number of workers (for site civil works) per day = 20;
  - average number of workers on site per lot per day = 0.12;
  - average number of truck/service deliveries per lot per day = 0.03.
- House construction:
  - average number of tradesman per day per house = 2.5;
  - average number of building supply deliveries per house per day = 1.

Residential traffic

It has been assumed that in the first six years:

- There will be limited employment, commercial, educational and other community facilities within the site.
- Demands for trip making will be met in Virginia or Two Wells, and further afield in Munno Para, Gawler and Elizabeth.
- The average number of trips per day per households will be four.

Display Village traffic

Display village visitor traffic has been discounted due to the very minor number of vehicles expected during weekday peak hours. It is assumed, the majority of display village traffic will be generated on weekends and during the weekday inter-peaks.

Overall traffic generation

Estimates of daily traffic movements to and from the site per day over the six years between 2011 and 2016 are summarised in Tables 12.1 and 12.2.

Table 12.1 Estimated daily trips to/from the site: January 2011 to December 2016

Year	Date	Lots created per year	Traffic generation (trips per day)						
			Civil works and lot turnoff		House construction		Residential activity	Total	
			Cars	Trucks	Cars	Trucks	Cars	Cars	Trucks
1	2011	120	28	7	0	0	0	28	7
2	2012	160	38	9	450	180	0	488	189
3	2013	200	47	12	600	240	720	1,367	252
4	2014	300	71	18	750	300	1,040	1,861	318
5	2015	400	94	24	1,125	450	1,360	2,579	474
6	2016	480	113	28	1,500	600	2,160	3,773	628

Table 12.2 Estimated peak hour traffic generation: January 2011 to December 2016

Year	Date	Lots created per year	Traffic generation (trips per peak hour)	
			Civil works and lot turnoff	
			Cars	Trucks
1	2011	120	7	2
2	2012	160	54	20
3	2013	200	144	27
4	2014	300	197	34
5	2015	400	272	51
6	2016	480	394	67

Peak factors (expressed as a percentage of daily trips) assumed for Table 12.2 are as follows:

- Civil works – 25%.
- Allotment completion – 25%.
- House construction – 10%
- Trip generation by residents – 10%.

The estimated peak hour traffic generation volumes are considered conservative when compared with the 2016 volumes projected by the MASTEM model. The model shows an AM peak outbound volume of 300 cars with a PM peak inbound volume of 280 cars, both well below the estimated peak traffic generation of 461 vehicles.

By 2016, some employment and mixed use precincts will be operating within the site, and these are likely to result in a reduction of the number of peak resident trips into and out of the site to levels more consistent with the MASTEM forecasts.

12.1.2 Traffic generation post-2016

Traffic generation post-2016 is discussed in Section 12.2 following.

12.2 Traffic movements generated by the proposed development

Guideline 4.4.2: Detail the traffic movements generated by the proposed development including heavy vehicles, walking and bicycle movements.

12.2.1 Overall trip generation and capture rates

Table 12.3 reports forecast trips from 2016 to 2036, and associated capture rates for work, education and other trips. It provides a measure of the scale of trips generated by the proposal, and the effectiveness of the proposal in meeting travel demands through the provision of schools, employment precincts, mixed use precincts, and centres.

Table 12.3 Trip levels and capture rates: 2016 to 2036

Year/trip purpose	Number of daily trips	% captured
2036		
Work	25,288	33
Education	8,931	66
Other[1]	88,917	91
Total	**123,136**	**77**
2031		
Work	20,722	28
Education	7,309	68
Other	72,301	90
Total	**100,332**	**76**
2026		
Work	14,269	25
Education	4,988	67
Other	49,046	92
Total	**68,303**	**76**
2021		
Work	7,356	16
Education	2,539	60
Other	22,951	89
Total	**32,846**	**70**
2016		
Work	1,655	3
Education	581	0
Other	4,743	76
Total	**6,979**	**52**

Source: MASTEM forecasts.

[1] Comprises home-based shop, recreation, personal business and other trips, plus non home-based trips.

12.2.2 Forecast traffic movements for all transport modes

Table 12.4 Shows forecast travel movements for all traffic types, 2011 to 2036.

Table 12.4 Trip levels by mode of travel: 2016 to 2036 (daily trips)

Mode/Year	No. internal trips	Mode share (%)
2036		
Car driver	36,983	38.8
Car passenger	11,170	11.7
Walk/cycle	42,584	44.7
Bus	4,623	4.8
Total	**95,360**	**100.0**
2031		
Car driver	29,334	38.5
Car passenger	8,955	11.8
Walk/cycle	34,274	45.0
Bus	3,637	4.8
Total	**76,200**	**100.0**
2026		
Car driver	19,186	37.0
Car passenger	5,865	11,3
Walk/cycle	24,428	47.1
Bus	2,405	4.6
Total	**51,884**	**100.0**
2021		
Car driver	6,649	28.7
Car passenger	2,399	10.4
Walk/cycle	13,227	57.2
Bus	853	3.7
Total	**23,128**	**100.0**
2016		
Car driver	954	26.1
Car passenger	379	10.4
Walk/cycle	2,182	59.8
Bus	136	3.7
Total	**3,651**	**100.0**

Source: MASTEM forecasts.

12.3 Traffic impact on surrounding road networks

Guideline 4.4.3: Describe the impact of traffic on surrounding road networks including Port Wakefield Road and Virginia Township.

The internal road network within the Masterplan, and the external access point Port Wakefield Road, will be progressively extended over time to accommodate growth in traffic demand as the Masterplan's residential, mixed use and employment precincts and centres are constructed and occupied.

At this time, it is anticipated the access point onto Port Wakefield Road will be a signalised intersection, with provision for future upgrades as the implementation of the proposal progresses.

Subject to the proposal as described in this EIS receiving approval, further design work of the access point will be undertaken. It is therefore requested the Governor reserve the decision on the detailed design of the access point as provided for by Section 48(6) of the *Development Act 1993*.

12.3.1 External road network

PB's assessment of traffic impacts on the external road network was based on an analysis of forecast link flows for 2031 (with reference to indicative 2036 volumes). The assessment also refers to select link traffic assignments that demonstrate the pattern of movements of traffic generated by the Masterplan's residential, mixed use and employment precincts and centres. The potential impacts of a commuter rail extension to Virginia on morning peak traffic movements in 2031 were also assessed.

Table 12.5 Forecast traffic impacts on Port Wakefield Road and Angle Vale Road (number off-peak hour trips)

Year/peak period	Port Wakefield Road[1]	Angle Vale Road	
		West of Old Port Wakefield Road	East of Old Port Wakefield Road
Morning Peak			
a) East/South			
2031-no BP	430	40	30
2031-with BP	2,020	1,360	800
2036-with BP	2,390	1,560	980
b) West/North			
2031-no BP	300	20	20
2031-with BP	620	800	570
2036-with BP	760	990	700
PM Peak			
a) East/South			
2031-no BP	430	40	30
2031-with BP	960	1,300	1,030
2036-with BP	1,190	1,580	1,260
b) West/North			
2031-no BP	500	40	30
2031-with BP	1,700	1,890	1,140
2036-with BP	2,090	2,110	1,290

[1] South of interchange at Angle Vale Road.

Source: MASTEM forecast analysis

12.3.2 Other local roads

An assessment of the impacts of the proposal's traffic on other local roads east of Port Wakefield Road was also undertaken. The main roads impacted, other than Angle Vale Road as described above are:

- Old Port Wakefield Road.
- Penfield Road.
- Curtis Road.
- Heaslip Road.

Table 12.6 summarises the predicted incremental additional peak traffic movements on these roads in 2031 attributable to the proposal. The main forecast outcomes were:

- Incremental growth on Old Port Wakefield Road attributable to the proposal in the order of 500 vehicles in the morning peak (southbound) and 735 vehicles in the afternoon peak (northbound). Part of this traffic has destinations/origins in Virginia, whilst the balance has destinations/origins in the Edinburgh Parks/Elizabeth area (via Penfield Road).
- Incremental growth on Penfield Road, (the most direct route between the proposal and Edinburgh Parks/Elizabeth) in the order of 258 vehicles in the morning peak (southbound), and 456 vehicles in the afternoon peak (northbound).

Table 12.6 Incremental traffic impacts on other roads: 2031

Road	Morning Peak		Afternoon Peak	
	East/South	West/North	East/South	West/North
Old Port Wakefield Road				
Incremental traffic[1]	492	220	271	735
Total traffic	690	290	380	990
Penfield Road[2]				
Incremental traffic[1]	258	–	–	456
Total traffic	380	230	170	710
Curtis Road[3]				
Incremental traffic[1]	166	115	249	296
Total traffic	200	150	300	320
Heaslip Road[4]				
Incremental traffic[1]	161	–	–	238
Total traffic	1,210	1,220	1,360	1,230

Source: MASTEM traffic forecasts

[1] Attributable to the proposal

[2] East of Old Port Wakefield Road

[3] South-east of Angle Vale Road

[4] Between Penfield Road and Womma Road

The net traffic volumes on Old Port Wakefield Road are within reasonable service capacity levels. Similarly, the net overall flows on Penfield Road in the respective morning and afternoon peaks are within service capacity limits of the road.

12.3.3 Impacts on Virginia

Traffic generated by the proposal will impact on Virginia in two ways:

- Travel to Virginia to access employment and services, especially in the early years of construction.
- Travel through Virginia to the Edinburgh Parks and Elizabeth region as noted above.

Traffic analyses undertaken for Virginia indicate that incremental growth in peak traffic movements through Virginia to/from Penfield Road will be relatively small up to 2026. After this time, MASTEM forecasts a significant increase in peak traffic – in the order of 200 trips in the morning peak, and 560 trips in the afternoon peak.

Incremental growth in peak traffic to/from Virginia, inferred from the volumes on Old Port Wakefield Road and Penfield Road, will be relatively minor beyond 2016. This trend is consistent with the timing of the Masterplan's residential, mixed use and employment precincts and centres. It is also a reflection of relatively low proportions of shopping and other personal business trips taking place during peak periods.

It is likely that there will be more significant increases in off-peak traffic movements to/from Virginia over time, but these are currently not modelled within MASTEM.

The forecast increases in through traffic movements to/from Penfield Road will have the biggest impact on the roads and intersections within Virginia. There is expected to be a need for longer-term traffic management and parking improvements to the two key intersections of Old Port Wakefield Road and Gawler Road and Penfield Road respectively within Virginia. The timing and potential form of such improvements can be better defined in the future, and would be the subject of monitoring of traffic movements through the town over time after as the proposal is progressively implemented.

12.4 Predicted travel demand and public transport routes

Guideline 4.4.4: Describe the predictions regarding travel demand (in all forms) and structure of public transport routes throughout the proposed township.

12.4.1 Forecast internal traffic movements for all transport modes

Table 12.7 shows forecast travel movements for all traffic types within the site, 2011 to 2036.

The table shows high sustained levels of travel by walk/cycle and bus. These shares decline marginally over time as residential precincts are progressively created away from activity centres. Nevertheless, trip mode shares remain high at full site occupation.

Public transport mode shares remain relatively low, ranging from 3.7% in 2016 to 4.8% in 2036. The trade-off is relatively high walk/cycle mode shares. The level of car mode shares reflect the importance of walk/cycle and public transport modes in maintaining relatively low levels of car usage within the proposal.

Table 12.7 Trip levels by mode of travel: 2016 to 2036 (daily trips)

Mode/Year	Number of internal trips	Mode share (%)
2036		
Car driver	36,983	38.8
Car passenger	11,170	11.7
Walk/cycle	42,584	44.7
Bus	4,623	4.8
Total	**95,360**	**100.0**
2031		
Car driver	29,334	38.5
Car passenger	8,955	11.8
Walk/cycle	34,274	45.0
Bus	3,637	4.8
Total	**76,200**	**100.0**
2026		
Car driver	19,186	37.0
Car passenger	5,865	11.3
Walk/cycle	24,428	47.1
Bus	2,405	4.6
Total	**51,884**	**100.0**
2021		
Car driver	6,649	28.7
Car passenger	2,399	10.4
Walk/cycle	13,227	57.2
Bus	853	3.7
Total	**23,128**	**100.0**
2016		
Car driver	954	26.1
Car passenger	379	10.4
Walk/cycle	2,182	59.8
Bus	136	3.7
Total	**3,651**	**100.0**

Source: MASTEM forecasts

12.4.2 Public transport

A key principle embodied in the Masterplan is the provision of a public transport services which link residential precincts with the Masterplan's schools, mixed use and employment precincts and centres. The aim is to provide basic accessibility for people who do not own cars, and to avoid the need for households to purchase a second car.

An efficient and effective public transport system will also contribute to the use of other sustainable transport modes within the proposal. Therefore bus services need to complement the provision of convenient walk and cycle networks.

It is also important that public transport access be extended beyond the site, especially in the early years of construction and occupation, when facilities within the site are expected to be limited. These bus services will need to be linked to external school, shopping and related commercial facilities, and to other long-haul rail services to Adelaide's CBD.

A further objective of the proposed public transport service arrangements is to contribute to achievement of the State Strategic Plan target to 'increase the use of public transport to 10% of metropolitan weekday passenger vehicle km travelled by 2018, as well as reduce reliance on private vehicle transport'.

Peak bus route structure

An indicative peak bus period bus route structure was prepared in conjunction with DTEI for 2031, and beyond. The broad structure is shown in Figure 12.1. It is envisaged bus route and service arrangements would evolve over time as succeeding stages of the Masterplan are constructed and occupied, potentially to the form shown in Figure 12.2.

By 2031, it is expected that the bus services would be operated by MetroTicket buses under contract to the Government. Within the site, these services would link residential precincts to schools, neighbourhood centres, the District Centre, and employment nodes. Externally, the routes would indicatively extend as staged services to Munno Para, Elizabeth and Salisbury shopping centres and associated rail interchanges. Services to Elizabeth and Salisbury could be routed through Virginia, replacing the current Route 900 loop service from Salisbury to Elizabeth.

Service standards would comprise:

- Route spacing of approximately 1 km.
- Typical stop spacing in the order of 300–350 m.
- Typical peak service headways of 15 minutes.

Buses would stop at partially indented bays along the arterial and sub-arterial roads, and within the indented parking bays on distributor and collector roads. Peak bus services would not operate on local streets. In addition to on-street stops, it is envisaged that interchanging would be provided near to the district centre, together with park-and-ride spaces. More limited park-and-ride spaces might also be provided at neighbourhood centres.

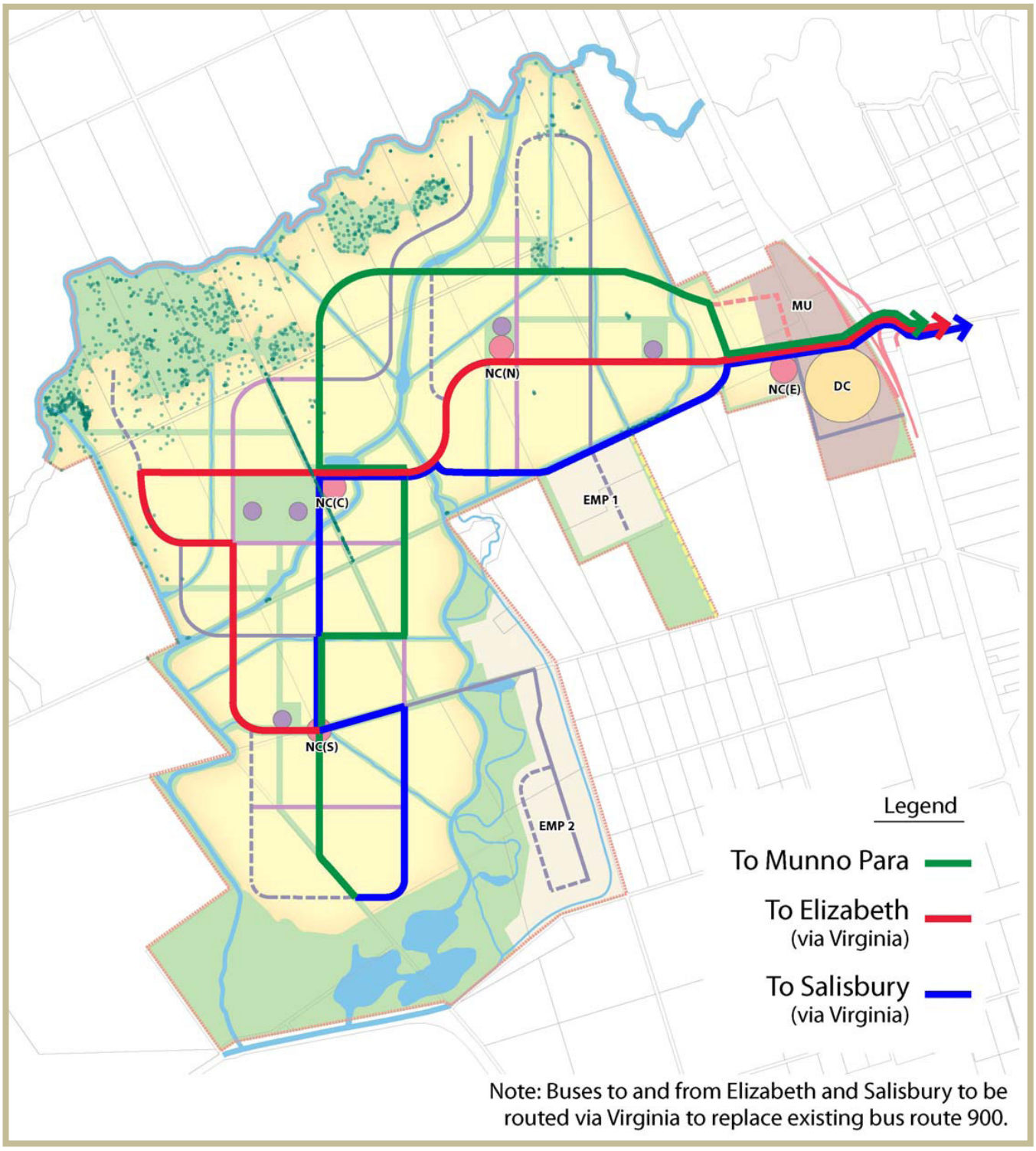


Figure 12.1 Proposed bus route strategy 2031

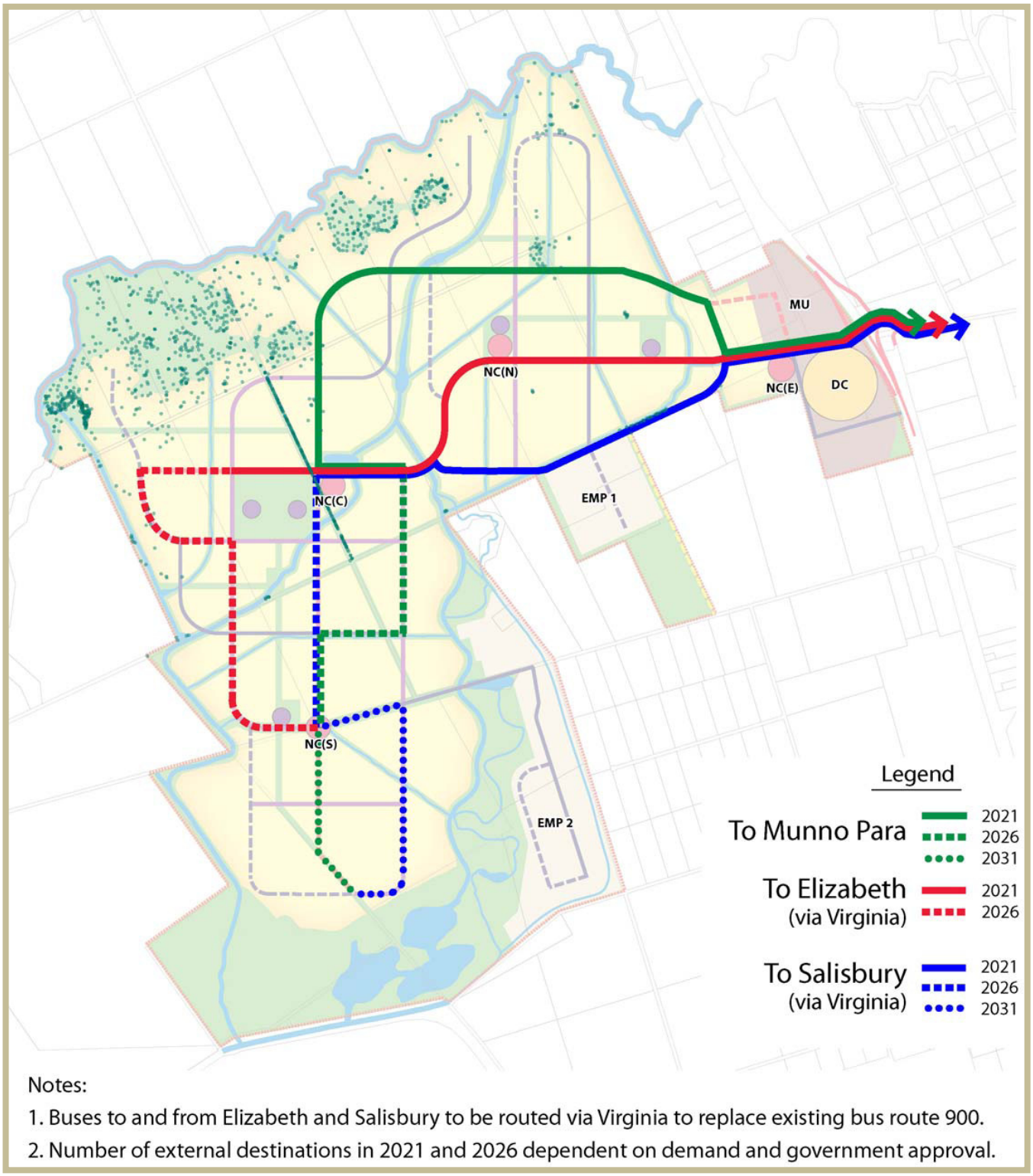


Figure 12.2 Proposed bus route staging

The route structure shown in Figure 12.1 provides a good coverage of residential precincts, with the majority of residents being within an average walk of about 500 m of a bus service, consistent with Metropolitan standards. Services are more direct towards the district centre, becoming less direct in outer parts of the Masterplan. Marginal additional travel times on the outer sections of the routes offset shorter walk access times.

It is expected that the peak bus route patterns in Figure 12.1 might vary in off peak periods to provide differing foci on activity centres.

Potential staged bus network development

The bus network will be progressively expanded with each of the proposal's future stages. The Masterplan will guide that expansion, ensuring the network is implemented in detailed designs, and bus routes are connected across stages.

The levels of services, including timetables and routes will be related to the construction of schools, centres, and residential, mixed use and employment centres. This will be the subject of detailed planning with each of the proposal's future stages.

Potential patronage levels

The forecast growth in daily public transport trips over the period 2016 to 2036 as output by the MASTEM model is reported in Table 12.8.

Table 12.8 Forecast daily bus demand: 2016 to 2036

Year	Internal bus trips	External bus trips	Total bus trips
2036	4,623	3,995	8,618
2031	3,637	3,816	7,453
2026	2,405	3,098	5,503
2021	853	1,653	2,506
2016	136	520	656

Source: MASTEM model

A description of the proposed method of providing public transport is at Chapter 14.1.2.

12.5 Anticipated volume of goods deliveries and delivery hours

Guideline 4.4.5: Detail the anticipated volume of goods deliveries and delivery hours, the size and manoeuvrability of the largest delivery vehicle and the location of the loading bays for the proposed neighbourhood/community centre.

The neighbourhood centre has been designed only to a concept level at this time.

To completely address this guideline, it would be necessary to have detail of the neighbourhood centre's tenants.

However, at this time, it is considered all types of vehicles will deliver to the neighbourhood centre. Semi – trailers would visit infrequently, given the relatively small scale of the proposed supermarket.

A loading bay for larger vehicles is proposed at the rear of the supermarket, with turning facilities. It will be suitable for unloading larger vehicles.

Smaller vans delivering to the specialty shops will use car parking spaces for the short time they are at the centre.

Delivery hours will be spread throughout the day, as it is understood supermarkets take deliveries as stocks become depleted.

The neighbourhood centre will be designed to accord with relevant design requirements embodied in the Playford (City) Development Plan and to comply with applicable traffic and access standards.

Subject to the proposal as described in this EIS receiving approval, further design work of the neighbourhood centre will be undertaken and this guideline will be fully addressed.

It is therefore requested the Governor reserve the decision on the neighbourhood centre's detailed design as provided for by Section 48(6) of the *Development Act 1993*.

12.6 Movement within the Neighbourhood Centre

Guideline 4.4.6: Detail the pedestrian interfaces of the proposed neighbourhood centre and their relationship to the car parking spaces and public spaces, including consideration of the needs of different age groups and the disabled.

Guideline 4.4.7: Describe how the design of the proposed neighbourhood/community centre would incorporate measures for disabled and aged movement.

Guideline 4.4.8: Provide an analysis of the pedestrian 'desire lines' across the site, investigating permeability of the site's public access spaces and connectivity between buildings and car parking areas, with emphasis on protected pedestrian paths throughout the car parking areas.

The neighbourhood centre has been designed to a concept level only at this time.

However, its concept design and its relationship with the display village illustrated in Figures 3.9, and 3.10, show the principles for pedestrian movement which will be detailed:

- Arcades along shop fronts with a clear and sheltered supermarket entry, and a direct connection, level, between specialty shops and the supermarket.
- Direct access from car parking aisle to the arcade, with safety facilitate by sign posted pedestrian crossings where pedestrian and car movements potentially conflict.
- Pedestrian threshold between the neighbourhood centre and town square, and the landscaped area.
- The use of pavement treatments to delineate pathways.
- The direct routes between the neighbourhood centre and the display village.
- A logical and efficient route around the display village, where traffic will be excluded to ensure safety.
- Direct access from car parking aisle to the arcade, with safety facilitate by sign posted pedestrian crossings where pedestrian and car movements potentially conflict.
- The ability to provide level and safe access for people who have impaired mobility or use a wheelchair.

Should the proposal, as described in this EIS, be approved by the Governor, the detailed design of the neighbourhood centre, at which stage this guideline will be fully addressed.

The neighbourhood centre will be designed to accord with relevant design requirements embodied in the Playford (City) Development Plan and to comply with applicable disabled access standards, contained with Australian Standards, and the Building Code of Australia.

It is therefore requested the Governor reserve the decision on the detailed design of the neighbourhood centre as provided for by Section 48(6) of *the Development Act 1993*.

Chapter 13 Urban design

This chapter describes the urban design principles applied to the Masterplan's design.

Urban design is crucial to the creation of a unique character, which provides the community with a sense of belonging.

The proposal's Masterplan, and individual stages, will require their own character and identity. The following techniques will be applied to the urban design of each of the proposal's stages.

- Themed precinct and street naming, which will be used in street signs and landscape entry statements. The natural, Indigenous and European heritage of the site will be used as sources for these names.
- Creation of meeting places such as parks, community facilities, shops and cafes.
- Themed street furniture and paving within precincts and centres.
- Themed landscaping within precincts and centres.
- Creation of landscape features and enhancement of existing natural features, for example river red gum woodlands, the Gawler River and creeklines, and the site's horticultural context.

The urban design principles applied in the public domain will be followed through into the Design Guidelines provided to new residents when they purchase their allotment, and similar themes will applied to the design of public buildings.

13.1 Construction materials, surface treatments and colours

Guideline 4.5.1: Provide details of construction materials, surface treatments and colours for the proposed neighbourhood/community centre and display village.

The neighbourhood centre has been designed to a concept level.

The Concept Neighbourhood Centre Plan at Figure 3.9, and its elevations illustrate the design intent for the final building. It indicates a mix of materials, colours and architectural features intending to create a building which is interesting and of an architecturally high standard.

The neighbourhood centre and sales office will be the first point of contact potential residents will have with the proposal. A high standard of architectural design will therefore be achieved.

Should the proposal, as described in this EIS, be approved by the Governor, the architectural design of the neighbourhood centre building and sales office will be undertaken, at which stage this guideline will be fully addressed.

The detailed building design will comply with the relevant design requirements embodied in the Playford (City) Development Plan, and the Building Code of Australia.

Approval is sought to develop the neighbourhood centre as described in Chapter 3.2.3. It is requested the Governor reserve the decision on the detailed design of the centre as provided for by Section 48(6) of the *Development Act 1993*.

13.2 Noise mitigation

Guideline 4.5.2: Describe the measures that would be taken to address the potential for noise conflict at the interface between the proposed commercial component and residential components.

Connell Wagner have undertaken a preliminary assessment of the potential for noise conflict between residential and commercial activities accommodated in the Masterplan (Appendix 12).

Their conclusions are discussed in Chapter 11.2.

The assessment notes that noise emissions will need to be considered in the detailed design and location of buildings and land uses within each stage. This design process will comply with the requirements of the Playford (City) Development Plan and relevant EPA standards.

The Neighbourhood Centre Concept Plan at Figure 3.9 shows the neighbourhood centre buildings located at the furthest point from proposed residential areas possible within the proposed neighbourhood centre allotment. Loading activities will be undertaken behind the building, and building plant will also be focused at the back of the building.

This separation, combined with the screening provided by the building will mitigate noise impacts on adjoining residences.

Should the proposal, as described in this EIS, be approved by the Governor, the detailed design of the neighbourhood/community centre will be undertaken at which stage this guideline will be fully addressed, as it relates to the interface between the neighbourhood centre and adjoining residential precincts.

Approval is sought to develop the neighbourhood centre as described in Chapter 3.2.3. It is requested the Governor reserve the decision on the detailed design of the centre as provided for by Section 48(6) of the *Development Act 1993*.

13.3 Application of Crime Prevention through Environmental Design principles

Guideline 4.5.3: Demonstrate the application of CPTED (Crime Prevention Through Environmental Design) principles throughout the proposal including personal and public safety and security issues.

Crime Prevention Through Environmental Design (CPTED) principles seek to reduce the opportunities for crime in urban environments by increasing the efforts and risks for offenders. Put simply, CPTED is about designing and building safer places.

CPTED principles as detailed in *Crime Prevention through Environmental Design—Guidelines for Queensland* (State of Queensland, 2007) can be summarised as:

- Surveillance – providing opportunities for “eyes on the street” (or public place) so that activity in public places is naturally noticed by users of adjacent buildings and places.
- Legibility – designing environments that allow people to know where they are and how to get where they are going, avoiding the risk of confusion or entrapment.
- Territoriality – being clear about the line between public places and private places, avoiding the risk of people trespassing by accident or inadvertently finding themselves in somebody else’s private space.
- Ownership – active urban places which are used by, and significant to, their community will be safer than those which are not “owned” by the public.
- Management – well-maintained places are more likely to encourage legitimate use and community “ownership” than those which are broken-down, dirty or vandalised.

- Vulnerability – urban spaces that are open, accessible, visible, active and (after dark) well-lit will be safer than those which create hidden spaces from which there is only one route of escape.

CPTED principles have been applied in preparation of the Masterplan and Stage 1 Indicative Allotment Layout Plan, and will be used to inform and guide the detailed design of the neighbourhood centre and the display village and the detailed land division plan for each of the proposal's stages.

In particular, the Masterplan reflects CPTED principles in that it:

- Features a regular and orthogonal street layout, promoting legibility and permeability through direct lines of sight and movement for pedestrians and by providing choices for movement between destinations.
- Incorporates open spaces capable of hosting a range of activities (for example, walking, cycling, passive recreation, water features), promoting opportunities for passive surveillance and maximising potential activity levels.
- Embraces a landscaping concept that will minimise the risk of vulnerability by avoiding unnecessary blocking of sight lines or lighting footprints.
- Incorporates neighbourhood and local centres which will promote activity and interest in each precinct.

As each of the proposal's stages are designed, CPTED principles will be incorporated, guided by the principles set out in the Masterplan.

The Stage 1 Layout Plan reflects CPTED principles in that it:

- Encourages passive surveillance of public spaces and pedestrian routes (the two internal reserves, the school site and the neighbourhood centre site are abutted by public roads rather than having allotments back onto them, and the linear open space corridor is abutted by public roads on both sides for at least one side for more than 75% of its length).
- Features orthogonal road alignments, allowing good lines of sight into and out of individual streets.
- Provides good permeability and choice of access for pedestrians, in particular by avoiding dead-end culs-de-sac or narrow pedestrian-only walkways and ensuring connectivity of pedestrian movement routes.
- Promotes clarity between public and private spaces by minimising the number of allotments which abut a road and a reserve on opposing boundaries.

The detailed design of the neighbourhood centre will embody CPTED principles including in the positioning of buildings, facilities and public spaces relative to each other and pedestrian circulation routes, as demonstrated in the Concept Neighbourhood Centre Plan at Figure 3.9.

The design and function of lighting, the provision of legible signage, the location and orientation the building's entrances, the landscaping will all be detailed to ensure CPTED principles are incorporated and an attractive and safe focus for the community is fostered.

Should the proposal, as described in this EIS, be approved by the Governor, the detailed design of the neighbourhood centre will be undertaken at which stage this guideline will be fully addressed.

Approval is sought to develop the neighbourhood centre as described in Chapter 3.2.3. It is requested the Governor reserve the decision on the detailed design of the centre as provided for by Section 48(6) of the *Development Act 1993*.

13.4 Car park shelter, shading and screening treatments

Guideline 4.5.4: Provide details of the shelter, shading and screening treatments for the car parking areas.

The neighbourhood centre has been designed to a concept level.

The Concept Neighbourhood Centre Landscape Plan shows evergreen trees within the car park area which will reduce the potential visual impact of a large area of paving, and provide shade and shelter for cars and people.

The detailed landscape design will comply with the relevant design requirements embodied in the Playford (City) Development Plan.

Should the proposal, as described in this EIS, be approved by the Governor, the detailed architectural and landscape design, of the neighbourhood centre, including shelter, shading and screening, will be undertaken at which stage this guideline will be fully addressed.

Approval is sought to develop the neighbourhood centre as described in Chapter 3.2.3. It is requested the Governor reserve the decision on the detailed design of the centre as provided for by Section 48(6) of the *Development Act 1993*.

13.5 Screening of air-conditioning plant and ducting

Guideline 4.5.5: Provide screening details for any air-conditioning plant and ducting proposed on the roof areas of the proposed neighbourhood/community centre.

The Neighbourhood Centre has been designed to a concept level.

The Concept Neighbourhood Centre Plan shows the neighbourhood centre oriented to face the street and allow legible access to the car park, and display village.

Air conditioning plant will be provided at the rear of the building, where it will not be viewed from Stage 1's residential areas.

Views of the rear of the building, and any building plant or loading areas provided there, will be screened by a densely planted landscaped buffer planned between the rear of the building and the proposed rear boundary of the neighbourhood centre site.

Any air-conditioning plant and/or ducting proposed on the roof areas will be screened where from public places, primarily through the use of parapet walls around the roofline and installation of roof-mounted screening structures.

The design will accord with relevant requirements embodied in the Playford (City) Development Plan.

Should the proposal, as described in this EIS, be approved by the Governor, the detailed design of the buildings in the neighbourhood centre will be undertaken, at which stage this guideline will be fully addressed.

Approval is sought to develop the neighbourhood centre as described in Chapter 3. It is requested the Governor reserve the decision on the detailed design of the centre as provided for by Section 48(6) of the *Development Act 1993*.

13.6 Signage

Guideline 4.5.6: Describe any signage associated with the proposed development detailing the location, materials, colours, illumination and size.

The neighbourhood centre has been designed to a concept level. Indicative locations for signage are shown on the Concept Neighbourhood Centre Plan and its elevations.

The concept plan shows an entry feature, which will comprise a wall and water feature. Signage of high quality design will be attached to the wall with the name of the proposal. This signage and feature is planned as a permanent feature of the proposal and accordingly will be maintained and replaced periodically.

Other signage will comprise business signs on the neighbourhood centre and sales centre buildings.

Individual builders within the display village will be responsible for signage on their display homes.

Any signage associated with the neighbourhood centre or the display village will be designed to accord with relevant design requirements embodied in the Playford (City) Development Plan.

Should the proposal, as described in this EIS, be approved by the Governor, detailed design of the neighbourhood/ community centre will be undertaken, at which stage details of signage proposed will be fully addressed.

Approval is sought to develop the neighbourhood centre as described in Chapter 3.2.3. It is requested the Governor reserve the decision on the detailed design of the centre as provided for by Section 48(6) of the *Development Act 1993*.

13.7 Amelioration of visual impact

Guideline 4.5.7: Indicate what types of measures have been considered to ameliorate the visual effect of large roofed areas.

The site and its locality are characterised by flat topography. There are therefore no vantage points from which the roofed areas of the neighbourhood centre and display village buildings will be easily viewed as a single mass.

Notwithstanding this, the Concept Neighbourhood Centre Landscape Plan (Figure 9.3), shows the use of trees to punctuate the visual impact. The Concept Neighbourhood Centre design shows a variety of materials and architectural detailing which will create new buildings with an interesting and attractive appearance.

The neighbourhood centre will be designed to accord with relevant design requirements embodied in the Playford (City) Development Plan. It is envisaged that any visual impacts associated with roofing elements will be minor in nature and entirely consistent with other centres of this nature that currently exist throughout metropolitan Adelaide. If necessary, visual impacts will be ameliorated by design techniques including articulation of roof form, use of low-reflectivity materials in selected areas and use of architectural elements such as parapet walls or pediments.

The display homes will be residential dwellings. It is therefore anticipated their roofed areas will present in the same manner as any other residential neighbourhood construction should the proposal be approved.

All residential neighbourhoods accommodated in the Masterplan will be provided with street trees, which, when mature, will visually intersperse the roofed areas of those neighbourhoods. As the proposal will be staged over 25 years, the new areas with exposed rooves will be relatively small at any one time.

A more detailed visual assessment is at Appendix 17, and it discussed at Chapter 14.9.

Should the proposal as described in this EIS, be approved by the Governor, the detailed design architectural and landscape design of the neighbourhood centre will be undertaken, at which stage this guideline will be fully addressed.

The proponent is seeking an approval to develop the neighbourhood centre as described in Section 3.2.3 and requests that the Governor reserve the decision on the detailed design of the neighbourhood centre as provided for by Section 48(6) of the *Development Act 1993*.

Chapter 14 Community impacts

The proposal will require the normal range of services from public agencies provided to any community, whether they are living in a new or established suburb. Service requirements are the same, regardless of the location of housing, and therefore are not a result of the unique circumstances relating to the proposal and the site.

Metropolitan Adelaide's northern region has experienced significant growth in recent years and it is expected that this region will remain the focus for metropolitan growth under the new 30 Year Plan (see Chapter 2).

The proposal's projected population is substantial and can support a range of health, education, recreation and community services.

However, Connor Holmes notes service planning for the proposal should not take place in isolation, rather a regional planning approach should be taken. It is beyond the scope of this EIS to project future human service needs within the region, this needs to be led by government (Appendix 25).

Human service needs described in this EIS relate, therefore, to the demand for services generated by the proposal's residents and suggested provision should be reviewed as regional planning progresses.

The proposed 25-year implementation period provides substantial scope for reviewing human services needs as the population grows to assess the validity of demographic projections and adjust service provision according to need, both within the site and in the region.

Typically, any new suburb relies on areas adjoining established suburbs to access services in its initial stages. As the population of the new suburb grows, demand for services increases and it becomes viable to provide an increasing range of services within that new suburb. When fully constructed and occupied, the new suburb becomes home to a range of services commensurate with its size and demographic characteristics, relying on centres within its region only for higher-order services.

Service providers need to decide the right time in the new suburb's growth to increase the range of services delivered directly to it.

Typically, service delivery lags behind the growth in demand generated by the new suburb, unless the service provider is willing to subsidise the early provision of the service.

The proposal has three characteristics which will make the delivery of services in time with growing demand more straightforward, than the usual experience in new suburbs:

- A Masterplan and Staging Plan which will guide land division and construction, and therefore growth, facilitating the orderly and economic provision of services, timed to meet the demand generated by the growing population.
- A single proponent, liaising with government agencies to ensure effective and efficient provision of services.
- A strategic location in Metropolitan Adelaide's northern region relative to established suburbs, centres and employment areas, so new residents will be able access services during the proposal's early stages.

14.1 Implications for public services providers

Guideline 4.6.1: Outline the implications for public service providers to support the proposed development including health, transport (including public transport), education, high needs housing, community services and recreation.

As construction and occupation proceeds, a series of critical thresholds will be reached, at which time it will become viable to provide a range of services.

The proposal's age profile is expected to be similar to Andrews Farm and Hewett, reflecting a similar buyer profile. Connor Holmes have prepared a projected age profile for the proposal over its 25 year construction and occupation time frame (Appendix 5).

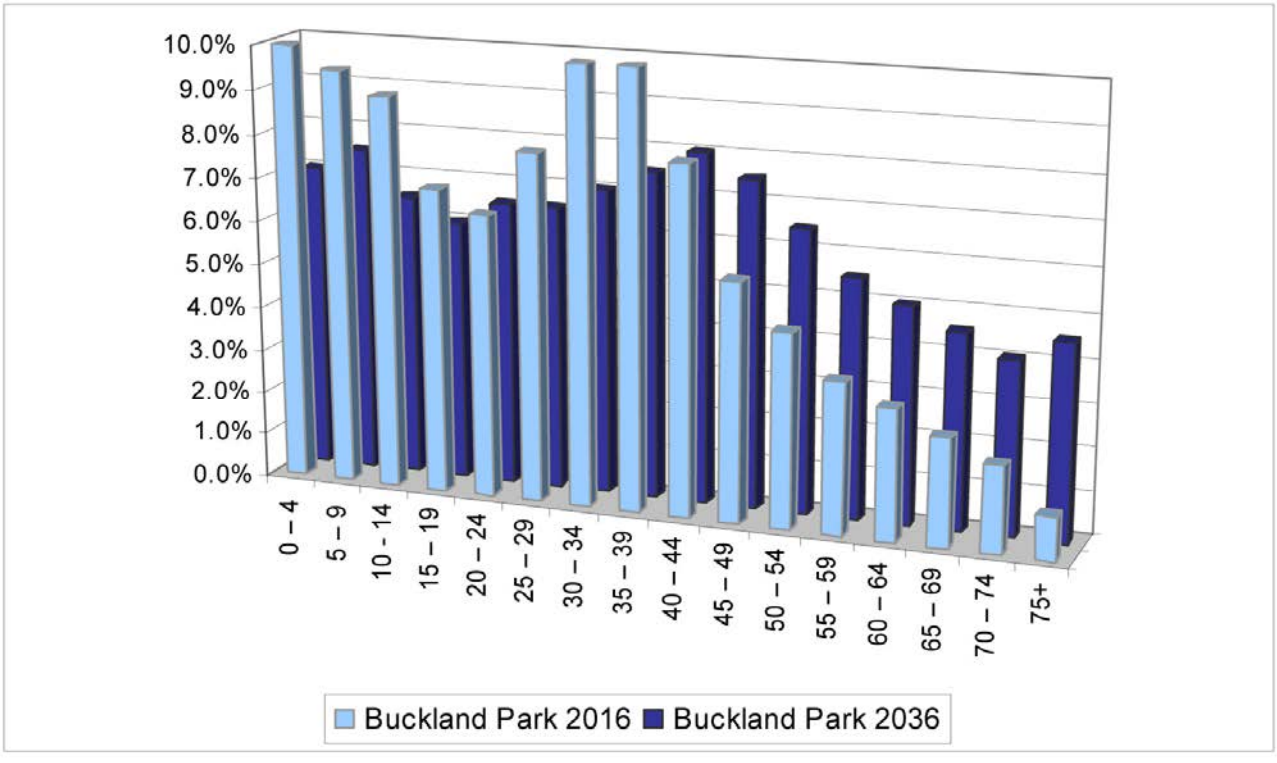
These projections can only be considered a planning tool. There are many factors which will influence the dwelling yield and population make up over the 25 year implementation period.

Table 14.1 Demographics over 25 year implementation period

Year	Dwelling	Population	Occupancy Rate
2016	780	2,145	2.75
2021	3,460	9,475	2.74
2026	6,660	18,416	2.77
2031	9,860	27,158	2.75
2036	12,000	33,000	2.75

Source: Connor Holmes.

The proposal's population is expected to steadily age over the period to 2036, as illustrated in Figure 14.1.



Source: Connor Holmes

Figure 14.1 Age profile over time

Connor Holmes have undertaken a detailed consideration of service implications for specific sectors (Appendix 25).

14.1.1 Health

Health issues considered include access to public hospital services, public and general practice and specialist services, community health services and aged care.

Hospital services

The projected population of 33,000 by 2036 is insufficient to support accommodating a public hospital within the Masterplan, however, additional demand for hospital services will be generated so they must be provided elsewhere. It is expected the proposal's residents will access the following hospital services:

- Lyell McEwen Hospital, Elizabeth (22 km).
- Gawler Hospital, Gawler (24 km).
- Queen Elizabeth Hospital, Woodville (30 km).
- Royal Adelaide Hospital, Adelaide (30 km).

The provision of additional, or extended, major public hospital facilities is a matter for Government to consider in the context of growth in Metropolitan Adelaide's northern region.

General practice and specialist medical services

Public general practice services are unlikely to be established within the site. However, a GP Plus Health Care Centre is planned at Elizabeth. In addition to a general practice service, this centre will provide the following:

- Chronic disease self-management programs
- After-hours GP services
- Physiotherapy
- Nursing and midwifery services
- Health education
- Specialist clinics
- Minor medical procedures
- Allied health—podiatry, dental, physiotherapy, occupational therapy
- Children and youth health
- Drug and alcohol services
- Community mental health
- Counselling
- Aboriginal health.

The centre will offer an extended hour service as an alternative to visiting a hospital, providing the proposal's residents with acceptable access to medical hospital services, public general practice services and specialist services.

The Elizabeth GP Plus Health Care centre will be a large centre, and it is understood another, smaller GP Plus Centre is likely to be established within the Playford LGA. These centres will serve the proposal's residents, but

have not been accommodated in the Masterplan. The availability of public transport will, therefore, be crucial in ensuring these services are accessible to residents.

Provision has been made in the Masterplan for private medical services in the neighbourhood and district centres, it is expected that private general practice and specialist services will be established in these locations. If required, the district centre can accommodate a GP Plus Health Care Centre.

Community health services

Playford City Council currently provides health services to its community, including baby immunisation clinics, youth services and services for people with disabilities.

Demand for these services within the site will grow. Some of these services will be provided out of community centres, accommodated in the Masterplan.

Aged care

The Masterplan can accommodate both a retirement village and residential aged care facilities at locations and times determined by demographic and demand growth.

Based on the projected age profile at 2036, demand for aged care beds is expected to be in the order of 150 to 200 beds.

These facilities could be provided either by the private sector or the state government as part of the 5% high needs component of Affordable Housing.

14.1.2 Transport

The existing road network, and the proposed road network described in the Masterplan, accommodates the provision of road based public transport services, such as taxis, access cabs, and public and private bus services.

As with any new suburb, the early provision of good public transport services will be important to provide residents who do not have access to a car, and to establish public transport as a habit.

Proponent-funded local commuter bus service

A community bus service from the site to connect with the 900 bus route at Virginia will commence when the first residents move in. The community bus will also be available for other trips, for example, to school and to health services, and other community activities. This service would commence with the arrival of the first household. Timetabling and frequency of service would be directly linked to demand.

Joint-funded local commuter bus service

As the proposal's population grows, a public regional bus service would commence. It is anticipated this service will require subsidy to underpin its viability. This would be subject to negotiations and agreements with the state government during the detailed design of future stages, but could indicatively commence at approximately 1,500 households.

The Masterplan accommodates a bus route network, which will be progressively implemented with each stage (see figures 12.1 and 12.2)

State Government (Metroticket) bus service

Once the population can support a full government Metroticket service this would be provided. The stage at which this should occur would need to be negotiated and agreed with the state government, but could indicatively take place after when 4,500 households are established on the site.

Parsons Brinkerhoff have considered this issue in detail (Appendix 24). It is discussed further in Chapter 12.

14.1.3 Education

The Masterplan accommodates the four primary schools and two high schools projected to be required when the proposal is completely constructed and implemented.

Decisions regarding the location of government schools, their number and format, for example the provision of a B-12 super schools or the like, will be made by the Department of Education and Children's Services (DECS).

Decisions by the non-government school sector are commercially based and depend on demand. However, early commitment to the establishment of schools may occur to secure market share.

Connor Holmes concluded the majority of the proposal's students will attend education facilities within the site. This has positive implications in terms of reducing the need for car travel, and increasing opportunities for local children and parents to build community relationships (Appendix 5).

School education

Demand for public school services within the site has been assessed on the basis that overall school provision, including public and private services, is equivalent to 100% self-sufficiency. That is, a school place is provided for each school age child living within the site. It is recognised that some students will attend schools elsewhere and, that equally, the proposal's new education facilities will attract students living elsewhere in the region.

Connor Holmes projected the number of students living on the site over time. Of these students, it is estimated that 60% of primary school students and 40% of secondary school students will attend government schools. This is consistent with trends in the comparison new suburbs in the Metropolitan Adelaide's northern region.

Connor Holmes concluded the proposal would support the provision of:

- Four primary schools; two government and two non-government.
- Two secondary schools; one government and one non-government.

In line with the DECS Education Works Program, it is expected one government primary school and the government secondary school will be combined to create a B-12 super school. The configuration of the government schools will, however, be determined by DECS.

Tables 14.2 and 14.3 show the number of primary and secondary school enrolments at various stages of occupation, and the number and type of schools needed to accommodate those enrolments.

Table 14.2 Primary school enrolments and schools

Year	All Schools		Government		Non-Government	
	Students	Schools	Students	Schools	Students	Schools
2016	320	–	192	–	128	–
2021	1,336	2	802	1	534	1
2026	2,449	3	1,470	2	979	1
2031	3,395	4	2,037	2	1,358	2
2036	3,762	4	2,257	2	1,505	2

Source: Connor Holmes 2008.

Table 14.3 Secondary school enrolments and schools

Year	All Schools		Government		Non-Government	
	Students	Schools	Students	Schools	Students	Schools
2016	167	–	67	–	100	–
2021	720	–	288	–	432	–
2026	1418	2	567	1	851	1
2031	1874	2	750	1	1124	1
2036	2046	2	818	1	1228	1

Source: Connor Holmes 2008.

The planned location of these schools is shown on the Masterplan. The proposed distribution of schools will provide the following benefits:

- Provision for a primary school within Stage 1.
- Location of schools near neighbourhood centres to reduce the number of trips and provide opportunities for shared facilities, such as ovals and halls.
- Location of schools on public transport routes.
- Co-location of a non-government secondary school and government B-12 school adjacent to the neighbourhood centre (central) to maximise accessibility throughout the site and opportunities for shared facilities, such as an indoor recreation centre or library facilities.

In the early years, prior to the construction of the first primary school within Stage 1, projected to be around 2017/2018, it is expected most primary school students will attend Virginia Primary School, which has adequate site area to accommodate demountable buildings. The first primary school is likely to be privately operated, however, the school site can be made available to DECS if required.

Pre-school education

Connor Holmes expects four pre-schools will be required, to be co-located with primary schools. It is reasonable to expect these pre-schools will be privately operated and two government operated, as they will be co-located with two private and two government primary schools.

As shown in Table 14.4, it is expected that the first pre-school, to be located within Stage 1, will open at the same time as the first primary school, at approximately 2017/2018. By 2036, total pre-school enrolments are expected to be approximately 538 children, equivalent to 269 full-time pre-school places.

Table 14.4 Pre-school placements

Year	Estimated number in pre-school	Number of FTE places	Places within Buckland Park
2016	48	24	–
2021	202	101	101
2026	372	186	186
2031	495	248	248
2036	538	269	269

Source: Connor Holmes 2008.

Child care

Connor Holmes calculated the number of children in the child care age category based on the projected 0–5 year old population. The number of child care places required has been calculated using information sourced from the ABS on the proportion of children in child care by year of age (Catalogue No. 4402.0). This has been applied to the projected 0–5 year old population. Of the total number of children in child care, an estimate of the proportion of children in different types of child care has been applied (Appendix 5).

It is recognised not all child care places will be provided within the site as working parents may prefer a child care centre close to their place of work. Therefore, it has been assumed only 75% of the required child care places will be required within the site.

ABS data provides the proportion of the 3 to 5 year old population attending pre-school. Specifically, the following pre-school attendance rates have been applied to the projected 3 to 5 year old population:

- 24% of three year olds
- 56% of four year olds
- 34% of five year olds

ABS data indicates that the majority of children attending pre-school are enrolled for between 10 and 19 hours per week. It has therefore been assumed that children will, on average, attend pre-school 2.5 days per week.

Unlike child care placements, it is expected most children will attend pre-school close to home so sufficient pre-school places should be provided to accommodate all of the projected pre-school enrolments. As for pre-schools, it is expected that child care facilities will be located within or in close proximity to primary schools. Though all childcare centres in South Australia require licensing by DECS, these services will be privately operated and therefore do not have ongoing public service implications.

14.1.4 High needs housing

In accordance with the Housing Plan for South Australia, 15% of all allotments will be designed and priced to facilitate construction of Affordable Housing, with one third of these, 5%, to be offered to Housing SA for acquisition of high-needs housing. More detail is provided in Chapter 14.5.

It is likely Housing SA will not provide high-needs housing until the centres and services required to support the residents are available. Residents are likely to require services above those provided in the immediate vicinity of the housing. Housing SA will plan high needs housing and the necessary support for residents.

The Masterplan accommodates suitable locations for high needs housing if and when Housing SA wishes to provide it.

Connor Holmes addresses the issue of Affordable Housing in more detail in Appendix 26.

14.1.5 Community services and community building

Connor Holmes notes community services are provided by all levels of government, Commonwealth, State and local (Appendix 25). Service provision within the site will be determined by the relevant government agencies. It is most likely that community services within the site will be provided by the Playford City Council and would be expected to include library services and home assistance services including domestic, gardening and personal care support.

An inclusive, active and sociable community is fundamental to attracting future residents, and therefore fundamental to the proposal's success.

The first component of the community building programme is the provision of a community space which will provide a venue for community based activities.

Figure 14.2 Mt Barker BBQ 2008

Figure 14.3 Mt Barker BBQ 2008

Figure 14.4 Mt Barker BBQ 2008

Figure 14.5 Rhodes Peninsula 2005

Figure 14.6 Rhodes Peninsula 2006

The second component is the provision of community worker to facilitate those activities.

The third is funding for those activities.

Together, these three components provide the opportunities for residents to meet and form the connections which build communities.

As the community matures, it is envisaged many community building activities will be initiated by the residents themselves, for example, forming sports teams, informal groups and clubs, and of course, there will be private social interaction.

In Stage 1 the proponent will sponsor some of these activities, for example, sports teams, cultural and school events.

The photographs on the previous page were taken at successful and popular community building events conducted by the proponent in new residential areas, at Mt Barker in Adelaide, and at the Rhodes Peninsula, in Sydney.

14.1.6 Recreation

The Masterplan accommodates a range of active and passive recreation facilities, including linear parks, ovals and local parks. Based on sporting participation rates and ratios of participants to sporting facilities, demand for outdoor sporting facilities has been estimated as follows:

- Australian Rules Football/cricket – 8 ovals
- Netball – 15 courts
- Soccer – 8 pitches
- Tennis – 33 courts.

There are many sporting clubs and facilities already established in the Playford LGA that are currently under used. The proposal's residents are likely to join existing clubs and use facilities outside the site, and some Playford LGA residents will use the proposal's facilities.

In addition to outdoor sporting and recreation facilities, the provision of an indoor recreation centre could be supported by the proposal. An appropriate location for this facility is within or adjacent to the central neighbourhood centre and its collocated schools.

The recreation centre should be available for use by schools as well as the general public. Most school use can be expected to take place during school hours, whereas public use of this facility is more likely to be out of working hours. Connor Holmes project approximately 3,500 students will attend the two schools adjacent to the central neighbourhood centre, suggesting that the facility would be well-used during school hours.

This location will be central to all residents, and is on a proposed bus route. The Masterplan accommodates area for an indoor recreation centre; however, the design, format and scale of this facility will be considered during the design of the stage in which it is located, projected for 2022 to 2026.

All outdoor sporting and recreation infrastructure should be considered for shared use by schools and the general public, delivering benefits such as:

- Enhancing safety—avoiding under-used recreation areas that can attract vandalism and other criminal activity.
- Enhancing cost-efficiency—the ongoing maintenance of recreation areas and sporting facilities can be shared between the Playford City Council and schools.
- Promoting an active community.

Collaboration between the proponent, the Playford City Council, DECS and private school and recreation facility providers will be required to realise these opportunities.

It is likely Playford City Council will require a Council depot within the site to support open space maintenance. There is adequate land accommodated in the Masterplan for this facility when required.

14.1.7 Libraries

There are currently two libraries serving Playford City's population of 78,000 people. Applying this rate of provision to the proposal's projected population of 33,000 people, one library will be warranted to serve residents when it is fully constructed and occupied in 2036.

It is conceivable library formats may change during the proposal's 25-year construction and implementation time frame. For example, the use of electronic information systems may grow, reducing requirements for physical space to house books. Or, community library facilities may be shared with school library facilities.

Nominating a library location and configuration at this time would restrict the Council's ability to consider alternate methods for providing library facilities in the future.

There is adequate land within the Masterplan's centres to accommodate a library if and when it is required by Council.

Operation of any library within Buckland Park would be the responsibility of Council, and would be funded in the normal manner from a combination of State Government grant moneys supplemented by a contribution from Council.

14.2 Predicted workforce and employment characteristics

Guideline 4.6.2: Identify the anticipated workforce characteristics of the proposed resident population and where the workforce is likely to be employed.

By 2036 Connor Holmes project 16,500 employed persons will live at the site. This is 63.3% of the over 15 year old population and 50% of the overall population. This is above current ASD and Playford LGA employment ratios, but significantly below those of comparison suburbs such as Hewett and Mawson Lakes.

It is expected the proposal and the comparison suburbs will have similar characteristics.

The projected employment profile of the proposal's residents, by industry sector, is shown in Table 14.5. It is based on the composition of employment within metropolitan Adelaide, adjusted to reflect industry trends within new suburbs in the Adelaide's northern region and broader industry trends, such as the decline of manufacturing employment in South Australia.

Connor Holmes predicts a large proportion of the proposal's residents will to hold jobs within the site (Appendix 5). The Masterplan accommodates employment, commercial, retail and mixed use precincts to provide employment. The projected number of jobs created within the site is 10,687 by 2036. Table 14.6 provides a breakdown of the predicted uses, number of workers and an indicative staging of employment.

Current journey to work patterns within the Playford LGA and major employment growth areas have been reviewed to determine likely locations where residents will work.

These rates of employment are based on rates achieved in existing areas accommodating the same land uses.

Table 4.5 The proposal's residents 2036 employment by industry

Industry of employment	% of workers	Number of workers
Accommodation and food services	4.9	809
Administrative and support services	3.5	578
Agriculture, forestry and fishing	3.3	545
Arts and recreation services	0.8	132
Construction	6.8	1,122
Education and training	6.0	990
Electricity, gas, water and waste services	0.9	149
Financial and insurance services	2.7	446
Health care and social assistance	11.0	1,815
Information media and telecommunications	1.5	248
Manufacturing	18.0	2,970
Mining	0.6	99
Other services	3.4	561
Professional, scientific and technical services	2.4	396
Public administration and safety	8.0	1,320
Rental, hiring and real estate services	1.2	198
Retail trade	14.5	2,393
Transport, postal and warehousing	6.1	1,007
Wholesale trade	4.4	726
Total	**100.0**	**16,504**

Source: Connor Holmes.

Table 14.6 Proposal's employment

Employment Type	2016	2021	2026	2031	2036
Retail	70	299	1,120	1,526	1,838
Bulky goods	0	0	100	200	600
Education	0	142	384	547	603
Commercial, office, community	8	52	452	1,278	2,438
Light industry, industry, services, trades	0	815	1,630	3,339	5,208
Total	**78**	**1,308**	**3,686**	**6,890**	**10,687**

Source: Connor Holmes.

10,687 jobs represent an employment self-sufficiency rate of 65%, meaning that projected employment provision can theoretically provide jobs for 65% of employed residents. However, not all jobs will be held by residents and employment self-containment, that is the proportion of employed residents who hold jobs within the site, is estimated to be 45%.

Consequently, 55% of the working population is projected to travel outside the proposed urban area for employment. Current journey to work patterns within the Playford LGA and major employment growth areas have been reviewed to determine resident's likely work.

More than two thirds of employed Playford LGA residents are employed in Adelaide's north, including Port Adelaide, while only around 7% are employed in Adelaide's CBD. Strong population and employment growth in the Adelaide's northern region is expected to continue into the future, supported by major new infrastructure investment including:

- Port River Expressway.
- Outer Harbour Channel Deepening.
- South Road Upgrade.
- Le Fevre Peninsula Transport Corridor.
- Northern Expressway.
- Northern Connector.

Future employment growth areas in the region are expected to include:

- Kingsford Regional Industrial Estate (Light Regional LGA)
- Greater Edinburgh Parks (Salisbury and Playford LGAs)
- Le Fevre Peninsula, Port Adelaide and Gillman.
- Expansion of employment within Mawson Lakes (further 2,000 jobs).
- Expansion of Activity Centres, nominated in the Planning Strategy.
- Employment precincts within the new Playford North and Blakeview release areas.
- Employment within future growth areas such as Gawler East and Concordia.
- Infill within existing, under-used industrial zones throughout Adelaide's northern region.

Based on the above, an employment location profile has been prepared and is shown in Table 14.7. Notably, the proportion of residents employed within Playford LGA, including within the site, is projecteded to be high as a result of the employment opportunities provided in the Masterplan's employment and mixed use precincts and centres. Additionally, employment within the Adelaide's northern region has been scaled up from current patterns within the Playford LGA to reflect projected future employment growth in these areas.

Table 14.7 Projected employment locations for residents

Local government area	Jobs
The site	7,425
Playford	2,475
Salisbury	2,376
Port Adelaide Enfield	1,320
Adelaide	726
Charles Sturt	396
Tea Tree Gully	330
West Torrens	317
Gawler	330
Norwood, Payneham & St Peters	132
Prospect	66
Light	264
Unley	66
Burnside	66
Campbelltown	66
Mitcham	33
Marion	33
Walkerville	23
Mallala	23
Holdfast Bay	13
Onkaparinga	4
Other	16
Total	**16,500**

Source: Connor Holmes.

14.3 Contribution to industry development in the northern Adelaide region

Guideline 4.6.3: Outline how this development will support industry development in the northern Adelaide region.

This Guideline is addressed in Chapter 16.2.

14.4 Residential population

Guideline 4.6.4: Outline the number and type of dwellings and the expected residential population in the proposed staging of the development and the timing of stages.

14.4.1 Number and type of dwellings and expected resident population

The Masterplan can accommodate 12,000 dwellings and an ultimate population of 33,000. Residential areas and densities are identified in Table 14.8. These yields will be subject to future detailed design.

Table 14.8 Dwelling yields

Location	Net area available (ha)	Net density	Total dwellings
Low-density residential villages	77	10	700
Traditional density residential villages	449	20	8,580
Medium-density clusters	61	40	2,320
Mixed use precinct	13	40	400
Total dwelling yield	600	22	12,000

Source: Connor Holmes.

The Masterplan seeks to focus higher density residential areas around centres and public transport routes, while lower density areas are located where natural features, such as mature Eucalyptus trees near the Gawler River, which are accommodated in the Masterplan.

The Masterplan accommodates 600 ha of net residential land, which will include a range of housing types to meet market demands and expectations over the life of the project.

The proposal's scale and 25 year implementation time frame supports, and indeed requires the provision of housing which suits a range of people and households in different age and income brackets.

The housing type mix and the household types projected generally seeking those housing types are summarised in Table 14.9.

Table 14.9 Housing type by household type

Land and housing package	Size		Component of total yield	Household type
	Site area	Frontage		
Acreage	2,000 m^2+	40 m+	<1%	Families
Premium	800–1,000 m^2	22 m+	5%	Families
Traditional	540–700 m^2	18–22 m	25%	Families
Courtyard	420–480 m^2	14–16 m	20%	Families, Older couples
Four packs	360–450 m^2	12–15	2%	Families, Older couples
Villa – large	375 m^2	12.5 m	10%	Families, Older couples, Older Singles, Couples, Single-parent families, Low-income groups
Villa – small	300–330 m^2	10–11 m	10%	Families, Older couples, Older Singles, Couples, Single-parent families, Low-income groups
Cottage	300–350 m^2	14–15 m	5%	Families, Older couples, Older Singles, Couples, Single-parent families, Low-income groups
Gatehouse	150–300 m^2	10–14 m	5%	Older couples, Older Singles, Couples, Single-parent families, Low-income groups
Terraces/Row dwellings	125–300 m^2	5–10 m	5%	Singles, Couples, Older couples
Rear loaded dwellings	125–200 m^2	5–8 m	5%	Singles, Couples, Older couples
Mews dwelling	25–40 m^2	na	1%	Singles, Couples, Low-income groups
Apartments	70–100 m^2	na	3%	Singles, Couples, Low-income groups
Mansions	200–300 m^2	18–22 m	<1%	Singles, Couples, Small families
Shop top/Soho	70–100 m^2	na	<1%	Singles, Couples
Retirement – lifestyle	300–400 m^2	na	2%	Active retirees
Retirement – aged care	250–350 m^2	na	2%	Supported, Retirees, Low-income groups

Source: Connor Holmes

The housing mix projected includes 87% (10,440) of sites as allotments, and 13% (1,560) as a completed buildings, which reflects the proportion of detached and attached dwellings.

The housing types that can be accommodated within the Masterplan's residential precincts are defined in Table 14.10.

Table 14.10 Definitions of allotment and dwelling types

Allotment or dwelling type	Definition	Location
Acreage	Large allotments greater than 2,000 m^2 but including allotments of up to 2 ha	Areas incorporating significant natural vegetation, stormwater channels or buffers to adjoining land uses
Premium	Large suburban allotments providing scope for grand residences	Adjacent to woodland areas and in exclusive culs-de-sac precincts separated from other neighbourhoods.
Traditional	Standard suburban allotments providing scope for most project home designs including 'triple-fronted dwellings'	Throughout the site
Courtyard	Allotments providing dimensions suitable for specific courtyard products and most 'double-fronted dwellings'	Throughout the site
Four packs	Sites for four dwellings served by a common central driveway, typically of courtyard dimensions	On main road frontages and on reserve frontages where no road access is provided to the lots fronting the main road or reserve
Villa – large	Allotments providing dimensions suitable for large villa homes, typically single-fronted plus double garage	Throughout the site
Villa – small	Allotments providing dimensions suitable for compact villa homes, typically single-fronted plus double garage	Throughout the site
Cottage	Shallow allotments that provide for a smaller, more affordable housing product	Throughout the site
Gatehouse	Small lots, often at the rear of larger properties providing an affordable housing product	Facing onto laneways and minor streets
Terraces/Row dwellings	Attached dwellings built in rows of three or more which take advantage of zero side setbacks	Mixed use precincts, centres, near centres and where definition of the street environment is required. Corner sites permit vehicular access to the rear of the site.
Rear loaded dwellings	Detached dwellings on small allotments with zero side setbacks and with vehicular access provided from a rear lane, avoiding garaging onto key streets	On main road frontages and on reserve frontages where no access is available from the main road or reserve, and in precincts near the centres
Mews dwelling	Single-bedroom dwellings or bedsits located over garaging	Facing onto laneways and minor streets
Apartments	Multi-level attached dwellings at medium densities	In and around centres and mixed use precincts
Mansions	Two or three apartments on corner sites with separate vehicle access for each dwelling and taking on the appearance of a very large dwelling	At key intersections to define the scle of development of the area

Allotment or dwelling type	Definition	Location
Shop top/Soho	Multi-level attached dwellings located over ground level commercial floorspace, sometimes with ownership links between residential and commercial space	In centres, mixed use zones and along major road frontages
Retirement – lifestyle	Integrated villages, usually single storey, providing a range of recreation and lifestyle services to active retirees	Reasonable proximity to shops, public transport and medical services
Retirement – aged care	Low-care and high-care accommodation for older age groups, by way of independent living units and assisted care in hostels and nursing homes. May be multi-storeyed	Close proximity to shops, public transport and medical services

Source: Connor Holmes.

This projected housing mix provides for a wide cross-section of the community, and reflects the ability of the Masterplan to accommodate a wide range of housing types, at different prices, as a result of its significant scale.

14.4.2 Proposed staging and timing of stages

The rate of dwelling construction and occupation anticipated is outlined in Table 14.11. The rate is a function of a combination of factors including the:

- Overall size of the market.
- Ability of the proposal to capture a share of that market.
- Ability of the proposal to deliver housing to a range of market niches simultaneously.
- Timing and scale of competing land releases.
- Impact of construction marketing start up and wind down on delivery numbers.
- Time delay between land release and housing construction.

Actual dwelling construction levels are likely to fluctuate more than indicated in the above table as a result of ever changing market conditions, unanticipated construction delays and the timing of other projects, however, an average of around 480 dwellings constructed per annum is a reasonable mean figure.

These projections can only be considered a planning tool. There are many factors which will influence the dwelling yield and population make up over the 25-year implementation period.

Table 14.11 Construction and occupation

Date	Lots created	Lots created: cumulative total	Dwellings occupied	Dwellings occupied: cumulative total
2010	0	0	0	0
2011	120	120	0	0
2012	160	280	0	0
2013	200	480	120	120
2014	300	780	160	280
2015	400	1,180	200	480
2016	480	1,660	300	780
2017	600	2,260	400	1,180
2018	600	2,860	480	1,660
2019	600	3,460	600	2,260
2020	640	4,100	600	2,860
2021	640	4,740	600	3,460
2022	640	5,380	640	4,100
2023	640	6,020	640	4,740
2024	640	6,660	640	5,380
2025	640	7,300	640	6,020
2026	640	7,940	640	6,660
2027	640	8,580	640	7,300
2028	640	9,220	640	7,940
2029	640	9,860	640	8,580
2030	640	10,500	640	9,220
2031	640	11,140	640	9,860
2032	640	11,780	640	10,500
2033	220	12,000	640	11,140
2034	0	12,000	640	11,780
2035	0	12,000	220	12,000

Source: Connor Holmes.

In the first five years of construction, 2010 to 2016, the requirements for early access to facilities and commitment to infrastructure will be addressed. During the first five years:

- 1,660 allotments will be created

- Stage 1 will be completed, including the neighbourhood centre's first phase including a 1,500 m2 supermarket and 600 m2 of specialty shops, with the ability to double in size as more houses are occupied.
- A community bus network will be established to provide bus service for the first residents to connect with Route 900, and provide access to the region's shopping facilities, community services and schools.
- The storm and flood water management channel system will be commenced.
- Open space, parks and public domain landscaping, particularly in the neighbourhood centre, will be provided.
- A primary school will be established, by either the public or private sector.

The proposal's later stages will include the following:

- Between 2017 and 2021:
  - 3,080 additional allotments created;
  - establishment of another primary schools, public and private;
  - the second phase of Stage 1's neighbourhood centre;
  - a second neighbourhood centre will be constructed;
  - employment Area 1 will be partially constructed;
- Between 2022 and 2026:
  - 3,200 additional allotments created;
  - establishment of another two new schools, public B-12 and private secondary school;
  - employment Area 1 fully completed;
  - the district centre will be commenced;
  - a third neighbourhood centre will be constructed.
- Between 2027 and 2031:
  - 3,200 additional allotments created;
  - establishment of a fourth primary school and another secondary school;
  - ongoing creation of mixed use zone and district centre;
  - Employment Area 2 partially developed;
  - construction of a fourth neighbourhood centre;
  - decommissioning of the Stage 1 Neighbourhood Centre.
- Between 2032 and 2035:
  - 860 additional allotments created;
  - ongoing development of district centre, mixed use zone and Employment Area 2.

The above staging sequence is illustrated in the Staging Plan at Figure 3.11.

These are planning projections only, and will be the subject of detailed design at each stage, monitoring of demographic change, and fluctuations in the market.

14.5 Affordable housing

Guideline 4.6.5: Identify opportunities that would assist in reducing the cost of home ownership throughout the proposed development.

Guideline 4.6.6: Indicate how the Housing Plan for South Australia target of 15% affordable housing in all significant new residential development (including the 5% high need housing) will be achieved.

14.5.1 Opportunities to reduce the cost of home ownership

Connor Holmes notes it is generally acknowledged that an adequate supply of well priced urban land will reduce upward pressures on land prices and in so doing will promote affordability improvements in the marketplace overall (Appendix 26).

Therefore, the proposal will contribute to improved affordability in Adelaide's residential land market, by providing a new housing land supply over a 25-year timeframe.

Achieving the State Government's affordability price point of $213,000 for house and land packages relies upon some or all of:

- The assignment of a restrictive covenant/agreement on the property title providing some control over the sale and resale price of the property, where a home's market value is significantly higher than the affordable sale price.
- Innovative home financing, such as soft second mortgages, deferred land purchase, shared equity or subsidised financing options, which makes the sale price within reach of low and moderate income buyers.
- Design and construction of simple, high quality homes, resulting in a lower market value, as they are smaller homes on smaller lots.

The first option is not applicable to the proposal. It is unlikely in this context the price of house and land packages will be significantly higher than the Affordable Housing.

Subsidies are typically provided by the public sector, in the form of publicly owned and leased housing, or reduced financing costs, such as Homestart Loans.

The not for profit sector also provided subsidised housing, for example, retirement and aged care facilities, or co-operative housing projects.

Subsidised housing of this kind could be provided within the proposal.

However, these forms are housing are more suitable for the proposal's later stages when community services, centres and facilities are more established.

In the proposal's early stages, the most appropriate way of keeping costs down so house and land packages can be offered at less than $213,000, is the management of construction and land costs.

This will be achieved essentially by providing smaller homes on smaller lots, or the use of house types such as attached dwellings or apartments where built elements are shared, maximising construction efficiency.

Construction costs can also be managed by providing specifically designed affordable homes available from project builders. Project builders can also manage costs, by building uniformly designed homes in relatively high numbers.

Any future planning controls applying to the site will have to consider the requirements for reducing land take. For example, narrower public streets and appropriate density controls, reduced front and side setbacks and broad range of housing types will need to be permitted.

The proponents will work with house builders to ensure Affordable House types are available for the allotments nominated. These builders will have an opportunity to include their homes in the display village.

14.5.2 Achieving Housing Plan for South Australia targets for affordable housing

The proposal seeks approval for 12,000 residential allotments. Building the houses will be undertaken by others and, with the exception of the display village, will be subject to separate and subsequent assessment and approval.

Therefore, at this time, the Masterplan has been designed to accommodate 15%, or a projected yield of 1,800 affordable houses by 2036.

Should the proposal be approved, the proponent will seek discussions with Housing SA and the SA Affordable Housing Trust to agree on the detailed approach to affordable housing (including high-needs housing).

Land Management Deed will be placed on the title of Stage 1's Affordable Housing lots to ensure a house and land package can be offered to the market at below $213,000. These are specifically identified in Figure 14.7.

Figure 14.7 Affordable housing allotments in Stage 1

This Deed will not be the standard one provided by the Department of Families and Communities, as the affordable allotments will already be identified on the land division plan.

Stage 1's Affordable Housing will be Torrens Title, consistent with other allotments within the Stage.

Existing allotments within the remainder of the site are not owned by the proponents, and will not be owned by the proponents at any stage in the planning and construction process. The imposition of a Land Management Deed on the Title is therefore not appropriate, particularly as the site comprises 40 separate Certificates of Title, and approximately thirteen different owners.

The methods by which the Affordable Housing component will be guaranteed within the proposal's future stages is described below.

Statutory Controls

Requirements for Affordable Housing are enshrined in legislation, specifically the *South Australian Housing Trust Act 1995*, its general regulations and any criteria the Minister applies through notice in the government gazette.

- The Governor can apply conditions to any approval she may issue for the proposal which makes mandatory the provision of 15% of the dwellings within Buckland Park as Affordable Housing.
- Should the Governor approve the proposal, the site will be the subject of a Development Plan Amendment which will introduce zones consistent with the Masterplan. This Development Plan Amendment will include objectives and principles to ensure the provision of Affordable Housing in future land divisions.

Specifically, Section 3 of the *Development Act 1993* contains the following objective, which must be considered in the preparation of a Development Plan Amendment.

"to promote or support initiatives to improve housing choice and access to Affordable Housing within the community"

Section 23(3) of the *Development Act 1993*, sets out the Planning Strategy issues which must be promoted in Development Plans. Specifically Development Plans should include objectives and principles relating to the provision of Affordable Housing within the community.

Future stages will be subject to detailed design and land division approval. The provision of Affordable Housing will be assessed at that time against the relevant requirements, and a referral to the Minister for Housing in accordance with Schedule 8 of the *Development Act 1993* will be made.

During the assessment of future stages options for financing, the involvement of the SA Housing Trust, the provision of high need housing and other types of affordability initiatives can be considered. The proposal will be more established and these options more viable.

Market demand

Policy-induced land shortages have been a major factor influencing the decline of housing affordability experienced in recent years in Adelaide, and nationally. It is generally acknowledged that an adequate supply of well-priced urban land will reduce upward pressures on land prices and in so doing will improve affordability overall.

The proposal, by providing a new supply of housing land over 25 years, will contribute to improved affordability in Adelaide's residential land market.

Demand for affordable housing is expected to come from all types of households over that time period, but in Stage 1 a predominance of younger families are expected.

Distribution

Given the proposal's scale, and the need to respond to changing market conditions and Government policy settings over a 25-year timeframe, it is not possible at this time to determine the number and location of Affordable Housing allotments in proposal's stages beyond Stage 1.

However, the Masterplan includes the following principles to guide the future provision of affordable housing allotments:

- >15%: areas where a wide range of housing types, including medium density housing and apartments could be supported when Buckland Park becomes more established, particularly around centres and close to public transport routes.

- 5%–15%: residential neighbourhoods comprising predominately lower density, detached housing, which will be progressively created across the Masterplan, and over time to 2036.
- <5%: areas adjacent to the woodlands where allotments will be larger, to take advantage of landscape amenity and to accommodate requirements for tree retention. As these larger allotments will be necessarily more expensive it will be difficult to provide affordable homes. These areas are within the proposal's later stages.

Figure 14.8 shows the planned distribution of affordable housing through the Masterplan.

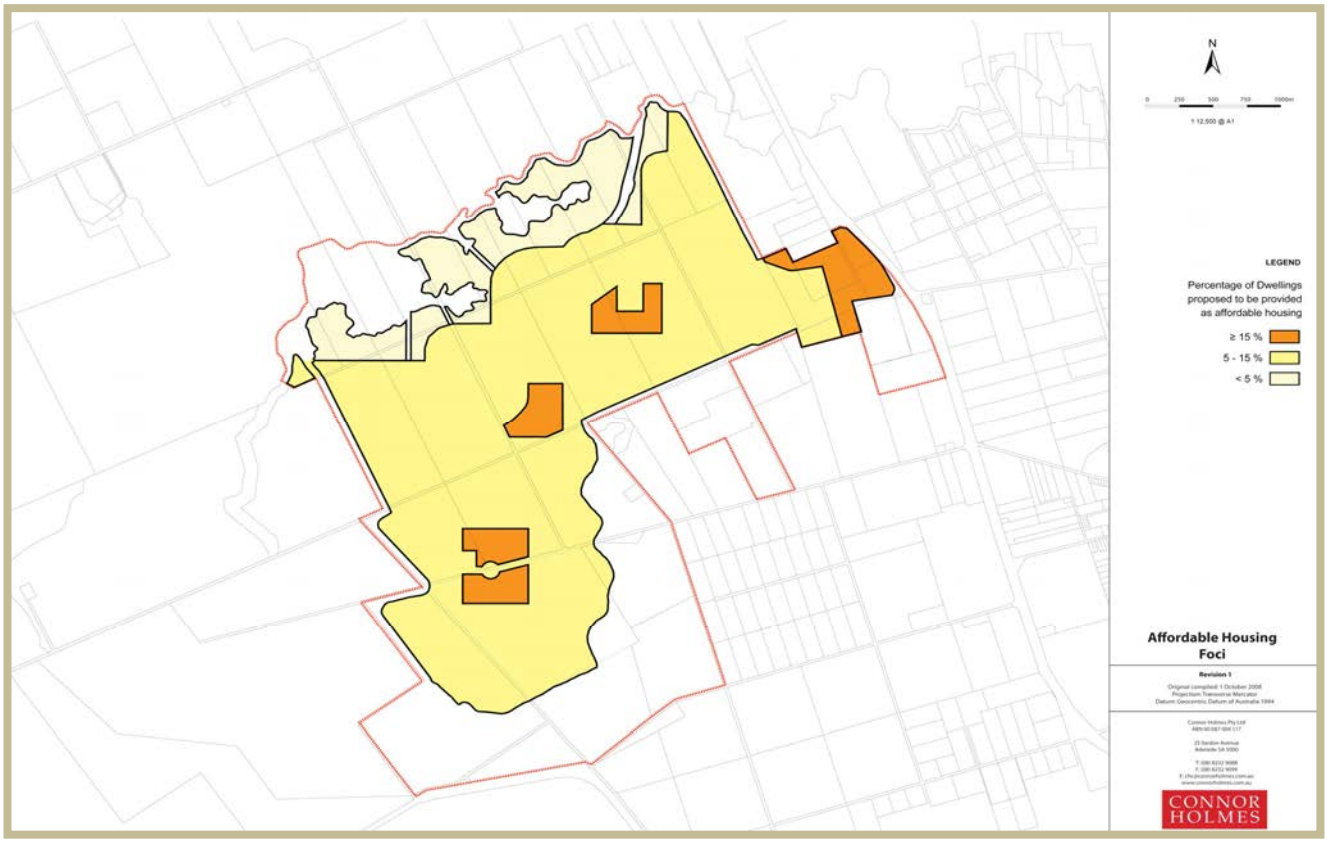


Figure 14.8 Principles for the distribution of affordable housing

14.6 Potential impacts on non-Aboriginal heritage sites

Guideline 4.6.7: Identify any potential impacts on places of non-Aboriginal heritage, including places of State or local heritage significance.

In response to this Guideline, a report has been prepared by SASH Consulting Services, European Heritage Assessment Report February 2008 (Appendix 4). The report concludes that there are no identified items of European heritage on the site or its vicinity that would form an impediment to the proposal proceeding.

However, the report does note that Buckland Park House is an important part of the locality's history, even though it will not be impacted on by the proposal.

In response to the findings of SASH Consulting's report, the proponents have committed to naming streets, parks and localities within the proposal for historical figures identified in the report.

14.7 Potential impacts on Aboriginal heritage sites

Guideline 4.6.8: Identify the effect that the proposed development will have on any sites, objects or remains of significance to Aboriginal archaeology, anthropology, history or tradition; including any items listed on the Register of the National Estate, the SA Register of Aboriginal Sites and Objects and any others identified by the Aboriginal traditional owners.

Australian Cultural Heritage Management (ACHM), in conjunction with the Kaurna Heritage Board (KHB) undertook a comprehensive, archaeological and anthropological field survey of the site during 2008.

This culminated in preparation of the report, A*boriginal Cultural Heritage Survey of the Buckland Park Proposal, Adelaide, SA,* September 2008.

This report contains confidential information, so does not form part of this EIS, it has however been provided to the Department of Aboriginal Affairs and Reconciliation (AARD).

In summary, ACHM considered the site and proposal in two stages. Stage 1 corresponds with the Stage 1 of the proposal. The remainder of the site beyond Stage 1 was considered separately.

Stage 1 area

Stage 1 did not return any results for visible surface archaeological sites, object, or remains (Section 3, SA *Aboriginal Heritage Act* 1988 – AHA), and it contained no landforms readily identifiable as potential archaeological deposits. No significant Aboriginal sites (AHA) were found on this land.

In respect of Stage 1, AHCM concluded no further action was required in respect of AHA.

An application under Section 12 of the *Aboriginal Heritage Act 1998* was made by the proponents on October 2008 for Stage 1.

However, AHCM recommend the implementation of a heritage management process which includes:

- Heritage monitoring when ground is disturbed for the first time, or for what appears to be the first time.
- A site discovery procedure developed with community consultation should Aboriginal sites, objects, or remains be identified during the ground disturbance phase.

ACHM also recommend the preparation and implementation of a Cultural Heritage Management Plan (CHMP) prior to any works associated with Stage 1 proceeding.

These recommendations will be adopted by the proponents and included as commitments in the EIS.

The Stage 1 CMP will include management arrangements for the required monitoring and an appropriate discovery procedure.

Remainder of the site

Three previously reported Aboriginal Heritage sites occur within the remainder of the site, two low-density stone artefact scatters and a scarred tree. The field survey conducted by ACHM and KHB identified six additional Archaeological sites (including two scarred trees), as well as seven areas of Potential Archaeological Deposits (PADs) which have been recommended for further, future investigation.

ACHM recommend a second stage survey using appropriate geophysical (remote sensing) methods, and limited (in the first instance) excavation to determine depth, nature and extent of selected artifact scatters in PAD areas.

This would identify and assess the archaeological horizons, and assist in designing future management plans and monitoring regimes once ground disturbance begins.

Further excavation may be necessary both before ground disturbance occurs and during construction to define the extent of occupation areas and to allow for appropriate Heritage Management regimes to be put in place. Such excavations would require Ministerial authorisation under Section 21 of the *Aboriginal Heritage Act* (1988).

Limited test excavations also would be required on areas where geophysical survey is advised, in order to establish baseline stratigraphic profiles for the areas being surveyed, and to provide positive identification for a sample of any sub-surface anomalies recorded by the remote sensing work. Such excavations would not in themselves require a S21 authorisation, but if the excavations reveal any Aboriginal sites, objects or remains, work would immediately cease and the discovery would be reported to AARD.

Further, AHCM have recommended a physical protection (fencing and signage) for culturally and archaeologically sensitive areas, for example scarred trees and sites defined as such by second stage geophysical survey and/or excavation.

They have recommended a CHMP be designed in consultation with the Kaurna Traditional Owners in the light of the information gathered and in advance of any ground disturbance, as early in the planning stage as possible.

A CHMP will contain contingencies for the management of material which is revealed during ground disturbance, but not previously uncovered, or anticipated during survey.

A CHMP should be developed, and consultation should occur with Kaurna Heritage Board, as soon as practicable in the planning stages or prior to any earthworks.

The recommended further investigations and CHMP framework should be implemented well in advance of completion of detailed design of the remaining stages of the Proposal, to insure that Aboriginal heritage values are adequately recognised and catered for.

The following will be undertaken as part of the detailed design of future stages:

- Further investigation of the PAD areas will be undertaken as soon as practical after any approval by the Governor of the proposal, in accordance with the method proposed by AHCM.
- A second application under Section 12 will be made for the remainder of the site as the more detailed survey recommended has been completed.
- A CHMP will then be prepared for the remainder of the site.
- The CMP for future stages will include management arrangements included in the CHMP.

14.8 Impact on any Native Title Claimants

Guideline 4.6.9: Describe the impact on any Native Title Claimants and the consequent impact on the potential ongoing enjoyment of native title rights (if any) by native title holders.

In response to this Guideline, Piper Alderman prepared *Native Title Report May 2008*. The report concludes that Native Title has been extinguished on all Certificates of Title and public roads within the site boundaries. Therefore the proposal will not impact on any potential ongoing enjoyment of native title rights.

In respect of the Crown Land on Park Road encompassed by the site, it was unclear whether Native Title had been extinguished.

Notwithstanding this, the Crown Land has been excluded from the Masterplan and the proposal.

The crown land allotment is shown on Figure 3.4.

14.9 Impacts on visual amenity and landscape quality

Guideline 4.6.10: Describe the effect on visual amenity and landscape quality, including the effects of the built form of structures such as the earthworks and power lines.

Earthworks

The principle earthworks included in the proposal are associated with the creation of roads and storm and flood water management facilities, such as channels and detention basins.

These structures will be low and therefore will not create significant visual impact. Roads will form an expected element in the proposal's built areas.

The storm and flood water management channels and detention basins are incorporated into the Masterplan's open space areas. The visual impact of these structures will be minimal as they will be landscaped, revegetated with indigenous vegetation as part of the proposal's biodiversity areas or incorporated into recreation facilities, for example, sports fields.

Powerlines

Two new power lines are required to serve the fully implemented proposal. These are described in Chapter 15. A new 66kV line is required along Angle Vale Road, and a second along Park Road.

ETSA have advised the new line along Angle Vale Road will require poles, 20–23 m high and 120–150 m apart. The configuration of the lines is illustrated below.

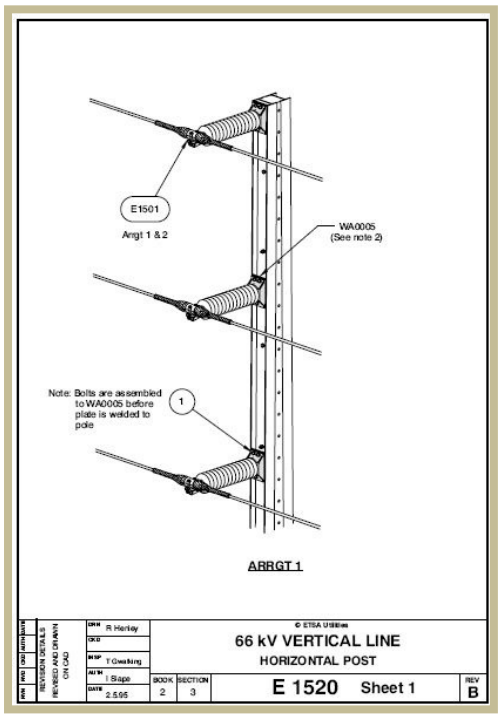


Figure 14.9 Detail of line along Angle Vale Road

ETSA could consider removing the existing ETSA infrastructure along Angle Vale Road, and co-locating it with the new infrastructure. This would minimise maintenance costs, and potential visual impacts.

ETSA have advised the new line along Park Road will require poles, , 20–23 m high and 120–150 m apart. The configuration of the lines is illustrated below.

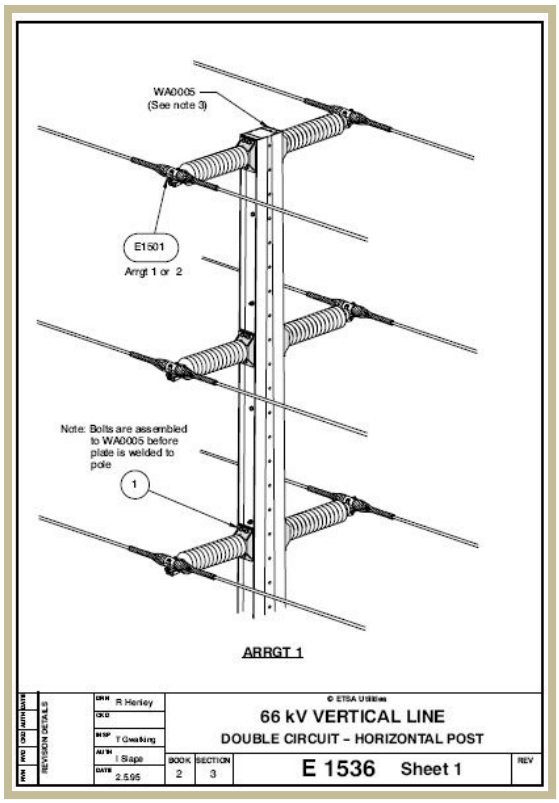


Figure 14.10 Detail of line along Park Road

There is an existing 11 kV line along Park Road with a vertical scale of 6–10 m. The pylons form a repetitive visual element to the road corridor. The proposal includes replacement of the 11 kV and co-location to a 66 kV aligned to the southern verge of Park Road. It is likely ETSA would remove this line and collocate it with the new line, minimising maintenance costs, and potential visual impacts. The proposed 66 kV transmission line will be twice the vertical scale of the existing pylons.

Swanbury Penglase have prepared a visual impact assessment of the new powerlines in Park Road (Appendix 17).

A photomontage was prepared which considered the visual impact of the proposed power lines.

Swanbury Penglase predicted the proposed changes to power lines in Park Road will provide a proportionate increase in the visual affects along this road corridor, however this will be contained to a local visual effect.

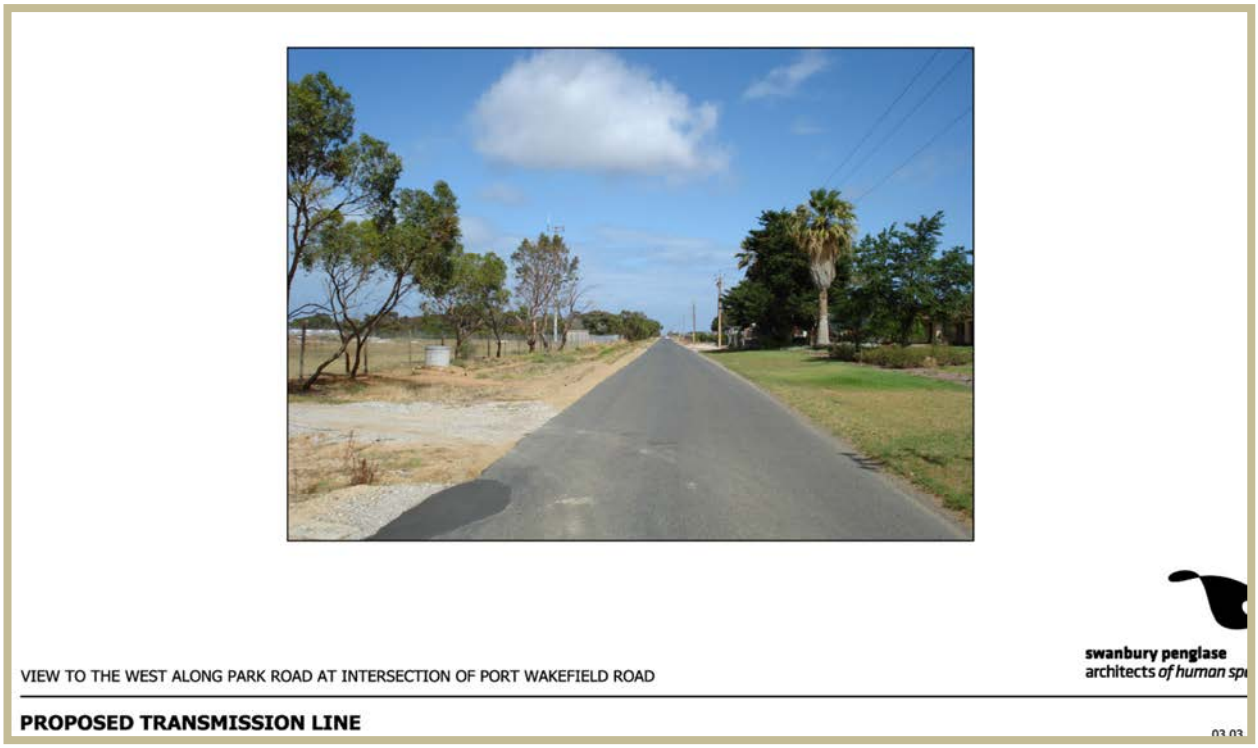


Figure 14.11 Existing powerlines in Park Road

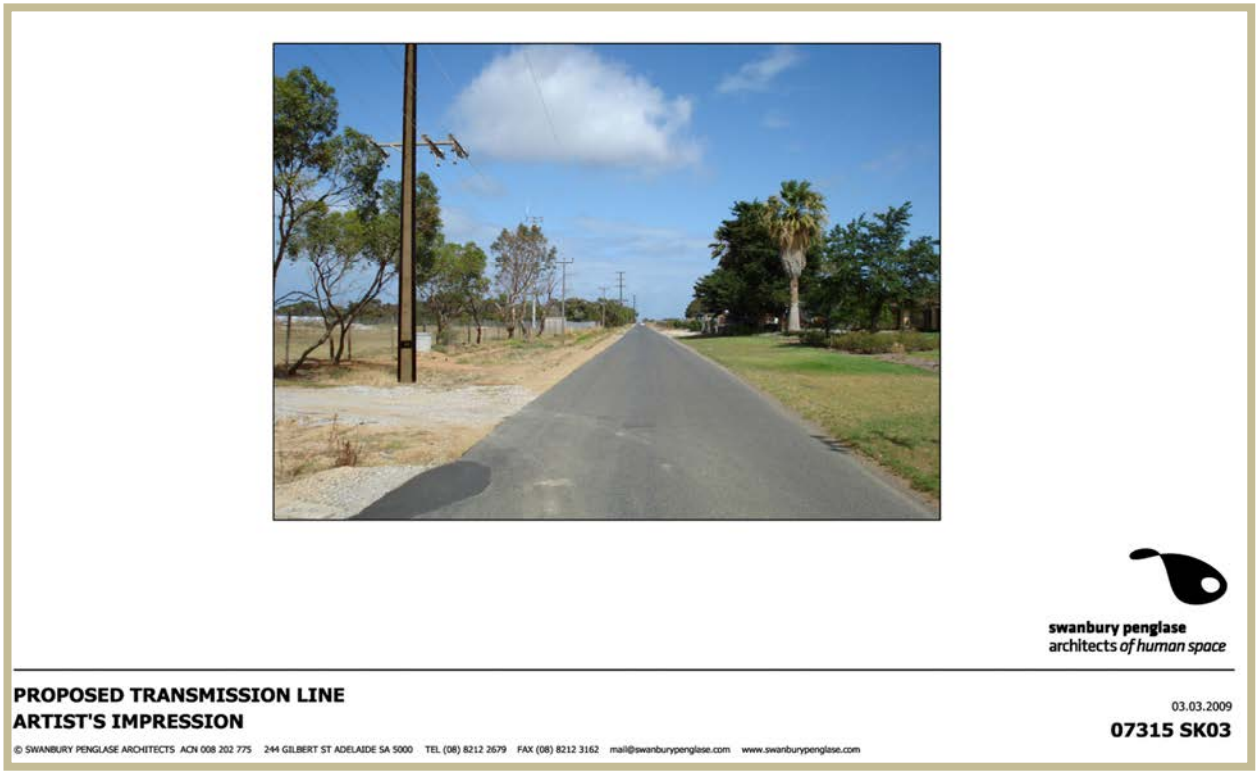


Figure 14.12 Photomontage showing proposed powerlines in Park Road

Other visual impacts

Swanbury Penglase have prepared a detailed assessment of the proposal's potential impacts on the region's visual amenity (Appendix 17).

They have concluded the proposal represents a significant change to the existing land use. The dominant character of the landscape is horticultural and grazing practices, the amenity of which is relatively low.

Virginia is located approximately 2–3 km to the east of the site. There will be limited visual effect or character change to the township of Virginia. There will be moderate effect to the northern urban fringe with isolated rural residential dwellings observing a degree of change associated to the proposal.

The major visual element in the landscape region is the Gawler River corridor. This distinctive element provides a shelter belt of vegetation to the northern boundary of the site. Its retention and rehabilitation as part of the proposal will provide screening between the proposal and viewpoints to the north.

Views of the proposal will principally be short distant and from the south to south-west, indicating that the extent of the visual effect is limited to a contained viewshed. Consequently the visual effect of the proposal would be seen by a narrow percent of the local community with no identified significant views adversely affected.

14.10 Proximity to existing and potential dwellings and other land uses

Guideline 4.6.11: Describe the proximity to existing and potential dwellings and other land uses and outline the measures which will be taken to address the potential for conflict at the interface between new residential areas and existing adjacent agricultural and horticultural areas.

The relationship of the proposal to existing dwellings and the Masterplan has been considered. The site's context has been described in Chapters 4 and 5.

Existing dwellings have been identified in the immediate locality and the wider locality including Virginia Township. Figure 14.13 shows the relationship of these land uses to the Masterplan.

There are a number of dwellings close to the site, particularly to the south-east in and around the thirty-six allotment rural living subdivision fronted by Nemesis Court, Park Road and Thompson Road. Further to the north-east of Port Wakefield Road are greater concentrations of dwellings associated with various horticultural and other uses.

Within the Virginia there are limited areas for residential expansion. More recently there has been residential expansion directly to the west of the Virginia within the Residential Zone.

The potential for new dwellings in the site's locality is determined by the Playford (City) Development Plan, which limits new dwellings to:

- Allotments created up to 3 November 1999 within the Horticulture (West) Zone.
- Within living areas identified within the Virginia Township.

The creation of additional allotments within the Horticulture (West) Zone is listed as a non-complying land use therefore any application must pass the stringent requirements of the non-complying process.

Conceivably the number of new dwellings will be limited by non-complying designation on allotments created after 3 November 1999.

Therefore, the potential for new dwellings in the site's locality is limited, with new dwellings only probable within the Virginia Township boundary.

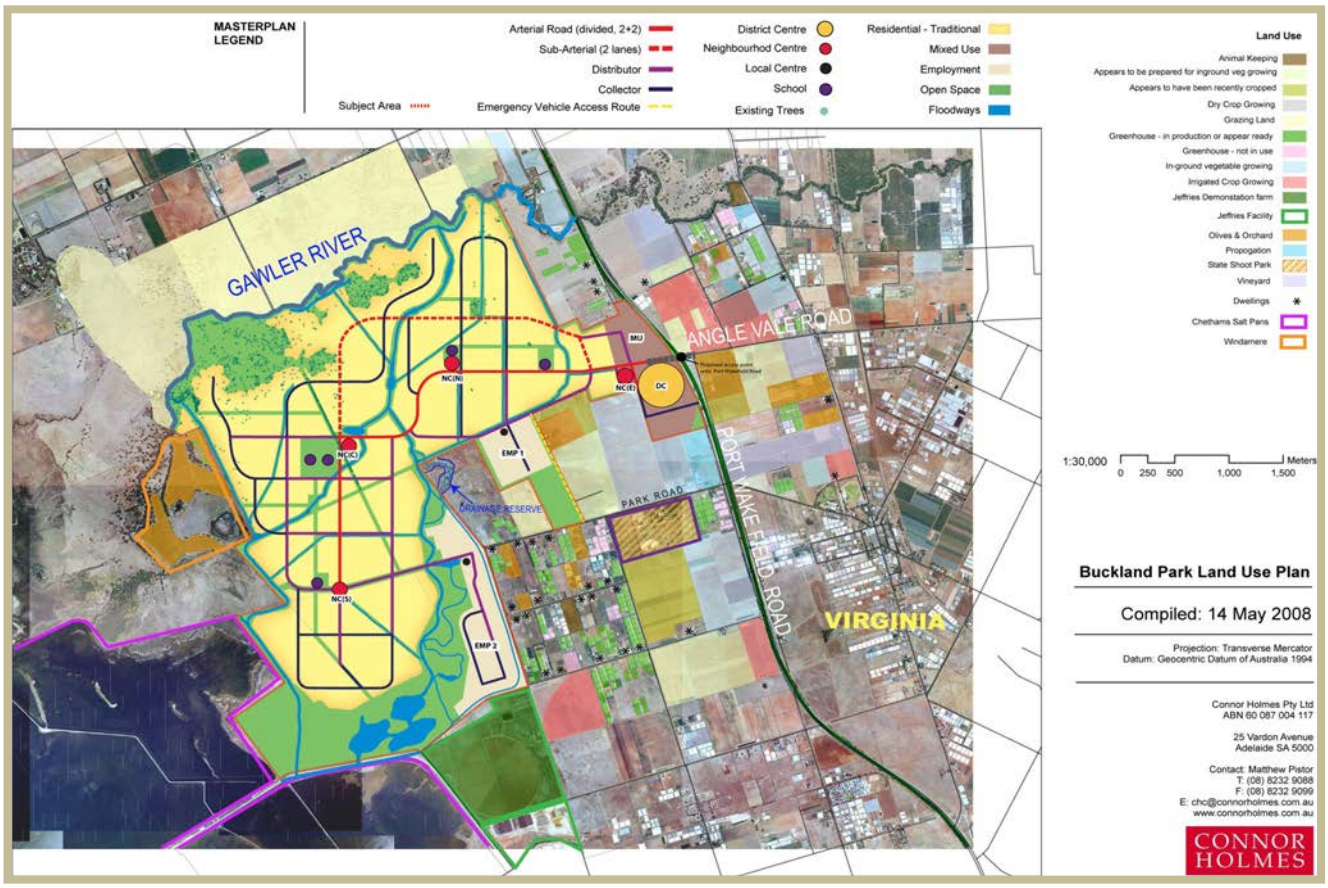


Figure 14.13 Relationship of surrounding land uses to the proposal

In addition to dwellings, there are activities in the site's locality which have could potentially conflict with the proposal. Table 14.12 describes these uses and the principles incorporated in the Masterplan to address potential conflicts.

Table 14.12 Masterplan principles to address potential conflict

Land use	Chapter
Jefferies composting facility	See Chapter 11
SA State Shooting Park	See Chapter 11
Horticulture, such as irrigated market gardens, orchards and olive groves and glasshouses, and associated dwellings.	Separation by at least 20 m has been accommodated in the Masterplan, either by the use of landscaped buffers or public road reservations. Inclusion of Perpetual Holding's facility in a proposed employment precinct, separated from proposed residential areas by linear parks. The parts of the site closest to horticultural activities, particularly in the south, have been accommodated in employment precincts or as open space. Windamere estate, adjoining the site's western boundary, will be provided with public road access as part of the detailed design of the proposal's western stages. Potential visual impacts on Windamere will be addressed in the detailed landscape design of the stages closest to Windamere. The Masterplan accommodates landscaped areas between residential precincts and Windamere's boundary. Air quality issues have been addressed in Chapter 11. Public road access and utility services will be maintained to all existing properties in detailed land division plans and CMPs for each stage. Rural/residential land uses are commonly found on the interface between country towns and cities. Future planning controls applied to the Masterplan's western residential precincts will address interface issues in detail. These will be complied with in those stages' detailed land division plan.
Cheetham salt pans	See Chapter 7.6.
Coastal vegetation which may support mosquitoes	See Chapter 9.10, however, it is noted that the Masterplan's residential precincts are separated from mosquito habitat by 3–7 km, a similar distance as the urban areas of Salisbury LGA from similar habitat. Provision of buffer fencing and landscaping in the proposal's western stages in accordance with the recommendations of Samson Institute (Appendix 22).

14.11 Impacts on Virginia

Guideline 4.6.12: Identify the effects on the existing settlement of Virginia in terms of retail, community services, health, education, welfare and the workforce.

14.11.1 Education

Virginia Primary School is the closest existing primary school to the site, located approximately 5 km from Stage 1 by road. It is the only school within Virginia and has an area of approximately five hectares and buildings with a capacity for 300 students, 270 students were enrolled in 2007.

There is room at Virginia Primary School for demountable buildings to accommodate Buckland Park's first primary school aged residents (Appendix 25).

Demand for both primary and pre-school education within Virginia is likely to increase in the proposal's early years. An increase in enrolments may have a positive benefit to the school, by allowing DEC to increase teaching resources and facilities offered.

14.11.2 Retail

The Virginia neighbourhood centre is the closest retail centre to the site, comprising retail floor space of 5,582 m^2. Key facilities include a Woolworths supermarket and Mitre 10 hardware store

Connor Holmes has considered the proposal's centres planning within the context of the region's existing hierarchy of centres (Appendix 27). They concluded in the early years of the proposal's construction and occupation, Virginia's neighbourhood centre is likely to experience an increase in retail turnover.

Prior to the Stage 1's neighbourhood centre being commissioned, it is expected construction workers will rely on Virginia. The first neighbourhood centre will be constructed in two phases, with phase 1 comprising around 2,000 m^2 of retail floor space, rising to an ultimate retail floor space of around 3,500 m^2 with phase 2.

The neighbourhood centre will grow to match the growth of the proposal's population. While every effort will be made to ensure the neighbourhood centre provides fundamental goods and services for the convenience of new residents, it is not anticipated there will be an over provision of retail space.

Rather it is more likely to be under provided, with new residents seeking some goods and services in the Virginia Neighbourhood Centre for some years.

For further detail on the anticipated effects on retailing within Virginia refer to Chapter 16 and Appendix 27.

14.11.3 Health

The Virginia Medical Centre on Old Port Wakefield Road currently offers private GP, dental and limited specialist medical services, including physiotherapy. The proposal's first residents may place additional pressure on that service. The provider may choose to expand the practice. Additional clients may make it possible for the Centre to increase the range of services offered, which would benefit Virginia's existing residents.

Should this not be possible, the speciality shops in phase 1 of the proposal's Stage 1 neighbourhood centre will be suitable for medical and dental practices. Suitable practitioners will be encouraged into the neighbourhood centre, and assisted if required if the resident population is not large enough to maintain financial feasibility.

It is expected that private medical services will locate within the Masterplan's neighbourhood centres and district centre. These facilities will be available to Virginia residents, increasing their health care options.

14.11.4 Workforce

The Masterplan accommodates land for mixed use, retail, commercial and employment precincts with the potential to accommodate 10,687 jobs by 2036.

It is envisaged that an range of industries and businesses could locate within those precincts. Connor Holmes projects only 45% (7,425) of the proposal's new residents will be employed in those precincts (Appendix 5). The remaining 3,262 jobs will be available for residents of the surrounding region, including Virginia.

A comparison of the employment profile of Virginia and the ADS indicates that there is a focus on employment in the agricultural sector within Virginia's workforce.

Agriculture provides employment for more than one quarter of the employed population of Virginia compared with less than 1% of the metropolitan employed population. Wholesale trade is also a key employment industry for Virginia residents, providing employment for around 11% of the working population, compared with around 4% of the metropolitan working population. Industries which are underrepresented in Virginia's employment profile include service industries and public administration.

Employment opportunities within the site will be focused on industries currently underrepresented in Virginia's employment profile, including education, health and professional services. Whether or not these opportunities are taken up by Virginia residents will be dependent upon individuals' skill base and personal choice.

14.12 Impact on local and regional land uses

Guideline 4.6.13: Describe the impact on local and regional land uses.

The proposal has the potential to impact on land uses at both the local level and to a lesser extent at the regional level. The site's context as described in Chapters 4 and 5. The implications of this context for the proposal, and the proposal's implications for its context are discussed in Chapter 14.10.

This Chapter therefore considers this Guideline in a strategic planning context.

The proposal will slowly alter the character of the site's locality, and to a lesser extent, its region.

The South Australian government is reviewing Adelaide's strategic planning. On 5 November 2008 the Minister for Urban Development and Planning initiated the "Growth Investigations Areas" project to ensure there is enough land to accommodate Adelaide's projected growth over the next 25 years.

The results of the project will become progressively available over 2009.

Coupled with the project is the Government's recently announced *Directions for Creating a New Plan for Greater Adelaide* which responds to current and emerging thinking on a vision to direct Greater Metropolitan Adelaide's growth. This EIS considers the relationship of the proposal to the Directions.

It is likely that a proportion of that growth will occur in Metropolitan Adelaide's northern region, where the site is located. This growth will be supported by the commissioning of NEXY, and the planned Northern Connector. Combined with these improvements in the region's accessibility, the proposal and its regional infrastructure have the potential to facilitate other growth in the region. In turn, the proposal's strategic location is enhanced by the improvements and potential growth.

Subject to the proposal's approval, Playford City Council may consider reviewing its strategy for other land in the vicinity, particularly in locations with limited value for horticulture, and/or where accessibility to infrastructure and services associated with the proposal has improved its strategic value for accommodating Metropolitan Adelaide's growth.

14.13 Community consultation processes

Guideline 4.6.14: Describe any community consultation processes already undertaken and identify any issues raised during this process regarding the potential effects on communities.

Guideline 4.6.15: Identify any changes made to the proposed development as a result of this process.

Formal community consultation has not been conducted however, the following consultation processes have been undertaken.

14.13.1 Establishment of a community enquiries register

Only four enquiries regarding the proposal have been directed the proponent. These have been registered and the action taken in response recorded. Table 14.13 summarised the enquiries directed to the proponent and the response.

14.13.2 Issues from community representatives

A range of community representatives have been consulted, including the Virginia Horticulture Centre and Playford City Councillors. Table 14.14 summarises the issues raised and the responses.

Table 14.13 Enquiries directed to the proponents

Date	Issue	Response
19 September 2008	***Business future*** Should an existing business in proximity to the site be upgraded, or sold so the owner could retire?	The enquirer was advised his property was not within the site and legal advice should be sought regarding planning controls. He was also advised to view the EIS during the public exhibition.
10 October 2008	***Stormwater management and potential flooding impacts on adjoining properties***	The enquirer was advised this issue would be addressed in the EIS, which would be submitted to the State Government and be available on public exhibition.
20 October 2008	***Water supply*** The enquirer asked if water supply options for the proposal would allow water supply to properties in the area of Virginia.	The enquirer was directed to SA Water. Potential benefits to the site's area associated with the supply of water are described in Chapter 7 and 16.
10 December 2008	***Zoning changes*** The enquirer was concerned his business may be affected by future zoning change.	The enquirer was advised zoning changes were only proposed within the site's boundaries.

Table 14.14 Issues raised by the community

Issue	Chapter
Impact on adjoining land – including land adjoining Port Wakefield Road	See Chapter 14.11 and Table 14.12
Management of Gawler River flooding – including potential blockages on the Gawler River during a flood event	See Chapter 7
Salinity and high watertable	See Chapter 7
Impacts on Virginia	See Chapter 14.11
Water infrastructure supply	See Chapter 7
Energy and electricity use	See Chapter 9 and Chapter 15
Community facilities	See Chapter 14 1 and Chapter 14.18
Housing supply	See Chapter 6.2, 14.5 and 14.6
Horticultural Industry	See Chapter 16
Jefferies composting facility	See Chapter 11
The provision and timing of community services	See Chapter 14.1 and 16.5
Public transport	See Chapter 12 and Chapter 14.1.2
Infrastructure funding	See Chapter 16
Funding of roads and local infrastructure – including maintenance	See Chapter 16
Provision of access to the coast	See Chapter 8 – *provision of access to the coast is neither achievable nor desirable*
Thompsons Creek	See Chapters 7 and 10
Council's ongoing involvement	See Chapter 16
Affordable Housing and the SA Housing Trust	See Chapters 6.2 and 14.5
The Urban Growth Boundary	See Chapter 19.2
Roadside Marker Sites	See Chapter 10

14.14 Addressing potential social and physical isolation issues

Guideline 4.6.16: Describe how the potential social and physical isolation of residents at Buckland Park (including those with no access or limited access to private vehicles) would be addressed.

A strong sense of community and a range of community facilities and services will be required to promote social connectivity among residents.

The proposal has the ability to mitigate the impact of potential physical and social isolation.

The proposal's scale enables it to support the provision of a range of physical infrastructure and social infrastructure. The Masterplan and Staging Plan allow coordination of its provision with the occupation of new housing.

The locality's existing community will be able to access this infrastructure.

Connor Holmes has undertaken an assessment of the site's strategic context, (Appendix 2). They concluded the site is more strategically favourably than other new and growing suburbs in Greater Metropolitan Adelaide, on many key indicators, pertinent to social isolation.

The keys to overcoming physical and social isolation in the early years of the proposal's occupation are:

- The provision of a community centre within Stage 1's neighbourhood centre.
- The funding of a community worker based and resourced in the community centre.
- The funding and operation of a community bus.

The following are considered key elements of building a strong community:

- Good urban design.
- Housing diversity.
- Accessible and appropriate human service provision.
- Effective public transport, and pedestrian and bike networks, integrated with the planning of centres, parks and employment and mixed use precincts.
- A sense of community identity.

The proposal's scale will support a range services and facilities including:

- Retail and commercial services.
- Employment opportunities.
- Recreation and sporting facilities.
- Community facilities.
- School, pre-school and child care facilities.
- Public transport services.

The accessibility of these services and facilities is enhanced by good urban design, community engagement in planning, and encouraging dual use of facilities where appropriate.

A Community building program will be implemented in Stage 1, including the provision of

- Dedicated community officer

- Range of community facilities
- Community events
- Resident welcome pack
- Buckland Park community newsletter
- Buckland Park community website.

More detail is provided in Chapters 9, 14.1.2 and 14.1.5.

14.15 Land tenure arrangements

Guideline 4.6.17: Describe the land tenure arrangements for the final development pattern.

Within Stage 1, all new allotments created will be Torrens Title, and available for purchase, either by future residents, private business or, in the case of the school site, by a government or a private provider.

Reserves for recreation and stormwater management facilities be vested with Playford City Council as part of the proposal's compliance with Section 50 of the *Development Act 1993.* Public roads will likewise be dedicated to Council.

However, this process cannot be undertaken without the agreement of Council. All parks, roads, public landscaped areas and stormwater facilities will be designed to Council's reasonable specifications. All plans will be certified and the Council will regularly inspect work to ensure compliance with its standards.

A reasonable maintenance and defects period will be agreed, and land and facilities will not be vested until that period has elapsed. The opportunity for bonding some work to allow dedication prior to completion of construction or the maintenance and defect period will be agreed with Council.

Affordable housing lots nominated in the Stage 1 layout plan will be burdened with a land management deed to ensure they met the DFC's requirements (Appendix 26).

Future stages have been identified in the Staging Plan and Super Lot Land Division plan. As construction and occupation progresses to each new stage, these will be subject to detailed Land Division, in the form of Torrens Title residential lots, and larger lots nominated by the Masterplan for that stage, for example, centres, schools, higher density housing, parks, stormwater facilities and regional open space required for biodiversity purposes.

Higher density housing lots could be further strata subdivide after the housing is constructed.

It is anticipated arrangements for dedicating land to Playford City Council will be the same as for Stage 1. It is anticipated that some land required as regional open space will be dedicated to the state government as part of any Significant Environmental Benefit that may be required.

14.16 Infrastructure benefits and improvements to amenity

Guideline 4.6.18: Describe the benefit and amenity improvements due to infrastructure changes.

The following benefits are expected to flow from the provision of infrastructure to service the proposal:

- Additional patronage on the route 900 bus, which will underpin its viability, and eventually the frequency of service, and the number of potential destinations accessible by pass from the locality will increase.
- SA Water's options for the provision of potable water have considered the potential for an additional 11,000 allotments to be created in the region, allowing infrastructure to be sized to allow strategic growth, or incremental growth around Virginia.
- Electricity infrastructure will improve the security of electricity supply to the existing users in the locality.

- Stormwater will be available for other users in the locality, including Playford City Council or horticultural or other businesses.
- The Masterplan accommodates land for schools which will increase the range of education options available to local children.
- Economic benefits flowing from the proposal will be most obvious within Metropolitan Adelaide's northern region.
- The proposal's district centre will provide a range of retailing facilities, services and employment opportunities not otherwise available in the site's vicinity.
- The rehabilitation of the Gawler River corridor and its potential transfer to government will provide an additional passive recreation facility and ecological asset for the community in the site's vicinity.
- The Masterplan's open spaces can accommodate active recreation facilities which will be available to all sporting clubs in the locality.
- The Masterplan accommodates commercial, employment and mixed use precincts and centres, which will provide employment for people in the site's locality.
- The Masterplan accommodates land for high needs housing which will provide housing options for residents of the local area requiring this type of housing.
- The proposal includes provision for 15% Affordable Housing which provide housing options for residents and their children which are located close to their existing family homes.
- The proposal will provide housing options for residents and their children which are located close to their existing family homes.
- The proposal will provide housing options for residents and their children which are located close to their existing family homes.
- The proposal will provide housing options for potential workers in surrounding horticultural industries, supporting the viability of those businesses.

14.17 Impacts of any odour and other emissions drift from the adjacent composting operation

Guideline 4.6.19: Describe the impacts to residents of the proposed development of any odour and fugitive emissions drift from the Jeffries composting operation on adjacent land.

Chapter 11 addresses this issue.

14.18 Community facilities

Guideline 4.6.20: Describe the types of community facilities to be provided as part of the proposed neighbourhood centre and the value to the community of locating those facilities within the proposed development.

The proposal's scale will support a range of community facilities. From a social, environmental and economic sustainability perspective, there are significant benefits associated with locating a range of community facilities within the site and reducing dependency on external facilities. These benefits include:

- Increased access to community facilities.
- Reduced car dependency.
- Increased local economic/employment opportunities.

- Increased opportunities for social interaction among residents.

The Masterplan accommodates a district centre and three permanent neighbourhood centres and it is within these centres that many community facilities will be concentrated.

14.18.1 District Centre

The Masterplan allocates land for a district centre, which it is anticipated will comprise higher order retail facilities. It adjoins land allocated as a mixed use precinct and commercial area.

The District Centre is located to facilitate access to and from Port Wakefield Road, maximising its exposure and accessibility and to planned bus routes. The District Centre can accommodate the following community facilities:

- Community services
  - library
  - community centre
  - places of worship.
- Retailing
  - supermarket(s)
  - discount department store
  - specialty retailing
  - bulky goods retailing.
- Commercial services
  - professional services
  - post office
  - banks/financial institutions
  - offices
  - motel.
- Entertainment facilities
  - restaurants/cafes
  - hotels/taverns
  - nightclubs/bars
  - auditorium
  - cinema complex
  - amusement hall.
- Health services
  - medical centres
  - dental services

  - specialist medical services
  - community health facilities
  - alternative care.
- Emergency services
  - ambulance
  - fire
  - police.
- Transport services
  - bus interchange/park and ride facility.

14.18.2 Neighbourhood centres

The Masterplan allocated land for three neighbourhood centre, established by 2036. In addition to shops, provision has been made for commercial and community uses within neighbourhood centres.

They have been located to maximise the number of households within walking distance, and are adjacent, or in close proximity, to schools and open space areas to minimise travel and maximise potential for shared use of facilities such as playing fields, libraries and community centres.

The Stage 1 Layout Plan includes a temporary neighbourhood centre as shown in Figure 3.8. It is proposed the centre will include a community space, built by the proponent and commissioned to coincide with the occupation of the first house.

The proponent will fund and resource a community officer based in the centre. The officer will commence work at the beginning of Stage 1's occupation, commencing in 2013 and will undertake the following activities:

- Get to know new residents, which will assist them with their other responsibilities.
- Organise targeted community activities, such as children's excursions, and the events described below.
- Facilitate the creation of community groups such as a business owner groups, Neighbourhood Watch, Playgroup, Mother's groups or other special interest groups.
- Facilitate use of the community centre for religious worship.
- Liaise with Council and the State government agencies regarding activities or programmes of interest to the community, and provide information to those agencies on issues within the growing community.
- Coordinate the use of the community bus outside of its commuter and school bus services, so that it provides an asset to other parts of the community.
- Provide residents with information on the programmes and activities offered by Council and State government agencies.
- Provide residents with information on planning and construction activities within Buckland Park, and conversely provide the proponents with information on how these activities may affect residents. A Buckland Park Construction Management Group will be established with representatives from the proponent, builders, Council, Police and residents to ensure construction occurs in a timely and safe manner, minimising impact on existing residents.

- Liaise with Playford's sporting and cultural organisations and providing information to them, and the Buckland Park community, on groups and activities which may be of interest to both.
- Prepare a community newsletter and managing the community website.
- Provide a point of contact for Virginia's existing community.
- Distribute a welcome package will be provided to all new residents, which will include:
  - welcome letter describing the community and planning and construction activities;
  - council, relevant government agencies, emergency and other useful contacts;
  - local business details;
  - community facilities;
  - upcoming events;
  - transport information, including bus timetables and routes.
- Community website information and password.
- Information on sustainability initiatives in place.
- Information on the site's biodiversity attributes and their responsibilities.

A range of community events will be arranged by the Community Officer. The nature and scale of these events will vary as the community becomes progressively occupied. Some events will be organised for all residents, and there will be smaller events for precincts or streets. Potential events include:

- Meet the street.
- Community barbeques and picnics.
- Seasonal events, such as Christmas Carols or Easter parades.
- Community planting days, to engender a sense of responsibility and ownership of the site's biodiversity assets.
- Sporting and cultural activities.
- Community planning days, to engender interest in the design of public parks and spaces, buildings and urban design.

The Community Officer will be available to provide ongoing information to the community as the proposal's construction and occupation progresses.

The community centre, community officer and community bus service within Stage 1's neighbourhood centre will be invaluable as a focus for the new community. Social networks will emerge as people meet in the centre during activities in which they have a shared interest.

It will also be a prominent point for obtaining the information necessary to establish a life in a new area.

14.18.3 Local centres

The Masterplan accommodates land for local centres, two within employment precincts to service worker populations.

It is anticipated these will comprise one or two small shops and will be built to coincide with construction of the precinct in which they are located.

14.18.4 Stage 1

Community facilities that will be provided in Stage 1 include:

- Sales office with associated showroom.
- Neighbourhood centre, comprising a supermarket and specialty shops (the supermarket will be constructed in two phases) café and commercial suites.
- Primary school site with pre-school.
- The first stage of the Masterplan's open space network, with walking trail, wetland and water feature.
- Community bus service.

Land has been included in Stage 1's design to accommodate the following:

- Private child care centre.
- A hotel site.
- Private recreation facilities.
- Sports facilities, probably shared by the school site.

Chapter 15 Infrastructure

The site's locality is characterised by rural and horticultural activities, with housing at correspondingly low densities. It is therefore not well served with physical and social infrastructure. However, trunk infrastructure is located in the site's vicinity.

This chapter describes the requirements for infrastructure to support the proposal, and the means of providing that infrastructure.

The proposal will require the following items of physical infrastructure:

- Electricity.
- Gas.
- Water, sewer and recycled water.
- Storm and flood water management.
- Roads.
- Public transport.
- Bicycle and pedestrian routes.
- Schools and education facilities.
- Open space.
- Biodiversity areas.

The proposal will be constructed and occupied in stages over a 25 year time frame. Implementation of infrastructure will be coordinated with the roll out of stages over that period. This will ensure cost effectiveness, by matching infrastructure provision to the growing community's requirements.

At each of the proposal's future stages, detailed design will be undertaken, guided by the Masterplan, ensuring infrastructure is implemented as planned. Continued work will be undertaken with Playford City Council, infrastructure agencies and government to coordinate implementation, maximising efficiency and minimising disruption.

Subject to the Governor approving the proposal, infrastructure plans will be prepared to relevant agency specifications, approved by agencies and implemented. During this process, arrangements for commissioning, handover and maintenance of infrastructure will agreed with the relevant agencies.

The state Government has recently announced *Directions for Creating a New Plan for Greater Adelaide.* The Government has therefore committed to a Plan that incorporates the following:

- Within the next 30 years Greater Adelaide can house 500,000 more people, nearly 250,000 new dwellings and 160,000 new jobs.
- New housing will move over time from a 50:50 split between existing suburbs and new suburbs, to a 70:30 split.
- Well located and functioning Transit Oriented Developments.
- A 25 year supply of broadacre land identified, and a 15 year supply of land zoned for urban use at all times.

Connor Holmes anticipates much of this new housing will be provided in Metropolitan Adelaide's northern region.

The provision of infrastructure to the proposal should be considered in the context of planning for Metropolitan Adelaide's northern region next decades.

15.1 Impacts on capacity of existing trunk infrastructure

Guideline 4.7.1: Describe the condition and capacity of existing trunk infrastructure and the likely impacts of the development on that capacity.

Telstra, ESTA, and APA, have undertaken assessments of their trunk infrastructure, and identified the required upgrades and new trunk infrastructure required to serve the proposal.

Parsons Brinkerhoff has investigated road and transport requirements. During their investigations, they liaised with Playford City Council and the Department of Transport, Energy and Infrastructure (DTEI).

Wallbridge and Gilbert have investigated water infrastructure requirements. During their investigations, they liaised with Playford City Council. SA Water provided infrastructure assessments which formed part of Wallbridge and Gilbert's options for servicing the proposal.

Electricity

There are existing substations at Virginia, Angle Vale and Bolivar. They are currently connected via 66 kV overhead lines. The Virginia substation is currently operating at only 80% of its capacity.

ETSA have assessed the capacity of these substations and lines, and the proposal's electricity needs (ETSA 2008 and 2009).

They have identified the following required trunk infrastructure:

- Upgrade of two x 12.5 MVA transformers operating at the Virginia substation, and installation of two new 25 MVA transformers.
- Installation of a new 66 kV line between the Angle Vale and Virginia substations, along Angle Vale Road. This will provide security of supply to Virginia and Two Wells, in addition to serving the proposal.
- Replacement of the existing 66kV line overhead line between the Virginia and Bolivar substations in the medium term, when the existing 66kV line capacity is exceeded by demand from the proposal, estimated to be at 6,000 allotments.
- A new Buckland Park substation on the site, in the vicinity of Park Road and Tippets Bridge Road. The substation requires:
  - a site 100 m x 100 m, on a registered, unencumbered, Torrens Title allotment;
  - direct access onto a public road, capable of accommodating heavy vehicles;
  - water, sewer and stormwater drainage, and clearance from the 100 year flood level;
  - Native Title, native vegetation, and environmental heritage clearance;
  - Development Approval with acceptable conditions for the construction of the substation.
- A new 66 kV double circuit line along Park Road between the existing 66 kV line on Port Wakefield Road, and the new substation.
- Relevant easements for electricity infrastructure. The easements must be:
  - registered on the relevant titles, and favour ETSA;
  - 26 m wide for 66 kV lines.

This infrastructure will be constructed above ground. A visual assessment of the Park Road and Angle Vale Road lines is in Chapter 14.

It will be progressively implemented to match demand from the growing community, and is estimated to be required at 6,000 allotments.

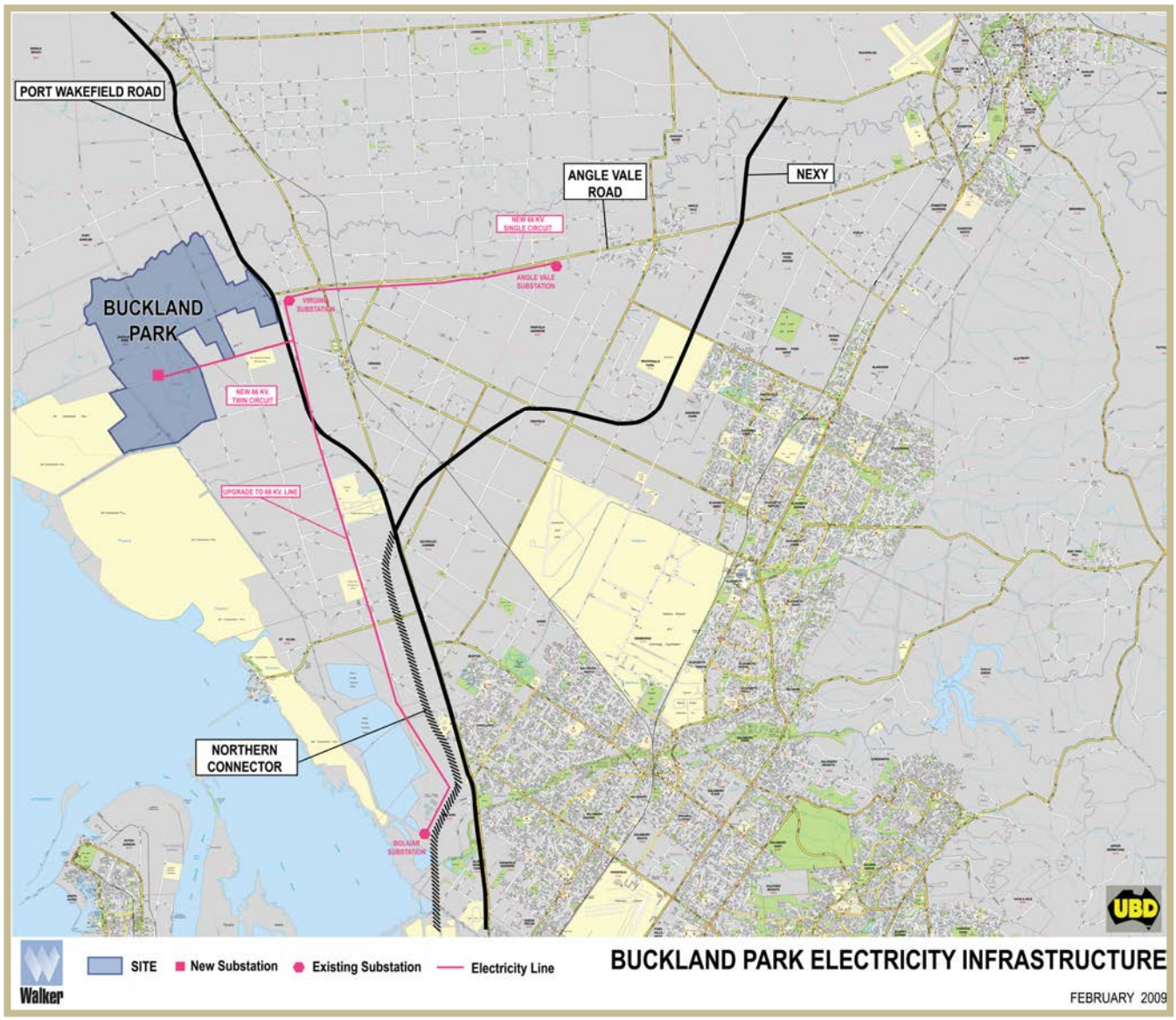


Figure 15.1 Regional electricity infrastructure

ETSA have considered requirements for provision of electricity infrastructure to Stage 1, and beyond to 970 allotments.

8 kVA house connections will be provided by underground internal electricity reticulation to each new allotment.

The electricity augmentation works required to serve the proposal will not only provide immediate benefits to Virginia and Two Wells, they will create sufficient capacity in the electrical network to allow the expansion of these towns.

Table 15.1 Roll out of Stage 1 infrastructure

Lots	Augmentation
0 – 170	• Virginia Substation upgraded to include 2 x 25 MVA transformers • Angle Vale Substation to be provided with a new 66 kV line bay and circuit breaker • Installation of 8kVA connection to each new allotment
170 – 370	• Installation of 8 kVA connection to each new allotment
370 – 570	• Installation of 8 kVA connection to each new allotment
570 – 770	• Installation of 8 kVA connection to each new allotment
770 – 970	• Installation of 8 kVA connection to each new allotment

Gas

APA Group is responsible for providing reticulated gas to homes. Epic Energy provide bulk gas and trunk infrastructure.

Epic Energy has a gas gate station located on the north eastern corner of Port Wakefield Road and Park Road, connected to a 20 inch existing pipeline which travels to the north and south.

APA Group has assessed the existing gas network's capacity in the site's locality.

APA advise the following infrastructure augmentation is required to supply the proposal with natural gas:

- A new 200 mm steel main extended from the Epic Energy gas gate station, approximately 1.5 kms from Angle Vale Road.
- Amplification of the Epic gas gate station.

The scope and timing of works will be resolved by the proponents, Epic Energy and APA Group, assessing estimated loads associated with the use of gas for hot water, cooking, heating and the possible implementation of gas air conditioning within new homes.

Reticulated gas is planned to be included within Stage 1 and the proposal's future stages.

Telecommunications

Telstra has an existing fibre cable that passes the site along Port Wakefield Road. Telstra has confirmed telecommunications infrastructure can be provided to the proposal.

Two new fibre connections will be required, from the East/West No 2 Fibre cable located in Port Wakefield Road. A new Telstra Outposted MDF room will be required in Stage 1. It will have capacity to serve the whole proposal. An area 30 m^2 to 60 m^2 will be accommodated in Stage 1 for the Outposted MDF room.

Copper cable will be used for internal reticulation to each allotment. Roadside cabinets linked back to the exchange by fibre cable will be required where the distance limit of the copper cable exceeded.

Each cabinet will service approximately 350 allotments. Cabinets are located in public roads and reserves.

Telstra has advised High Speed Internet access via ADSL 2+ will be available to each of the allotments.

There is adequate room within Stage 1's public domain for provision of the new exchange and roadside boxes.

Subject to the proposal's approval, the design and implementation of telecommunications infrastructure will be coordinated by the proponent and Telstra.

The process of providing telecommunications to the proposal's future stages will be the same as Stage 1.

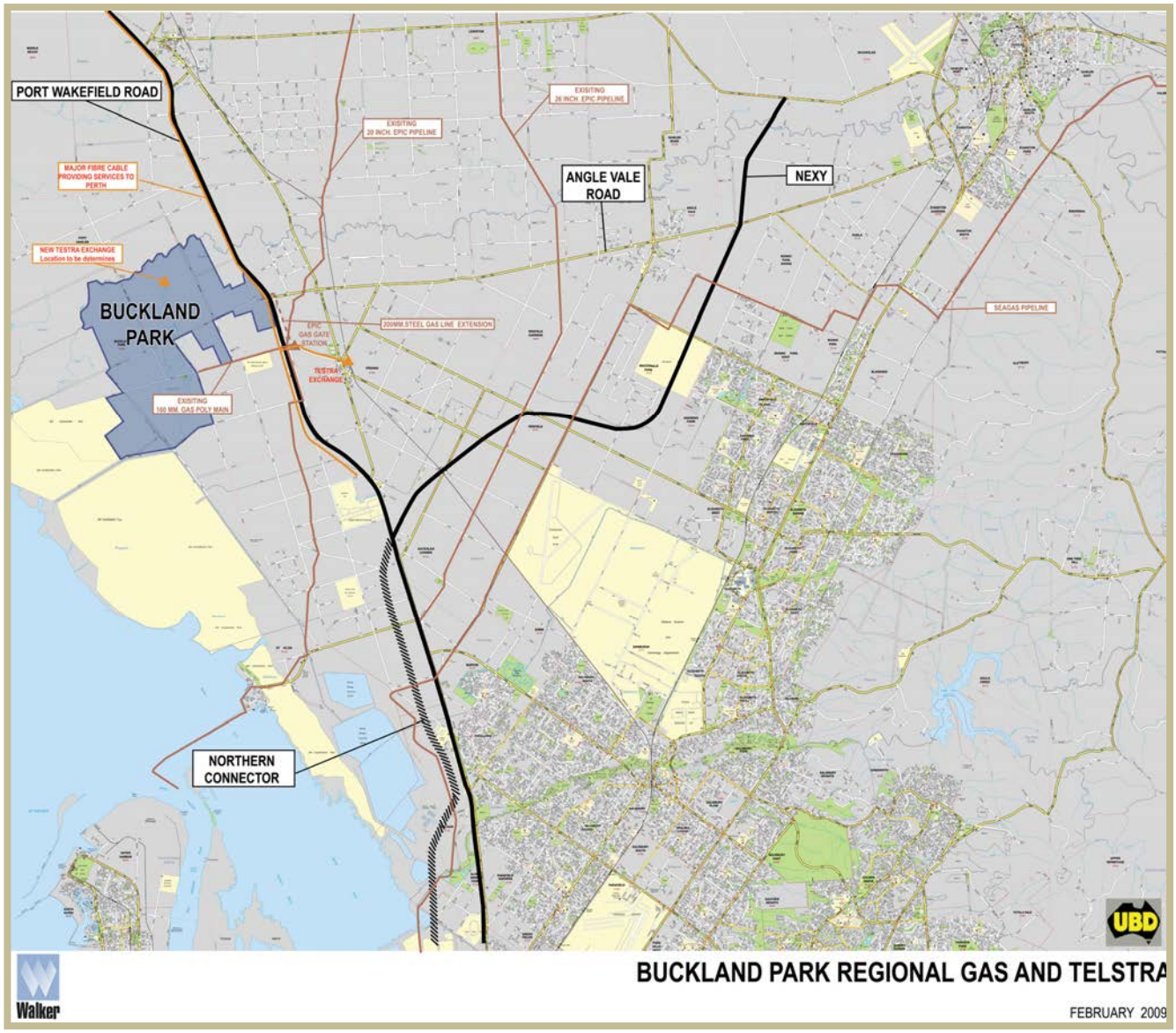


Figure 15.2 Regional gas and telecommunications infrastructure

Roads and public transport

The existing regional road network and required augmentation has been described in Chapter 4 and 12.

In summary, via Reedy Road, the site is connected to Port Wakefield Road (National Highway 1).

Via Port Wakefield Road, the site is connected to Angle Vale Road, which provides access eastward to Gawler and the Barossa Valley. Port Wakefield Road directly connects the site to southern destinations, including the Adelaide CBD and employment areas at Port Adelaide and in the Salisbury LGA.

The route 900 bus connects Virginia to the regional centres of Elizabeth and Salisbury, and interchanges with the Gawler Rail Line. The Gawler Line provides services to and from the Adelaide CBD.

Parsons Brinkerhoff has assessed requirements for road and public transport augmentation, after considering the capacity of the regional road and public transport network.

A major intersection upgrade will be required at the intersection of Port Wakefield Road, and Angle Vale and Legoe Roads.

In the early days of Stage 1, Legoe Road will be upgraded to accommodate construction and residential traffic. It is currently an unmade road between Port Wakefield Road and Reedy Road. It will require landscaping to make a welcoming entrance to Stage 1 and the display village.

While the road reservation for the main entry boulevard is included in Stage 1 Land Division Plan, in Stage 1 only the first lanes will be constructed. The additional lanes will be added as population grows with the proposal's later stages.

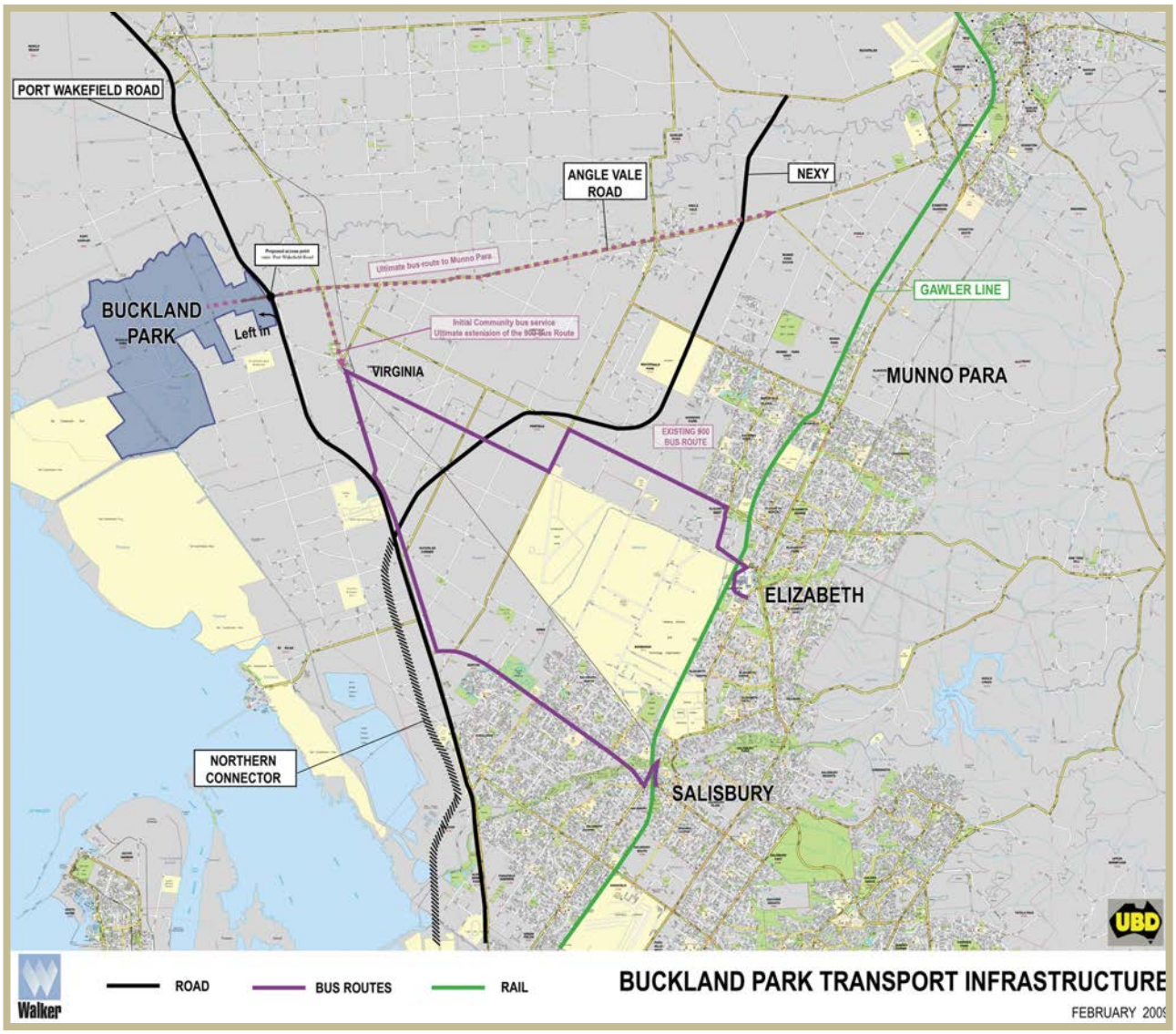


Figure 15.3 Regional transport infrastructure

Between 2028 and 2031, Angle Vale Road may require upgrading to 2+2 lanes, between Port Wakefield Road and Old Port Wakefield Road, a distance of approximately 1.3 km.

After 2031, Port Wakefield Road may require upgrading to 3+3 lanes to maintain a Level of Service (LoS) B.

These forecasts may be influenced by a range of factors, including changes in people's transport habits, the proposal's growth rate and the LoS ultimately required for Port Wakefield Road, given Metropolitan Adelaide's northern region's strategic importance as a potentially accommodating much of Adelaide's growth over coming decades.

Planning for these potential upgrades will be undertaken over coming decades.

A community bus service will be provided by the proponents to serve the first residents arriving in Stage 1. It will be based in the neighbourhood centre. It will connect commuters with the 900 bus at Virginia, as well as transporting children to school and providing for other trips as required by the community.

Beyond Stage 1, public transport will be progressively augmented. The community bus will continue operating as required, however, as the proposal's future stages are constructed and its population grows, bus routes will be implemented to connect schools and centres, and the route 900 bus service will be extended into the site. A new bus route into Munno Parra can be implemented.

Bus routes are discussed further in Chapter 12 and 15.4.

Augmentation to regional road and public transport infrastructure is illustrated below.

Water utilities

The provision of stormwater, floodwater, potable water, recycled water and waste water infrastructure is described in Chapter 7.

The Bolivar Waste Water Treatment Plant (WWTP) is located approximately 14 km south of the site. Little Parra Water Treatment Plant (WTP) is located approximately 20 km south-east of the site.

There is no stormwater or flood water infrastructure on the site, either to manage flows or provide water quality treatment.

Playford City Council is planning wetlands at the intersection of Heaslip Road and NEXY, approximately 8 km east of the site. These wetlands will be capable of treating stormwater prior to its storage in the aquifer for reuse.

SA Water have carried out an assessment of the proposal's requirements for potable water.

For Stage 1, and beyond to a total of 3,000 allotments, SA Water have provided two options for the viable provision of potable water. These options require the installation of new 250 and 600 mm mains over distances ranging between 3 km to 9 km.

SA Water provided three options to service the ultimate proposal. The preferred option requires the installation of approximately 19.5 km of 900 mm and 750 mm diameter water mains from the Little Para Water Treatment Plant, and the construction of a 20 ML storage facility.

SA Water advised it is expected there will be sufficient recycled water available from the Bolivar WWTP to supply the proposal. A new mains pipe, approximately 14 km long, will be required to bring recycled water to the site.

The recycled water supply will be supplemented by a 50 ML of stormwater captured on the site, treated in wetlands located in the northern section of the site and stored in the aquifer for re-use.

New allotments within Stage 1 will be provided with reticulated recycled water pipes, for connection to the recycled water mains when available later in the construction timetable.

Nevertheless, 80% of stormwater generated on the site will be captured for reuse. The water not stored on site will be available to other users. One option is piping it to Playford City Council's wetland for treatment and reuse. Treated water would be available for Council to use or supply to others. Other potential users of captured stormwater are local horticultural businesses.

Stormwater and flood water will be managed through a series of channels which have been accommodated in the Masterplan's open space. A detention basin will be located in the site's south-west corner. Part of the basin will be designed to allow capture of stormwater for reuse.

In Stage 1, storm and flood water will be managed through a series of channels incorporated into the Stage 1 layout. A detention basin will be required to capture stormwater, which may be reused in Stage 1's landscaping and water features.

Wallbridge and Gilbert completed a waste water servicing strategy for the proposal (Appendix 18).

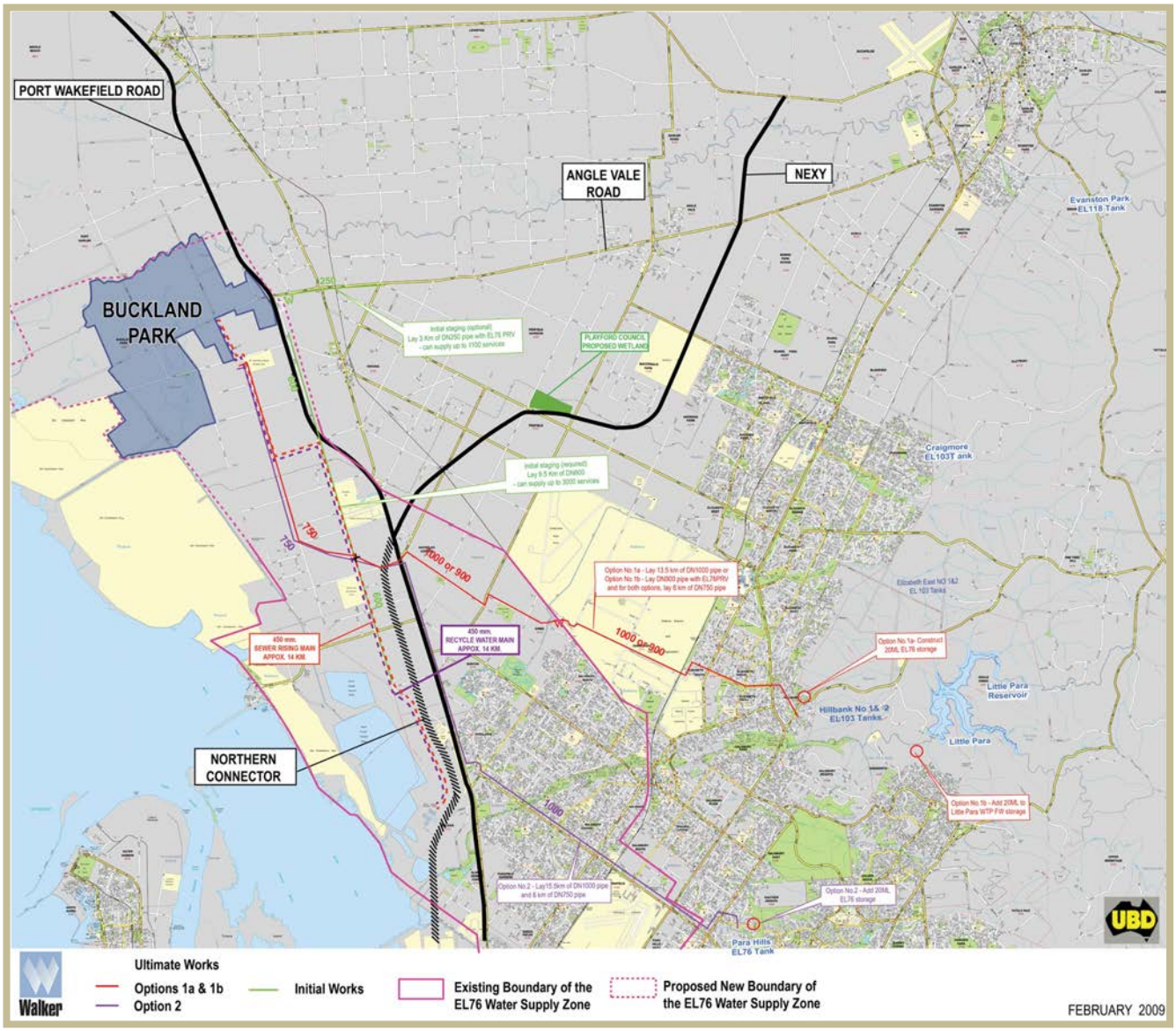


Figure 15.4 Regional water infrastructure

SA Water confirmed the Bolivar WWTP has the capacity to cater for the treatment of waste water generated by the proposal. Initial transfer for the first 1,400 homes will be via a sewer pumping station and a new 150 mm diameter sewer rising main. A 450 mm diameter sewer rising main will be required to cater for the proposal's future stages.

Wallbridge and Gilbert concluded a vacuum sewer system would be the most viable option for internal sewer reticulation.

The provision of potable water, recycled water and sewer infrastructure will benefit the existing towns of Virginia and Two Wells and could also have capacity to serve additional growth in Metropolitan Adelaide's northern region in the vicinity of the site and Waterloo Corner to the site's south.

15.2 Provision for police, correctional and judicial services

Guideline 4.7.2: Describe provision for appropriate police (SAPOL) and associated correctional and judicial services requirements.

The provision of police, correctional and judicial services within the site is a matter to be determined by the relevant government agencies.

In terms of police services, the provision of a police station at the site will depend on regional growth and whether the site is considered the most suitable location to serve the surrounding community.

Capacity exists within the District Centre and mixed use precincts to accommodate a police station if required. In the event that a police station is established, advice from SAPOL has indicated that the District Centre would be the preferred location. The District Centre is located adjacent to Port Wakefield Road and is proposed to incorporate major shopping, commercial and community facilities. The District Centre is also proposed to include a public transport hub with bus services to Elizabeth, Smithfield and Munno Para Interchanges, providing a high level of accessibility to the police station.

If SAPOL determines that a police station within the site is required it is likely to be a shop-front station operating 9 am–5 pm Monday to Friday, similar to that recently established at Blakeview. Floor space requirements for this type of station are in the order of 100 m^2 and need to meet specific police security requirements including construction materials, front and rear access and video surveillance. These requirements can be met in either the district centre or mixed use precincts accommodated in the Masterplan.

There are six community corrections centres across the metropolitan area, and it is unlikely that another will be required at the site. The Holden Hill Community Corrections Centre is the Northern Metropolitan Adelaide Regional Office and an additional centre is located at Elizabeth.

Magistrates Courts are located proximate to the Holden Hill and Elizabeth Community Corrections Centres and major police stations. It is therefore considered unlikely a Court House will be located at the site.

However, if it is determined that correctional or judicial services are required within the site, capacity exists to accommodate these services within the district centre or mixed use precincts.

15.3 Emergency services

Guideline 4.7.3: Describe emergency services arrangements for the proposed development.

The closest ambulance station and fire station to the site are at Elizabeth. Whether additional stations are required within the site will require further investigation and consideration in the context of regional growth.

There is, however, room for these services within the District Centre, in locations with suitable road access.

15.4 Access for buses

Guideline 4.7.4: Identify provision of suitable corridors/roadways in the proposed development that permit access by larger vehicles in the event of public transport being provided.

Parsons Binkerhoff prepared a structure for the proposal's road network, which is accommodated in the Masterplan (Appendix 24). It is founded on a hierarchy of arterial, sub-arterial, distributor and collector roads.

The road network creates logical bus routes through the Masterplan in stages. These are illustrated in Figures 12.1 and 12.2.

The road network and bus routes will be progressively implemented with each new stage, guided and coordinated by the Masterplan.

Within Stage 1, Legoe Road, upgraded as the first phase of main entry boulevard will be capable of accommodating the community bus service. It is not anticipated large buses will visit Stage 1, particularly in its early years of occupation.

15.5 Walking path network

Guideline 4.7.5: Identify provision of a suitable walking path network to link key nodes for public use.

Effective systems for pedestrian, bicycle, public transport and motor vehicle movement are critical to build a strong community. While private motor vehicles remain the most frequently used transport mode, there are high social, economic and environmental benefits associated with reducing car dependency. These include:

- Reducing greenhouse gas emissions.
- Reducing car operating costs, improving household budgets.
- Increasing health benefits from physical activity, such as walking to destination or public transport, and cycling.
- Providing equitable access to transport for those unable or unwilling to drive for example, the elderly, the young, people with medical conditions, or stay at home parents in households with only one car which is needed for the partner's commute to work.

Within Stage 1, pathways will be provided along the main entry boulevard, through the neighbourhood centre, and within parks and the school site.

These will be detailed in Stage 1's landscape plans.

The Masterplan includes a walking and bicycle network, which will be progressively implemented in the detailed design of each stage.

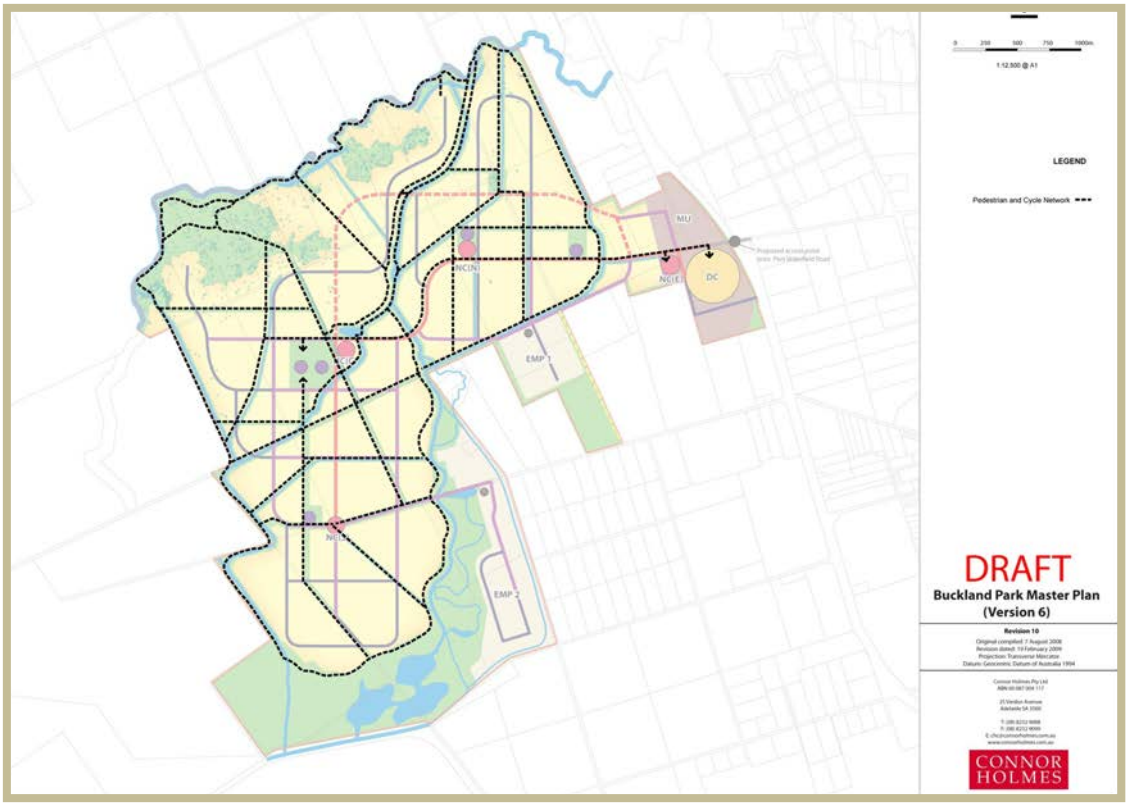


Figure 15.5 Masterplan pedestrian and bicycle network

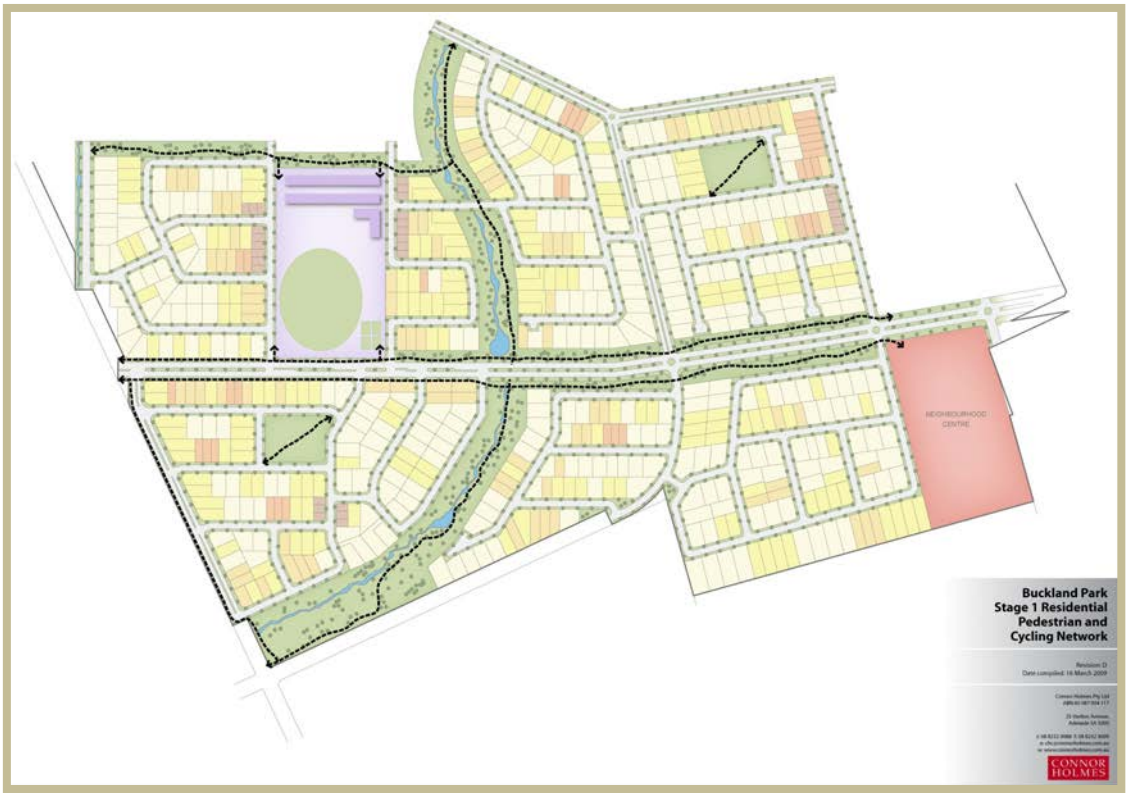


Figure 15.6 Stage 1 pedestrian and bicycle network

15.6 Best practice measures of infrastructure design

Guideline 4.7.6: Outline opportunities to incorporate best practice measures of infrastructure design, including avoiding the creation of four way intersections.

Wallbridge and Gilbert took an integrated approach to water infrastructure, creating a water utilities' strategy which balances storm and flood water, potable water, recycled water and waste water. This is illustrated in Figure 15.7.

The Masterplan and its stormwater management strategy establishes the structure for incorporation of WSUD principles. It will guide detailed stormwater designs for each of the proposal's future stages.

Stormwater will be captured for re-use, either within the site, or by other users. All allotments will have reticulated recycled water available.

Four way road junctions have been avoided in the Masterplan, but where they are included, they will be managed by incorporating roundabouts and traffic lights.

The Stage 1 Layout Plan includes two, four way intersections with the main entry boulevard. These will be managed with roundabouts. Parsons Brinkerhoff has considered the safety and effectiveness of these intersections and concluded they will work efficiently. Detailed design will be undertaken prior to construction. They concluded the roundabouts would operate satisfactorily.

Stage 1's residential precincts do not include four-way intersections.

Detailed land division design for future stages will avoid four-way intersections in residential precincts.

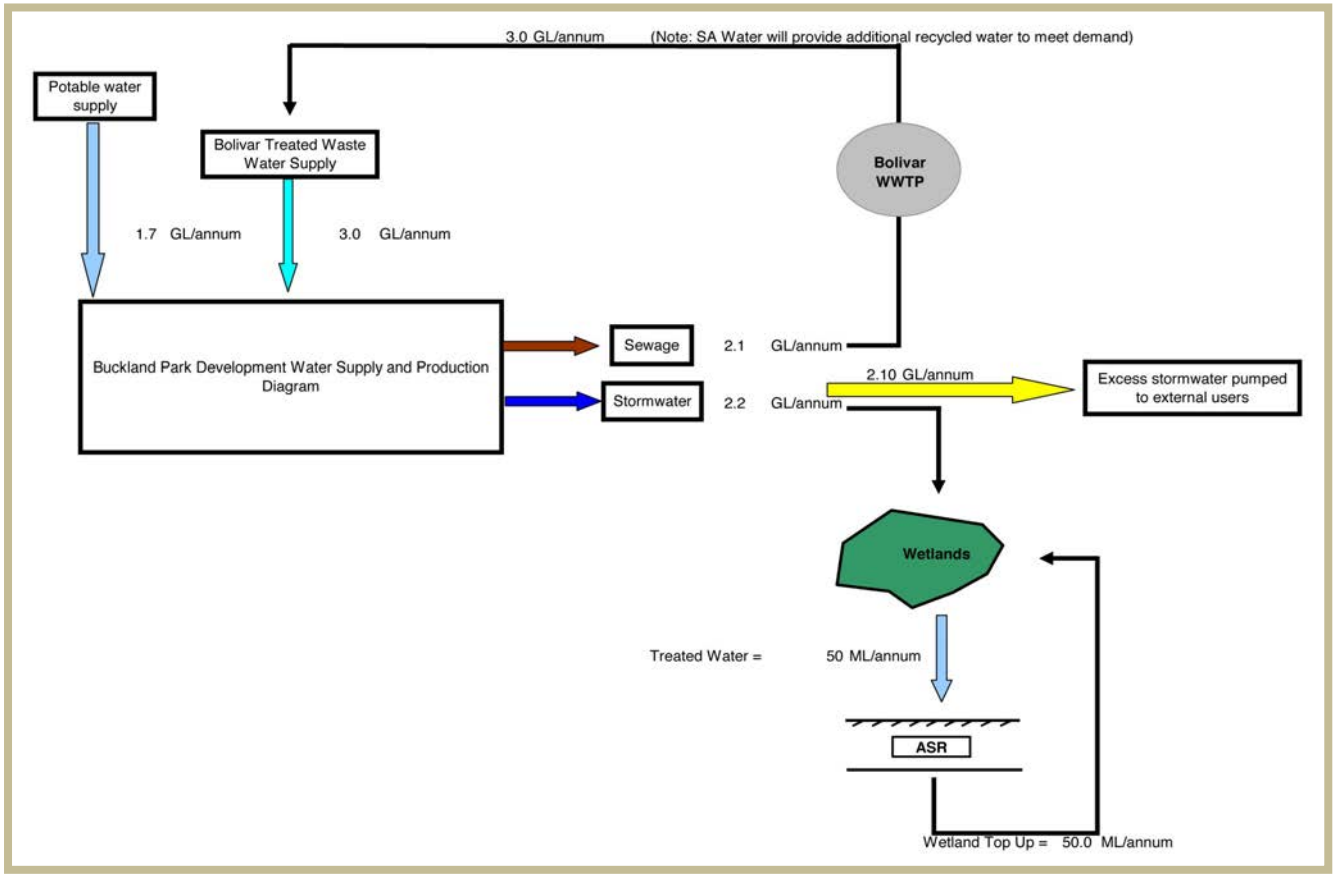


Figure 15.7 Water balance schematic

Chapter 16 Economic issues

This chapter describes the economic implications of the proposal, for Metropolitan Adelaide's northern region, Metropolitan Adelaide and South Australia. It considers industry, employment and the implications for local and state service providers.

16.1 Economic implications of loss of production potential

Guideline 4.8.1: Describe the current production potential of the subject land, and the economic implications arising from the loss of that land.

Hudson Howells undertook a survey of all landowners within the site in August 2008 in order to determine the current farm-gate value of agricultural production (Appendix 6).

All landowners were contacted and each was asked to provide:

- The total value of agricultural production from their land for the 2007/08 financial year.
- Number of people they employed.

The total farmgate value of agricultural production generated from the site in the 2007/08 financial year was $786,000, excluding Perpetual Holding's operation on Brooks Road, which will remain active on site and has been accommodated into one of the Masterplan's employment precincts.

Some of the landowners advised they rotate crops, and therefore the value of production for the 2008/09 year might be lower or higher than the 2007/08 year.

Of the thirteen landowners contacted:

- Five landowners advised they were intending to shift their agricultural production elsewhere should the proposal be approved.
- One landowner intended to stop farming altogether; the estimated value of his production is $6,000.
- Two were unsure what they will do.
- The remainder are not currently farming their land.

Hudson Howells concluded there are minimal economic implications associated with lost production on the basis of:

- $780,000 of production will be directly lost.
- Less than a $1 million of indirect benefits, from multiplier effect on other forms of production and consumption, will be lost.

The *Development of Horticulture Industries on the Adelaide Plains—A Blueprint for 2030* July 2007 prepared for the Virginia Horticulture Centre (VHC), notes the Adelaide Plains' horticulture industry produces approximately 16% of South Australia's horticulture output, with a farm gate value of $92 million.

The total loss to Virginia's farm gate production resulting from the loss of the site's agricultural land equates to less than 1% of the region's farm gate value.

This loss is considered to be very small, and outweighed by the economic benefits associated with the proposal.

While it is estimated there will less than 10 jobs lost Hudson Howells expect that most of these workers will find employment in metropolitan Adelaide's north, or the Adelaide Plains.

16.2 Opportunity for investment in the area

Guideline 4.8.2: Outline the opportunity for investment in the area from the proposed development.

Investment opportunities will emerge principally through support required for the construction and operation of the proposal's housing, retail, commercial, and industrial facilities, and the new community's demands for goods and services.

Hudson Howells note this investment according to may take place within the site, or elsewhere in Metropolitan Adelaide's northern region (Appendix 6). Investment opportunities will arise in the following sectors:

- Construction
- Retail
- Commerce and trade
- Industry
- Education and training
- Community services.

All of these industries are represented in the northern region and will benefit from investment generated from the proposal. For example, Connor Holmes estimated by 2036, the proposal's residents will shop in the region's centres, directly contributing $17 million per annum into the region's economy (Appendix 27).

Metropolitan Adelaide's northern region is undergoing growth in the housing and employment sectors.

Historically, Metropolitan Adelaide's industries are located close to markets, labour and transport, concentrated in the inner metropolitan area. However, the state's economy has grown, trade with interstate and overseas markets has expanded, and industries have changed in character. Small inner city sites are often no longer appropriate.

Concurrently, inner industrial sites, with good access to the metropolitan transport, are becoming more valuable for housing, commercial or retail uses. Industries are relocating to areas such as Metropolitan Adelaide's northern region, which offers efficient gateway access between interstate and overseas air, sea, freight rail and road transport networks, and metropolitan rail and road networks, needed to access metropolitan markets.

Large sites are available in the region, which are more suitable for modern industry that has a focus more on distribution, logistics, warehousing, and packaging, and less on small scale manufacturing. These businesses need inter-modal facilities, and scope to accommodate large vehicles, large buildings and corporate headquarters. This trend is expected to continue, and demand for new industrial land will be focused in Metropolitan Adelaide's northern region, where the site is located.

The South Australian government has responded by planning for more industrial land in Metropolitan Adelaide's northern region, and commencing major infrastructure projects to support that planning, for example, the Playford Inter-modal Facility, NEXY and the Northern Connector. But more land and infrastructure will be required. Chapter 2 provides more information on the site and region's strategic context.

The proposal's contribution to this type of investment will be the creation of a market and workforce in the same region, which will progressively expand over the next 25 years, matching growth in business investments employment opportunities.

Hudson Howells are of the opinion that continuing to support these trends will be essential to support Adelaide's and South Australia's economic well being.

The proposal will also contribute to economic growth by bringing infrastructure to this strategically important region. Additionally, it will also make more economically efficient use of the infrastructure provided or planned by government, by increasing the number and types of users, for example, by housing as well as industry.

It is anticipated the Masterplan's employment precincts would be suitable for businesses relocating from more traditional Adelaide locations needing dedicated industrial precincts designed specifically to cater for their needs.

However, it is likely some of the proposal's employment land will also be required for smaller service type industries, required to support the new community.

It is also expected over time, there will be a shift towards value adding of horticulture produce. This will range from food packaging to food processing and these activities will require labour, land and supporting infrastructure, and the provision of services to the rural sector, for example metal fabricators, wholesalers of retail equipment and supplies, refrigeration mechanics and equipment, and storage systems.

Investors will require labour, land and supporting infrastructure, for example power, water and telecommunications. Employment precincts within the Masterplan will supply all of these components, thereby having the potential to accommodate horticultural and other industrial activities.

Other factors enhancing the site's attractiveness for industry include its:

- Proximity to Port Wakefield Road, a National Highway, and easy access to intermodal facilities, creating a competitive advantage for firms involved in transport, logistics, freight forwarding and associated activities.
- Visibility to the Port Wakefield Road, creating a competitive advantage for businesses servicing highway users.
- An additional source of employment land supply, fostering more competitive – and therefore efficient – operation of the market.

The Masterplan accommodates land for employment opportunities. Whether or not they are taken up will depend on a variety of wider circumstances. The proponent will work with industry, the state government, Playford City Council, and the Virginia Horticulture Centre to promote the establishment of industry and businesses within the proposal's employment precincts.

The proponent has considerable experience with establishing new industrial projects, for example the new industrial estate at Direk, to the site's south, within the region.

Connor Holmes project 30% ($42 million per annum) of the region's spending will be drawn to the proposal's centres after 2036. 70% ($98 million) remains available to centres within the region (Appendix 27).

However, it is projected 15% ($59 million per annum) of the proposal's new resident's spending will be done in the region's existing centres.

Connor Holmes projects a net increase in retail spending in the region's existing centres of $17 million per annum.

This increase in spending directly in Metropolitan Adelaide's northern region will be the catalyst for more investment and services in existing centres, to the benefit of existing residents.

16.3 Employment and investment opportunities

Guideline 4.8.3: Identify employment and investment opportunities, including the "multiplier effect".

Investment opportunities are discussed in Chapter 16.2.

Table 16.1 summarises the value added and employment benefits of investment in the proposal's construction and establishment over 25 years.

Table 16.1 Estimated per annum job and income outcomes over 25 years

Item	External Infrastructure	Internal Infrastructure	Housing Investment	Other Investment	Total
Value Added ($ million)	$8.7	$21.7	$108.3	$47.1	$185.8
Employment (FTE jobs)	104	260	1,300	565	2,229

Source: Hudson Howell

Hudson Howell estimate infrastructure, housing and other construction associated with the proposal will directly and indirectly, have on average associated 2,229 FTEs of employment per annum over 25 years, including the flow through multiplier impact. This activity will generate for the State's economy, on average, $185.8 million per annum over 25 years. This includes associated incomes or value added.

In addition, Connor Holmes estimate the proposal's operational employment will be 10,687 by 2036, based on employment in the rates achieved in the employment sectors expected to be present at the site.

Table 16.2 Estimate of proposal's employment during the operational phase

Use	Floor space (m^2)	Workers per 100 m^2	Total workers
District centre			
Core retail	35,000	3.5	1,225
Bulky goods	30,000	2.0	600
Community/Commercial	35,000	4.0	1,400
Total	100,000	3.2	3,225
Neighbourhood centre (3 centres)			
Retail	16,650	3.5	582
Community/Commercial	1,950	4.0	78
Total	18,000	3.2	660
Local centre (6 centres)			
Retail	900	3.5	31
Total	900	3.5	31
Mixed use precinct			
Light industry	38,000	2.0	760
Commercial/Community	24,000	4.0	960
Total	62,000	2.8	1,720
Employment precincts			
Industry/Services/Trades	222,400	2.0	4,448
Total	222,400	2.0	4,448
Schools			
Education	–	–	603
Total	**403,300***	**2.6**	**10,687**

** Excluding education floor space*

Source: Connor Holmes

Hudson Howells estimate these 10,687 jobs will generate for the wider state economy a total of 25,955 jobs per annum, including 15,268 indirectly generated jobs. However, this total annual impact will not occur until 2036. Between 2010 and 2036 while the proposal is being progressively constructed and occupied, the multiplier impact will be generally proportional to the rate of direct employment growth as shown in Table 16.3.

Table 16.3 Total employment impact by year

Employment Type	Year				
	2016	2021	2026	2031	2036
Total Direct Employment	78	1,308	3,686	6,890	10,687
Total Indirect Employment	112	1,869	5,266	9,843	15,268
Total Employment	**190**	**3,177**	**8,952**	**16,733**	**25,955**

Source: Hudson Howell

16.4 Potential to attract other allied industries and commercial ventures

Guideline 4.8.4: Outline the potential for the proposed development to attract and enhance the business operations of other allied industries and commercial ventures.

Considerable construction activity will flow from the proposal, including construction of regional and internal infrastructure, 12,000 houses and commercial and community buildings, as well as landscaping and vegetation works.

This will generate investment and activity in all sectors of the economy:

- Mining of raw materials.
- Manufacture of concrete, bitumen, and building components.
- Retail and wholesale sales of those items.
- Horticultural and nursery industries.

This business and industry activity would occur, no matter where 12,000 houses were constructed however, the site's location within Metropolitan Adelaide's northern region will result in a focus on industries and businesses in the region, to the benefit of that region.

16.5 Potential infrastructure costs or savings to the Government

Guideline 4.8.5: Describe any potential costs or savings to the Government of infrastructure expansion with particular regard to transport networks, water supply, health, education and emergency services.

The requirements for infrastructure associated with Stage 1 are described in Table 16.4.

The staging and implementation of this infrastructure is described elsewhere in this EIS.

The required infrastructure is based on the demographic and allotment production projections. These can be considered planning tools only, and will be subject to variation over the 25-year implementation period, for example, as a result of market fluctuations. Also, allotment production tends to be slower in the first years, as sites and marketing become established, faster in the middle years as production and sales are in full swing, and slower at the end as the range of allotments available for purchase dwindles.

This affect is likely to be felt over the 25-year implementation period, and cause fluctuations within that period as it influences production in each individual stage.

Table 16.4 Summary Stage 1 infrastructure – 2010 to 2016

Component	Description	Implementation
Health	Shopfronts will be provided for private doctor and dental surgeries.	Proponent
	Existing regional health services will be utilised. For example, regional hospitals, immunisation clinics, youth and disability services.	Playford City Council and Department of Health
Social services	200 m^2 community centre will be provided, with potential for extension 400 m^2.	Proponent
	Community worker.	Proponent
Education	Land is available for a private childcare centre, subject to demand.	Private provider
	Other childcare facilities are available in the region.	Private provider
	Virginia Primary School has capacity to accommodate demountables in Stage 1's early years.	DECS
	A primary school will be required in later years to match the community's growth.	DECS or private provider
	Public or private high schools in the region will be used by the small number of high school students within Stage 1.	DECS or private provider
Recreation	An oval and two parks, pedestrian and bicycle paths, linear parks.	Proponent and Playford City Council
Electricity	Upgrade of Virginia and Angle Vale substation upgrades.	ETSA and proponent
	Internal reticulation.	ETSA and proponent
Gas	Gate station upgrade and new gas connection into the site.	APA, Epic Gas and proponent
	Internal reticulation.	APA and proponent
Telecommunications	New exchange on the site, two roadside boxes and new fibre connections.	Telstra and proponent
	Internal reticulation.	Telstra and proponent
Water infrastructure	Potable water mains and internal reticulation.	SA Water and proponent
	Internal reticulation of recycled water pipes for future connection.	Proponent and SA Water
	Waste water main and internal reticulation.	SA Water and Proponent
	Internal stormwater and flood management.	Proponent and Playford City Council
Roads and transport	Community bus service.	Proponent
	Upgrade of the intersection of Port Wakefield Road, Legoe Road and Angle Vale Road.	DTEI and Proponent
	Internal roads.	Proponent and Playford City Council
Biodiversity	There are no biodiversity areas associated with Stage 1.	NA
Emergency services	Existing services in the region.	SA Government
Waste collection	Domestic service.	Playford City Council
	Construction and commercial waste.	Private provider

The requirements for infrastructure associated with the proposal when constructed and occupied in 2036 are described in Table 16.5.

Table 16.5 Summary ultimate infrastructure – 2016 to 2036

Component	Description	Implementation
Health	Private medical and dental practices, and private hospitals within the site.	Private operators
	Regional and major health services.	Department of Health
Social services	Community workers for each future stage	Proponent and Playford City Council
	Regional social services – early childhood, aged, youth and disability services.	Dept. of Health and Playford City Council
Education	Child care and before and after school care.	Private operators or SA Government
	Four primary schools will be required.	Private operators or DECS
	Two high schools will be required.	Private operators or DECS
Recreation	Passive and active open space, pedestrian and bicycle paths and linear parks will be provided with each stage.	Proponent and Playford City Council
Libraries	1	Playford City Council
Community centres	2	Playford City Council
Electricity	New 66 kV line between Virginia and Angle Vale substations, and into the site, a new substation on the site, replacement of 66 kV line between Virginia and Bolivar substations and relevant easements.	ETSA and proponent.
	Internal reticulation.	ETSA and proponent.
Gas	Internal reticulation.	APA and proponent
Telecommunications	Internal reticulation.	Telstra and proponent
Water infrastructure	Potable water mains and internal reticulation.	SA Water and proponent
	Recycled water mains internal reticulation.	SA Water and proponent.
	Waste water mains and internal reticulation.	SA Water and proponent
	Collection of stormwater, and mains for its removal to other user.	Proponent and potentially other user
	Internal stormwater and flood management.	Proponent and Playford City Council
Roads and transport	Subdisidised extended regional bus services.	DTEI and proponent
	New and extended regional bus services.	DTEI
	Potential upgrades of Port Wakefield Road and Angle Vale Road between new and Old Port Wakefield Road beyond 2028.	DTEI
	Internal roads.	Proponent and Playford City Council

Component	Description	Implementation
Biodiversity	Rehabilitation and revegetation.	Proponent and SA Government
Emergency Services	Police, ambulance and fire services will be required. There are suitable locations within the Masterplan for these facilities.	SA Government
Waste	Domestic collection.	Playford City Council
	Construction and commercial collection.	Private provider

The proposal will generate significant economic benefits for the state.

Hudson Howells calculated directly, the state will receive the financial benefits of collection of state taxes of approximately $2.6 million per year. The UDIA (SA) estimate $15,000 in state taxes is generated for every $million of activity in the construction industry. These taxes include land tax, stamp duty of the transfer of real property and the emergency services levy.

Hudson Howell calculates there will be $171.5 million worth of activity per annum associated with the proposal. This will generate approximately $2.6 million in taxes per year.

The government is targeting 250,000 new homes in Adelaide to support South Australia's economic growth. A considerable amount of this new growth will occur in the Metropolitan Adelaide's northern region.

The proposal will supply sites for 12,000 dwellings, in a single well planned proposal. This is 5% of the target needed to support the state's economic growth.

Economic benefits flowing from the proposal are enhanced by:

- Economies of scale associated with a single, large-scale proposal, facilitating the orderly and efficient provision of infrastructure.
- Land use and infrastructure planning funded by the proponents rather than state or local government.
- The site's location in Metropolitan Adelaide's northern region, which provides opportunities for sharing infrastructure with other new suburbs, and creates a catalyst for more housing needed to reach the target of 250,000 new homes, with greater efficiencies for government.
- The proposal's scale, Masterplan and Staging Plans facilitate the orderly and economic provision of infrastructure. Housing provided in smaller proposals or infill projects could demand more government resources for land use and infrastructure planning and implementation.

16.6 Financial strategies to ensure infrastructure is in place

Guideline 4.8.6: Outline the financial strategies to be employed to ensure the infrastructure, which is the proponent's responsibility, is in place for the proposed development.

The proposal will take 25 years to construct and occupy. This will occur in stages. The Masterplan will guide the implementation of infrastructure to ensure it is coordinated to serve each new stage, while connected efficiently between stages.

The strategy for ensuring the infrastructure is in place for each stage is as follows:

- Prepare detailed land division plans for each stage which establish the final yield, land uses and infrastructure requirements.

- Prepare detailed implementation plans with Playford City Council or the relevant state agency – including funding responsibilities, designs, specifications and timing of construction and commissioning.
- Cost plans and specifications.
- Input those costs which are the proponent's responsibility into each stage's financial feasibility, which includes a wide range of other inputs, including the expected sale price of each allotment, government taxes and charges, legal and marketing costs, and interest on borrowed money.
- Decide to proceed.

State infrastructure and services

Regional infrastructure and services are funded in a variety of means, which vary across agency, and depend on whether they are provided by a private or government entity.

Funding can be in the form of grants from the federal government, user pays, government borrowing or from sources of state revenue.

A mixture of these funding arrangements will be used to provide services and infrastructure to the proposal. The proponent has commenced discussions with each agency and will continue to prepare options, designs and funding agreements with them.

Local Government services

Connor Holmes have described the means by which local government services are funded (Appendix 25). Revenue is sourced from one or more of the following:

- Rates.
- Statutory fees.
- Grants and subsidies.
- User charges.
- Reimbursements.
- Interest received.
- Other revenue.

The first three sources account for the vast majority of revenue for most Councils.

It is a generally accepted principle that operating revenue should be sufficient to fund service delivery and to fund replacement of assets at their existing service level according to the rate at which they wear out.

Typically, revenue and operating services are treated on a consolidated Council wide basis and would not normally be hypothecated to any particular geographic area, service or facility. However user charges may be applied to recover some or all of the costs of providing specific services or facilities.

Capital funding, that is, acquisition of new assets and improvements in asset service levels, usually termed "strategic enhancement", tends to be funded either from grants, including grants of assets, and/or from any operating revenue surplus.

Therefore, in relation to proposal, or any similar new suburb:

- New community assets would be vested in Council according either to applicable statutory requirements or otherwise mutually agreed commercial terms.

- Community services and programs would be delivered by Council, either from own source revenue or with the benefit of grants from State Government or others groups, and/or by responsible agencies.

In relation to specific types of services, capital and operating arrangements are envisaged as discussed below.

Parks and recreation facilities

Section 50 of the *Development Act 1993,* provides for open space contributions associated with division of land. This requirement of the Act would be applied to the proposal.

Council may require up to 12.5% of the site area as open space.

However, this requirement can be made in three ways:

- Land dedication – land can be provided unevenly over each stage –as long as the final total is 12.5%;
- Money contribution – currently $3,427/new lot; and/or
- A combination of land and money, with the total money amount calculated in accordance with the *Development Act Regulations*.

The land would be dedicated to Council, and the money would be paid to Council to spend on open space within its boundaries, not necessarily within site. The terms of any development authorisation must include the arrangements for open space contributions, including any provision for open space to also serve infrastructure functions.

For example, most Councils accept a portion of land being required for stormwater management purposes where this use does not unacceptably compromise use of the land for recreational purposes. Typically, use of land for temporary holding and discharge of stormwater is accepted as compatible with recreation use, although permanent retention or treatment is not.

Recreation services and facilities are typically funded by Council and/or community groups, predominantly sporting clubs, usually with contributions from State Government, such as recreation and sport grants.

There are areas of vegetation with regional significance within the site. It may be appropriate to vest this land with the State Government. Appropriate arrangements will be made during the detailed design of the affected proposal stage.

Libraries

Operation of libraries is the responsibility of local government, and is funded from a combination of State Government grant moneys supplemented by a contribution from councils.

Community centres and halls

Within Stage 1 the proponent will build, staff and operate a community space.

Beyond Stage 1, suitable arrangements for their provision will be agreed with Playford City Council.

Community centres and halls are funded from Council revenue, including potential revenue from user-charges such as venue hire fees.

Community programs and services

Typical services in this category include:

- Baby immunisation.
- Youth services.
- Consultation and engagement initiatives.

- Environmental programs (Bush for Life, Clean Up Australia Day, tree planting days).
- Aged services.
- Disability services.

Within Stage 1 the proponent will build, staff and operate a community space, to facilitate a community building programme.

In each future stage community programs and services would be funded either by Council, using grants, subsidies or own-source revenue, or by the responsible agency/group, likely with assistance from Council, for example, through subsidised access to rooms and facilities.

Community building

The first component of the community building programme is the provision of a community space which will provide a venue for community based activities.

The second component is the provision of community worker to facilitate those activities.

The third is funding for those activities.

Together, these three components provide the opportunities for residents to meet and form the connections which build communities.

As the community matures, it is envisaged many community building activities will be initiated by the residents themselves, for example, forming sports teams, informal groups and clubs, and of course, there will be private social interaction.

The proponent will continue to have a role in some of these activities, for example, sponsoring sports teams, cultural and school events.

Playford City Council currently runs community building programmes, and in later stages it is expected the Council will play a similar role with the proposal's new community.

16.7 Impacts of the neighbourhood/community centre on existing and approved retail/ commercial activities

Guideline 4.8.7: Analyse in detail the effect that the proposed neighbourhood/community centre would have on existing and approved retail/commercial activities in the immediate and broader area.

Retail and commercial activities within the site will be concentrated in centres. The Master Plan includes a centres hierarchy, comprising a District Centre and three permanent Neighbourhood Centres. In addition, a temporary Neighbourhood Centre is proposed as part of Stage 1 to provide retail, commercial and community services to early residents. The location and composition of these centres is described briefly in this section. Connor Holmes has considered planning the proposal's centres in more detail at Appendix 27.

16.7.1 Centre hierarchy

District centre

The Master Plan includes a District Centre, with associated Mixed Use precinct, which is expected to attract a combination of core and bulky goods retail facilities, and commercial and community facilities.

The District Centre is strategically located adjacent to Port Wakefield Road, on the Masterplan's main entry boulevard. This location will:

- Maximise visibility.

- Maximise and facilitate car and truck access.
- Maximise public transport access, by allowing co-location of the Centre with a bus interchange, at the main entry for regional bus services and the termination point for local bus services.

Neighbourhood centres

By 2036, it is expected three neighbourhood centres will be established. These will contain retail and commercial facilities, plus community uses. The neighbourhood centres have been located to:

- Maximise the number of households within walking distance.
- Facilitate access by foot, bike and bus.
- Maximise their role as a neighbourhood focus by:
  - including schools in the centre, or nearby;
  - locating centres adjacent to open space and sporting fields;
  - including potential for shared use of facilities such as schools, playing fields, libraries and community buildings.

Within Stage 1, provision has been made for a temporary Neighbourhood Centre. It is described in Chapter 3.2.3.

When the adjoining District Centre is opened, the Neighbourhood Centre will be redundant and will be decommissioned. This is expected to occur in or around 10 to 15 years after the proposal's commencement. The Neighbourhood Centre buildings will either be:

- Removed and replaced.
- Used for another purpose, such as commercial offices or community buildings.
- Incorporated into the new district centre.

Local centres

A number of local centres will be provided within residential and employment precincts. These centres are expected to have only a small amount of retail space, of around 150 m^2, but will contribute to the community by being within walking or cycling distance from homes and work places and located on bus stops.

Detailed planning of future residential areas and employment areas will include location of local centres, and any future planning controls applying to the site should permit their provision.

16.7.2 Impact on existing retail and commercial facilities

Connor Holmes has considered the impact of the proposal's planned centres on other centres within the region (Appendix 27).

The proposal's centres hierarchy is planned to serve the new population within its primary catchment (the site). Only limited expenditure is expected to be drawn from the secondary catchment (other centres in the region).

The proposal's residential precincts will add significantly to the population in the region and it is projected that around 15% of retail expenditure generated by these new residents will escape to the secondary catchment and to the Adelaide CBD.

Therefore the proposal is likely to have a positive impact on trade within higher order centres such as Elizabeth Regional Centre, Munno Para District Centre and Gawler Town Centre.

In addition, substantial residential growth and regeneration is planned in the Playford North and Blakeview area which will increase the catchment population of these centres by 30,000 over the next 15 years.

The Virginia and Angle Vale Neighbourhood Centres, are more likely to be impacted by the proposal's centres.

However, Angle Vale is 7 km from major retail facilities at Munno Para and will be influenced by the impending urban expansion of Munno Para West and Penfield. It is therefore considered unlikely the proposal's centres will make a perceptible impact on trading at Angle Vale.

At the 2006 Census, Virginia had a population of 1,433 persons, but a retail floor space of 5,582 m^2. To support this amount of floor space the Virginia neighbourhood centre is reliant on a catchment that extends well beyond Virginia's town boundaries. This catchment would overlap with the proposal's secondary catchment.

District Centres and Neighbourhood Centres play distinctive roles within centre hierarchies. It is widely experienced, and specifically encouraged in the Planning Strategy and the Playford (City) Development Plan, that a number of Neighbourhood Centres are located within the catchment of a more widely spaced District Centre network.

The Virginia Neighbourhood Centre would be expected to serve a similar function for its catchment community, as the proposal's Neighbourhood Centres will for their catchment communities. These neighbourhood centres will primarily provide weekly, daily and convenience purchases.

The Virginia Neighbourhood Centre and proposal's Neighbourhood Centres will sit at the same level in the region's centres hierarchy.

It is not anticipated the proposal's District Centre will draw expenditure away from the Virginia Neighbourhood Centre. A Neighbourhood Centre's role is different and compatible with the provision of District Centre, which provides for higher order comparison and specialty shopping.

The proposal can be expected to actually generate additional expenditure at other centres within its region. In the case of the Virginia Neighbourhood Centre, this benefit is likely to fluctuate. Firstly, the establishment of the new community will boost spending at Virginia, but this would fall away with the establishment of new centres in the site.

The impact of these fluctuations will be mitigated by the following measures:

- Stage1's Neighbourhood Centre will be constructed in phases, so only the minimum amount of retail floor space is provided to meet only the needs of the proposal's first occupants.
- Neighbourhood Centres provided in the proposal's future stages will only be provided as the population, and demand, grows. These Centres will therefore have their own catchment to draw on, and will not seek custom from the Virginia Neighbourhood Centre's catchment.

It should be noted, projected penetration levels into the proposal's centres from the secondary catchment are only 30% ($42 million per annum) of its projected retail expenditure. 70% ($98 million) remains available to centres within the secondary catchment.

In addition, the projected level of escape expenditure from the proposal, 15% ($59 million per annum), is greater than the $42 million expected to be drawn from the secondary catchment.

It is therefore concluded new population and centres will have a net positive effect on other centres in the region.

16.8 Impact on employment generation of ongoing commercial activities the development

Guideline 4.8.8: Provide a detailed analysis of the economic effects that could occur for local or broader employment generation from on-going commercial activities proposed in the development.

The proposal's construction and operation will support existing businesses and generate new business activity throughout the State, greatly exceeding activity directly generated by the proposal.

While 10,687 jobs are projected within the site when the proposal is fully established in 2036, Hudson Howell estimate an additional 15,268 jobs will be indirectly created in the State (Appendix 6). These will be in wide range of industry sectors and businesses.

A total of 25,955 jobs per annum will be generated directly and indirectly. However, this total annual impact will not occur until 2036 when the proposal is constructed and occupied. Between commencement of construction and 2036, the multiplier impact will be generally proportional to the rate of direct employment growth within the site. This is described in Table 16.6.

Table 16.6 describes the various industry sectors for the projected employment.

Connor Holmes expect 45% (7,425) of the 10,687 directly created jobs by 2036 will be held by local residents, the remaining 3,262 available to residents of the site's locality and region.

This level of employment represents a significant expansion of the existing employment base in the local area and region.

The 15,268 indirectly created jobs would be based in the locality's, region's and state's economies.

Table 16.6 Total operational employment impacts

Employment type	Direct employment	Employment multiplier (Type 2)*	Total employment impact
Retail	1,838	1.38	2,536
Bulky goods	600	1.38	828
Education	763	1.6	1,221
Commercial, office, Community	2,438	2.25	5,486
Light industry, industry, Services, trades	5,208	3.05	15,884
Total	**10,687**		**25,955**

* *Type 2 multipliers include both the induced production and consumption effects of the initial employment generated and therefore may include some double counting Type 2 multipliers include both the induced production and consumption effects of the initial employment generated and therefore may include some double counting.*

Source: Connor Holmes and Hudson Howells

16.9 Proposed hours of operation of retail and commercial activities

Guideline 4.8.9: Provide details of the proposed hours of operation of retail and commercial activities.

The Neighbourhood Centre will have the following hours of operation as set out in Table 16.7.

Table 16.7 Hours of operation at Neighbourhood Centre

Component	Operating hours
Retail – supermarket and specialty shops	• Monday to Saturday – 7:00 am to 6:30 pm • Sunday – 9:00 am to 1:00pm
Café in a speciality shop	• Monday to Saturday – 7:00 am to 6:30 pm • Sunday – 9:00 am to 5:00pm
Sales Office and Display Centre	• Monday to Sunday – 8:30 am to 5:00pm
Community Centre	• Monday to Friday – 9:00 am to 5:00 pm • Weekends and after office hours – as required to suit community activities

The hours of operation of the proposal's future commercial, employment, service and retail facilities will be the subject of assessment when Development Applications for those facilities are lodged.

Chapter 17 Risk/hazard management

This chapter considers methods of managing some of the risks associated with the site, the proposal's construction and the aviation industry.

17.1 Public safety strategies during construction

Guideline 4.9.1: Describe strategies for ensuring public safety during construction.

The CMP for each of the proposal's stages will include:

- The clear identification of construction zones, and requirements for fencing to exclude all non-authorised people from accessing those areas. These zones will be appropriately sign posted.
- Construction Traffic Management Plan, which will restrict construction traffic to routes chosen to minimise potential conflicts with pedestrians, for example by avoiding local roads and schools. All construction related vehicles will be parked in nominated construction parking areas, which will be fenced to prevent non-authorised personal from accessing plant and equipment. These areas will be appropriately sign posted.
- Pedestrian Management Plan, which will identify potential pedestrian routes around construction zones and will recommend fencing of those routes, or safer alternative routes as required. These routes will be appropriately sign posted.
- A Consultation Strategy, which will include consultation with the community, whether they live within the site or adjoining, prior to the commencement of construction, and the project manager's contact details to allow contact should issues arise. These details will be sign posted at the construction zone.

There is limited demolition associated with the proposal, only two dilapidated green houses are proposed for removal.

A separate CMP will be prepared for the Neighbourhood Centre, Sales Office and Display Village houses which will address similar issues.

All statutory requirements for the management of construction will be addressed, including any conditions of consent.

CMPs will be implemented during construction.

17.2 Prevention and management procedures for pollution spills and sewage leaks

Guideline 4.9.2: Describe procedures to prevent and manage pollution spills or sewage leaks.

The CMP for each of the proposal's stages will include:

- Hazardous Materials Management Pan for hazardous or potentially polluting substances associated with construction, including fuel and toilet facilities. It will identify suitable locations for these activities, considering any particular environmental circumstances applying to the stage. It will include:
  - requirements for sealing the storage areas to prevent spills entering the soil;
  - bunding around storage areas to prevent spills leaving the area;
  - facilities for capturing and treating any spills;
  - procedures for cleaning up spills.

- A Soil and Erosion Management Plan, which will include requirements for silt traps and covering disturbed surfaces.
- A Water Management Plan, which will include requirements for temporary drains, retention areas and the like.

The CMPs will be implemented during construction.

17.3 Fire management processes

Guideline 4.9.3: Outline the processes required with the appropriate fire services for fire management.

The CMP for each of the proposal's stages will include requirements for dealing with fire and emergencies associated with construction.

It will include contact details for emergency services such as local police, fire services and ambulances.

These details will be sign posted within all areas associated with construction.

The CMPs will be implemented during construction.

17.4 Bunding of hazardous materials storage areas

Guideline 4.9.4: Outline the proposal for bunding of hazardous materials storage areas.

Please see Chapter 17.2 for a discussion on this issue.

17.5 Impact of seismic events

Guideline 4.9.5: Outline the potential for the land to undergo liquefaction during a seismic event.

Golders and Associates note seismic activity has been recorded throughout South Australia. Liquefaction is generally associated with seismic disturbance of saturated low density silt and silty soils or saturated soft sensitive clays (Appendix 7).

Golders concluded there is a low risk that liquefaction of the land within the site.

17.6 Impacts on the obstacle limitation surface for airfields or aerodromes

Guideline 4.9.6: Identify any impacts on the Obstacle Limitation Surface for Edinburgh Airfield or any other impacts on the operation of aerodromes in the area.

There are two airfields in northern Adelaide that could potentially experience some impacts from the site:

- Edinburgh Airfield
- Parafield Airport.

These areas are shown on Figure 17.1. Both are subject to Obstacle Surface Limitations (OLS).

Parafield Airport's OLS are set in the *Airports (Protection of Airspace) Regulations*. To ensure these are adequately interpreted in local land use planning, these have been incorporated into the *City of Salisbury Development Plan*, under the *Development Act 1993* (Parafield Airport Master Plan, Parafield Airport, November 2004).

Figure 17.1 shows the extent of OLS for Parafield Airport. To the south of the line marked '45 metres', applications for all structures exceeding 45 metres above existing ground level must be referred to the Federal Airports Corporation as per the City of Salisbury Development Plan, Map Sal1 (Overlay 2) Airport Building Heights.

The site is located to the north of this line. Therefore there are no impediments to the proposal proceeding associated with Parafield Airport and its OLS's.

Edinburgh Airport's OLS's are set in the *Defence (Areas Control) Regulations 1989*. As can be seen on Figure 17.1, the site is within the OLS area in which any building over 90 m in height above the lowest point of the natural ground level beneath the structure requires the approval of the Minister for Defence, as stated in the *Defence (Areas Control) Regulations 1989* – Schedule 5 and Schedule 8 'Affected land near Royal Australian Air Force Base Edinburgh in South Australia'.

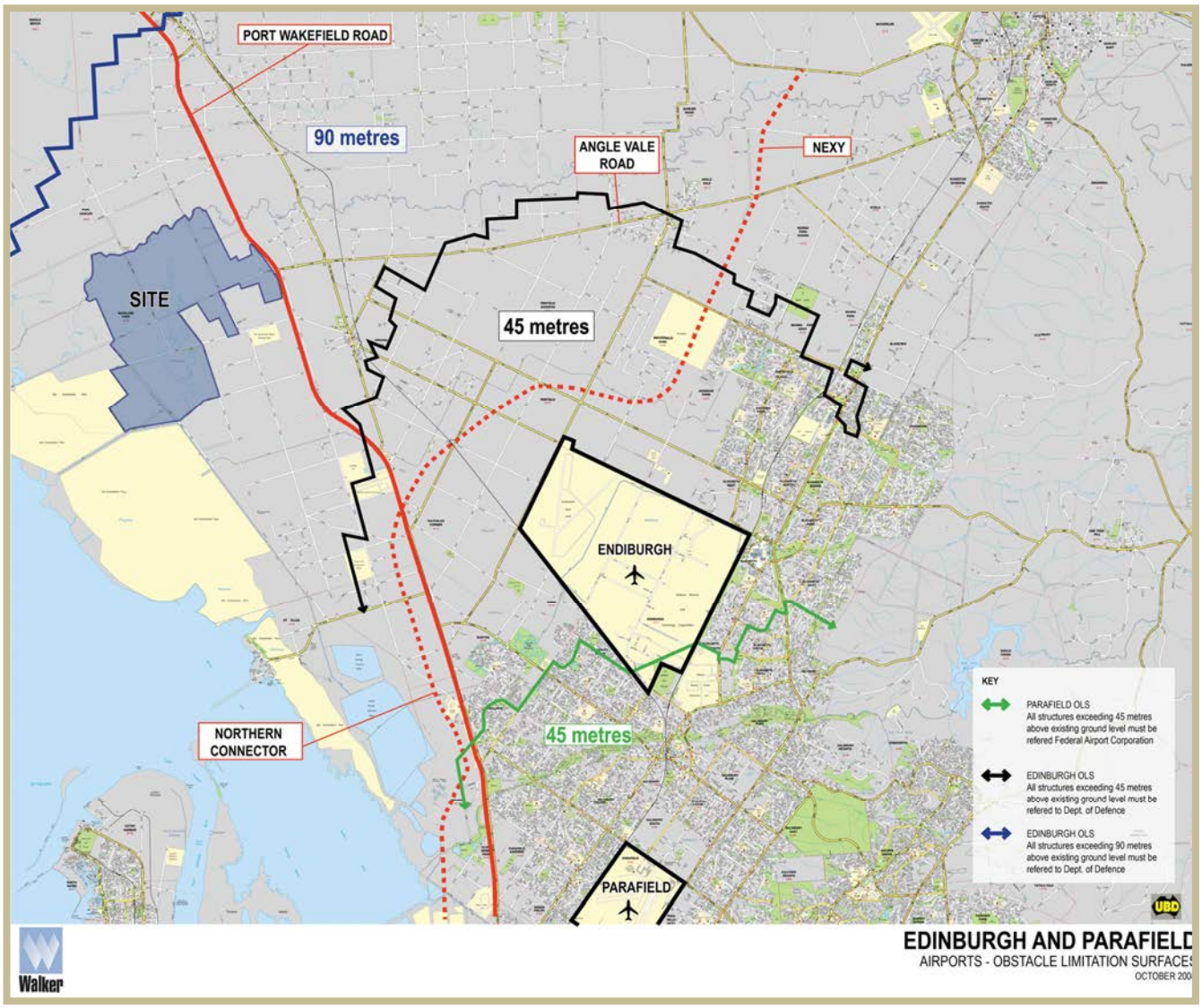


Figure 17.1 Airports and associated Obstacle Limitation Surfaces

The Masterplan does not accommodate land uses which are likely to exceed 90 m, therefore the approval of the Minister will not be required for future buildings. However, it would be appropriate to include this requirement in any future planning control applying to the site should the proposal be approved.

These controls could either prohibit buildings in excess of 90 m above the lowest point in the natural ground level beneath the structure, or could require the Minister's approval for such buildings, using the City of Salisbury Development Plan controls as a model.

The OLS's do not present an impediment to approval of the proposal.

Chapter 18 Construction effects

This chapter describes the proposal's construction staging, and the composition of its workforce.

18.1 Staging, planning and timing of the development

Guideline 4.10.1: Identify staging planning and timing of stages.

Staging of the proposal's construction and occupation will occur over a period of 25 years, as described in Chapter 3.3, Chapter 6, and Chapter 14.

Staging plans, yield projections over time and population projections over time can be considered planning tools only, and will be subject to variation over the 25-year implementation period, for example, as a result of market fluctuations.

Also, allotment production tends to be slower in the first years, as sites and marketing become established, faster in the middle years as production and sales are in full swing, and slower at the end as the range of allotments available for purchase dwindles.

This affect is likely to be felt over the 25-year implementation, and cause fluctuations within that period as it influences production in each individual stage.

The proposal's planning has been based on an assumption that an average of 480 allotments can be constructed and new residents found per annum.

This growth rate has been adopted for projecting the growth of the community over time and planning for infrastructure and services.

Subject to the proposal as described in this EIS being approved, it is anticipated construction of Stage 1 will commence construction in late 2009 or early 2010.

18.2 Construction workforce

Guideline 4.10.2: Outline the size and composition of the construction workforce.

The total number of construction workers employed on the site anticipated for Stage 1 is, 10 to 15 for the land division works, up to 50 for the neighbourhood centre and 2–3 per display village house.

The number of workers will fluctuate, depending on the intensity of building activity at any time. If construction is occurring in more than one location, for example, within the land division, and simultaneously within the neighbourhood centre, there will be more workers on site.

During some periods, the number of workers will be low, for example during bricklaying, or footings work, only a limited number of workers are required, and other trades work is not possible.

The construction workforce will be employed particularly in:

- earthmoving
- road construction
- laying of reticulated services
- landscaping in public domain areas.

The creation of Stage 1's Neighbourhood Centre will employ construction workers in all trades:

- Concreters
- Bricklayers
- Plumbers
- Gyprockers
- Carpenters
- Glaziers
- Tilers
- Landscapers
- Roofers
- Electricians
- Pavers
- Cabinet makers
- Painters
- Electricians
- Plumbers.

Construction workers will be supported by:

- Project Managers
- Builders
- Civil Engineers
- Architects
- Quantity Surveyors
- Landscape Architects
- Geotechnical Engineers
- Surveyors
- Hydraulic Engineers
- Interior Decorators
- Ecologists
- Draftsmen and women.

Ancillary workers providing materials and assistance for the construction will include:

- Signmakers
- Shopkeepers

- Horticulturists
- Kaurna monitors
- Ecology monitors
- Manufacturers of building materials.

In addition, administration of the construction's regulation processes will involve local and state government regulators, and building surveyors and certifiers in public or private practice.

Finally, the construction work force and all the people indirectly employed will be supported by staff who provide administration support.

18.3 Weed and disease management, control and prevention

Guideline 4.10.3: Identify how the prevention of spread of weeds and diseases into the horticulture area during construction is going to be managed.

The spread of weeds and diseases during construction will be prevented by the following means, which will be incorporated into each of the proposal's stages CMP as a Weed Management Plan:

- Minimisation of soil disturbance, and therefore vegetation disturbance, in the civil engineering plans.
- Establishment of defined routes for construction vehicles. For Stage 1, the construction route is Legoe Road, onto Port Wakefield Road. Legoe Road is within the site's boundaries.
- Wheel wash bays to ensure exposed soil from the site is not spread from construction vehicle wheels. It should be noted that most vehicles associated with the construction of a land division, for example earthmoving and road compacting vehicles, do not move from the site regularly, they are left on site for long periods of time on the site.
- Appropriately sealed car parking areas for construction workers, to ensure their vehicles do not come into contact with exposed soil from the site.
- Covering and spraying of stockpiled soil from the site.
- Covering of spoil loads in trucks leaving the site.
- Fencing around construction zone.

These measures will be included in the CMP for each of the proposal's stages, and implemented during construction.

18.4 Construction impact monitoring and minimisation

Guideline 4.10.4: Describe the proposed monitoring measures to minimise impacts during construction.

The specialist plans within each CMP will include relevant monitoring provisions. Compliance will be the responsibility of the Project Manager.

All construction workers and visitors to the construction site will receive induction training on all aspects of the CMP and its associated plans.

The specialist plans within the CMP will be informed by detailed site investigations, which will establish the environmental issues particular to each stage, required management measures, the monitoring required, including timing, and remediation measures or response procedures.

Particular on-site monitoring is required for the following issues:

- *Aboriginal archaeology.* A Kaurna accredited monitor will be on site whenever ground is disturbed for the first time. If any potential item of aboriginal significance is reported by the monitor, work will stop until it is properly investigated.
- *Ecology.* An ecologist will survey each construction zone of foot to ensure any indigenous plants (of significance) or animals are removed prior to construction commencing. Where possible, removed plant material will be used in rehabilitation and revegetation after works are completed. Areas to be protected will be fenced from construction zones.
- *Soil, erosion and stormwater.* The project manager will be responsible for regularly maintaining any soil and erosion management items, temporary drains or water retention areas to ensure they are functioning properly, and will augment them if required.
- *Rubbish.* The project manager will be responsible for regularly inspecting the area around construction zones, particularly areas with biological significance and removing any rubbish associated with construction activities.
- *Weeds and dust.* The project manager will be responsible for ensuring weed management and dust control measures are implemented. This includes:
  - covering all stockpiled material and spoil loaded on trucks for removal;
  - watering all disturbed areas in windy conditions;
  - washing truck and machinery wheels before they exit the construction vehicle parking area.
- *Noise.* The project manager will be responsible for ensuring all equipment used on site meets required EPA Guidelines and will respond to any noise complaints.
- *Public safety.*
- *Traffic management.*
- *Ground water.*
- *The community.* The project manager will be responsible for:
  - communication with the community, both with the site and beyond its boundaries;
  - ensuring up coming construction activities are publicly notified, preferably be letter drops to potentially affected houses;
  - responding to complaints, including any clean ups, remediation work and modification of procedures that may be required;
  - maintaining a complaints register.

Chapter 19 Legislation and policies

The site is located within Metropolitan Adelaide as defined in the *Metropolitan Planning Strategy* prepared by Planning SA in 2007. It is within Metropolitan Adelaide's northern region and forms part of the Playford LGA.

This chapter describes proposal's place within the context of the relevant Acts, planning strategies and the objectives and principles of the Playford (City) Development Plan.

Relevant legislation and policies are described in Chapter 2.

19.1 Compatibility with the Planning Strategy and Development Plan

Guideline 4.11.1: Describe the proposal's consistency with the relevant Development Plan and Planning Strategy.

19.1.1 Consistency with the Planning Strategy

Connor Holmes note the Government has identified there will be a need for new suburbs to accommodate part of Adelaide's growth over the next 30 years (Appendix 3). A Growth Investigation Areas project has been initiated to review of land supply and prepare a 25-year rolling supply of broadacre land. The site's locality is one area under consideration.

Projected increases Adelaide's in population demonstrate the need to resolve land supply, before scarcity begins to affect affordability.

This EIS has considered the proposal's consistency with the Planning Strategy's environmental, development and community initiatives, as listed in Table 19.1.

This EIS has considered the proposal in relation to the relevant provisions of the Strategy.

An integrated approach has been taken to planning the proposal's land uses, such as employment, centres and housing, and its transport networks, which facilitates its ability to be self sufficient. Adjoining communities will also enjoy the benefits of increased services and transport within the site.

The Planning Strategy encourages a "whole-of-water cycle" approach to the supply and use of water based on the hierarchy of "avoidance, reduction, re-use, recycling and appropriate disposal". This approach has been adopted in the proposal, see Chapter 15.6.

The Planning Strategy encourages a shift from the reliance on landfill and disposal to resource recovery approaches and recycling including mechanisms to reduce waste production and the clustering of facilities to increase efficiencies. This is the basis of *South Australia's Waste Strategy (2005–2010).* The Waste Strategy has been considered in the proposal, see Chapter 9.6.

The proposal is consistent with Planning Strategy and will be implemented in an orderly and economic manner.

In addition the proposal supports emerging Government policy, particularly *Directions for Creating a New Plan for Greater Adelaide*.

Table 19.1 Relevant provisions of the Planning Strategy

Relevant provisions	Chapter
Ensure there is an adequate and appropriate supply of land for residential purposes.	The proposal will supply a substantial amount of the housing required to support Adelaide's growth and economy over the coming decades.
Concentrate new housing into areas that have employment, infrastructure and services.	The proposal's scale, Masterplan and Staging Plan facilitates the provision of infrastructure and services to its housing in an economic, timely and coordinated manner. The Masterplan accommodates employment, commercial and mixed use precincts, open space and centres, integrated with housing and road, bus, walking and bicycle networks. Services and infrastructure provided to the proposal will also be available to residents and businesses in the region.
Achieve sustainability targets, particularly reducing our ecological footprint to reduce the impact of human settlements and activities.	See Chapter 9 for a full description of sustainability measures, which have been incorporated into the Masterplan as applicable.
Ensure proposals to change the economic use of land to housing include an assessment of the implications of that change on economic activity.	See Chapter 16 for a full description of the proposal's economic implications. It concludes $1.78 million associated with horticultural production will be lost, which is outweighed by the considerable economic benefits which will result from the proposal's implementation.
Prepare development strategies for surplus and under-used sites, including treatment of contamination, upgrading of physical infrastructure and community issues.	The Planning Strategy aims to protect key areas of primary production, including the northern Adelaide plains. The area identified in the Strategy as an "area of strategic interest for primary production", affects a small portion of the site. This component of the Planning Strategy must be considered within its overall context. The land within the site affected is small, 177.6 ha. This is not significant given the total size of the area of strategic interest. It is appropriate to also consider the best and most economic use for this land. The *Development of Horticultural Industries on the Adelaide Plains – A Blueprint for 2030* considered this land as having limited value as agricultural land. Conversely the land is strategically important to proposal's success, as it enjoys the best access to Port Wakefield Road, a major piece of transport infrastructure. The exclusion of the land will affect the viability of the proposal which will contribute to the state's economic strength. There is a need for viable new suburbs to serve Adelaide's economic and population growth in strategic locations. In this circumstance, it is considered the land is under used, and more appropriately used for urban purposes. This EIS includes an assessment of the treatment of contamination, the provision of infrastructure and community issues.
Develop higher residential densities in strategic locations around centres and transport nodes and interchanges to provide housing choice and support public transport use.	The Masterplan accommodates higher density housing around centres and on proposed road, bus, walking and bicycle networks.

19.1.2 Consistency with Playford (City) Development Plan

Sections of the Development Plan sections to the proposal are:

- Horticulture (West) Zone.
- MOSS (Recreation) Zone.
- Council-wide provisions.

The Horticulture (West) Zone

The proposal is inconsistent with the intent of the Horticultural West Zone. However, the site represents approximately 13% of the total area of land zoned for horticultural use within the City of Playford, and therefore the proposal will have a relatively small impact on attainment of the Development Plan's key objectives.

The Horticulture (West) zone allows for industrial or employment opportunities where value adding enterprises associated with horticulture industry are proposed.

The employment lands accommodated within the Masterplan will provide serviced land suitable for industries value adding to horticultural produce.

The suitability of the site for horticultural purposes has been considered in this EIS, and it was concluded the site was strategically better suited to the proposal, and the loss of its existing and potential for horticultural production would make a negligible impact on the economic productivity of the region.

The proposal will contribute to the achievement of the environmental and sustainability outcomes sought in the zone. The proposal will therefore not be detrimental to the attainment of the zone's overall intent.

MOSS (Recreation) Zone

Along the Gawler River corridor, the site is zoned MOSS (Recreation) Zone.

The pertinent objectives of the zone and their relationship to the proposal are described in Table 19.2.

The zone also contains principles of development control which underpin the achievement of the objectives. The proposal will be able to achieve the attainment of those principles so far as they may be applicable to the proposal.

Table 19.2 Objectives for the form of development in the MOSS Zone

Objective	Chapter
Objective 1: Establishment of a regional open space network.	This objective is facilitated by the Masterplan which accommodates the Gawler River corridor into open space.
Objective 2: A zone that provides a linear open space for a range of public and private activities, including passive and active recreational land uses in an open and natural landscaped setting as part of the Metropolitan Open Space System, within a well landscaped setting.	This objective is facilitated by the Masterplan which accommodates the Gawler River corridor into open space.
Objective 3: Protection of items of Aboriginal and European heritage significance and areas of scientific, archaeological or cultural importance.	The objective will be met by compliance with the Aboriginal Heritage Act as described in Chapter 14.7.
Objective 4: The maintenance of stormwater capacity and flood mitigation measures for adjoining areas, and the protection of recharge of underground aquifers.	This objective will be met through the implementation of the storm and flood water management strategy described in Chapter 7, and the implementation of ground water management methods described in Chapter 7.
Objective 5: Provision of cycle and walking paths within an integrated system of open spaces linking adjoining land uses.	This objective is facilitated by the Masterplan which accommodates the Gawler River corridor into open space.
Objective 7: Protection of the Gawler River, Little Para River and Smith Creek riparian zones through the conservation and enhancement of existing locally indigenous vegetation and the creation of a wildlife corridor.	This objective is met by accommodating the Gawler River corridor in the Masterplan's open space, and the implementation of flora management as described in Chapter 10.
Objective 8: Preservation and enhancement of the character, scenic beauty and amenity of the Gawler River, Little Para River, Smith Creek, Hills Face and coastline.	The Gawler River corridor is an important landscape feature on the site, and will enhance amenity for future residents. Its revegetation and rehabilitation, including weed control will be undertaken as the proposal's stages are implemented.
Objective 9: Provision of public access to and along the length of the Gawler River, Little Para River, Smith Creek, Hills Face and coastline.	Public access to the Gawler River corridor will contribute to the amenity enjoyed by future residents and the existing community. Public access will be facilitated as appropriate given the corridor's conservation value.
Objective 10: Land kept free of buildings and structures along the Gawler River.	This objective is met by accommodating the Gawler River corridor in the Masterplan's open space.
Objective 12: The Gawler River 100 year Average Return Interval Flood Plain kept free of development which could impede the flow of floodwaters.	This objective is met by in the storm and flood water management strategy described in Chapter 7.
Buildings, solid fences and increases in the level of land all have the potential to impede the flow of floodwaters or change the pattern of the movement of floodwaters. This in turn may increase the depth, velocity or spread to floodwaters in other parts of the floodplain, resulting in an increase in damage or inconvenience in that location.	This objective is met by accommodating the Gawler River corridor in the Masterplan's open space, and the storm and flood water management strategy which shows which areas should be kept free of structures, and is also accommodated in the Masterplan.
Objective 13: Development of the Gawler River Flood Plain which recognises varying degrees of flood hazard.	This objective is met by in the storm and flood water management strategy.

Council wide

As the Masterplan accommodates a range of different land uses, a number of the Development Plan's provisions are relevant.

Form of development

Objectives (Obj): 1, 2, 3, 5 and 6

Principles of Development Control (PDC): 1, 2, 3, 4, 5 and 8

These provisions are relevant as they seek orderly and economic development, based on the proper distribution and segregation of land uses and the capability and servicing of land. The provisions also seek to ensure that development does not lead to a potential hazard in the event of a major flood.

The site's proximity to Metropolitan Adelaide's employment hubs, public transport interchanges, key activity centres, major health and education institutions is strategically favourable (Chapter 2.4.2).

The proposal's scale, Masterplan and Staging Plan facilitates its orderly creation over 25 years. The ability to plan the implementation and funding of infrastructure assets prior to the proposal's commencement facilitates its economic development.

Land division

Obj: 7

PDC: 9, 10, 11, 12, 13, 14, 15, 16, 17 and 18

These provisions seek to ensure that the allotments created are generally suitable for their intended use in terms of area and configuration. In addition, these provisions seek to ensure that land which is to be divided is appropriately serviced. Further policy direction is also provided to ensure potential flooding issues are addressed. The proposal's Masterplan and Superlot Land Division Plan facilitate achievement of compliance with these provisions.

Transportation (movement of people and goods)

Obj: 8, 9, 10, 11, 12, 14 and 15

PDC: 19, 20, 21, 24, 25, 26, 27 and 30

The Masterplan demonstrates the integration of land use and transport planning to achieve these objectives. Land uses will be efficiently connected by pedestrian and bike networks, public transport networks and the road network.

Public utilities

Obj: 16

Objective 16 seeks 'Economy in the provision of public services' to ensure that development occurs in appropriate locations where public services can be provided in an economic manner.

The proposal's scale, Masterplan and Staging Plan facilitates its orderly creation over 25 years. The ability to plan for the implementation and funding of infrastructure assets prior to the proposal's commencement facilities the economic provision of public services to a large population.

Land use

The Development Plan's provisions relating to the future use of the land are considered here as they relate to the land uses accommodated in the Masterplan.

Residential development

Obj: 17, 18, 19, 20, 21, 22 and 23

The Development Plan focuses on regeneration and renewal opportunities to accommodate growth to make efficient use of infrastructure by provision of:

- Sustainable residential environments.
- Variety of housing forms and choice.
- New residential development which is integrated and cohesive and where timely provision is made for services convenient to the population they serve.

While the proposal is not regeneration or renewal of an existing suburb, it will create sustainable residential environments, provide for a variety of housing forms and choice in line with changing demographics, and will form an integrated and cohesive community.

Land division (Residential)

PDC: 34–70

These principles are detailed design matters concerning neighbourhood planning, allotment and road layout, public open space, stormwater management and water quality management.

Centres and shops

Obj: 24, 25, 26 and 27

PDC: 136, 137, 138, 139, 140, 141, 143 and 144

These provisions seek shopping, administrative, cultural, community, entertainment, educational, religious and recreational facilities located in integrated centres within a hierarchy based on function.

The policies outline desired design outcomes concerning management of interface issues, car parking provision, built form and signage.

These elements will be addressed in the detailed design of the proposal's future stages.

The Masterplan delivers a hierarchy of centres and shops as sought.

Community facilities

Obj: 30, 31 and 32

These objectives seek appropriate community facilities, provided to serve the community in a timely fashion early in a new community's occupation. This includes the provision of public transport.

The proposal will deliver the necessary community facilities, delivered in a timely manner facilitated by the Masterplan and Staging Plan.

In particular, Stage 1 includes the construction of a community centre and funding for a community worker to facilitate activities at that centre. It also includes funding for a community bus and the operation of that bus.

Rural development

Obj: 44, 45, 46, and 47

PDC: 194

These provisions seek the retention of rural areas for agricultural and pastoral purposes.

The land within the site considered as having strategic interest for agriculture is small, 177.6 ha.

It is also appropriate to consider the best and most economic use for this land.

The *Development of Horticultural Industries on the Adelaide Plains – A Blueprint for 2030* considered this land as having limited value as agricultural land.

Conversely the land is strategically important to proposal's success, as it enjoys the best access to Port Wakefield Road, a major piece of transport infrastructure.

The exclusion of the land will affect the viability of the proposal, which will contribute to the state's economic health.

There is a need for viable new suburbs to serve Adelaide's economic and population growth in strategic locations.

In this circumstance, it is considered the land is under used, and more most appropriately used for urban purposes.

Country townships

Obj: 50 and 51

Objective 50 seeks a country township character for new non rural activities.

The proposal is consistent with this objective's spirit, in that it will result in a community with a discrete identity, created by drawing on themes such as its natural and horticultural context, and its Aboriginal and European history.

Objective 51 seeks minimisation of conflict between township uses and the adjacent horticulture zone.

The proposal and Masterplan have been designed to minimise conflict between the land uses accommodated within the Masterplan and land uses within the site's locality.

Environmental

Catchment water management

Obj: 54–64

PDC: 222–234

These provisions seek to control impacts on surface and underground water resources and watercourse environs. Site planning and engineering design detail can effectively respond to these provisions.

Stormwater management

PDC: 235-248

These provisions seek to protect natural watercourses and land uses from the impact of storm and flood waters.

The proposal includes a storm and flood water management strategy which meets these objectives. It will be subject to detailed review and design with each of the proposal's future stages. This process will be guided by the Masterplan, which accommodates a structure of storm and flood water management channels and detention basins.

Conservation

Obj: 65, 70, 72 and 73

PDC: 257–258

These provisions seek the protection of attractive areas and native vegetation.

The Masterplan accommodates areas identified in preliminary flora and fauna survey work as having conservation importance. These areas will be designed in detail and appropriate rehabilitation, revegetation and management plans prepared and implemented.

Public open space

Obj: 79, 80, 81, 82 and 83

PDC: 291

These provisions seek the provision of adequate public parks and recreation areas. The Masterplan accommodates large areas of open space as networks through the site. Some of these areas will be incorporated into the MOSS (Recreation) Zone.

The detailed design of open space will be undertaken with each of the proposal's future stages, guided by the structure incorporated into the Masterplan.

The Stage 1 Layout Plan includes:

- Two parks to provide amenity to residential neighbourhoods.
- A linear park network for amenity, pedestrian and bikeway connections and stormwater management.
- A landscaped area within the neighbourhood centre which will improve Stage1's visual impact, provide an attractive entrance and include a children's playground.

Coastal areas

Obj: 84, 85, 86, 89, 90, 91, 92, 93

PDC: 301, 302, 303, 304, 305, 306, 308, 310, 312, 316, 317, 321, 333, 334 and 335

These provisions are applicable to coastal areas. They seek to minimise potential affects on coastal areas, and ensure coastal processes do not impact on development.

The provisions which relate directly to development within coastal areas or coastal reserves are not applicable to the proposal, as the site is not located within those areas.

The site is 2.5 to 4 km from the coast.

Pertinent to the proposal are the provisions which seek to mitigate the potential impact of stormwater from development located outside those areas, or minimise risk to those developments from the effects of climate change and sea level rise.

A comprehensive stormwater management strategy has been formulated which aims to capture, treat and re-use stormwater and minimise disposal to the coast, at a rate of 10m3/s as required by the Development Plan, and at a quality which complies with the EPA *Environment Protection (Water Quality) Policy 2003*.

Chapter 7.1.2 describes the requirements for compliance with Development Plan's provisions relating to sea level rise.

The stormwater and flood management strategy was prepared considering the impacts of climate change, including sea level rise and the incidence and intensity of tidal surge.

19.2 The Urban Growth Boundary

Guideline 4.11.2: Identify the issues related to a residential development outside the Urban Growth Boundary.

The site is within Metropolitan Adelaide's northern region, and is 9 km from the Urban Growth Boundary (UGB).

The UGB can only be considered a planning tool which must be regularly reviewed in response to Adelaide's changing demographics and economy.

The proposal specifically displays the following positive attributes and can be seen to achieve the principles underlying the formulation of the UGB:

- It does not involve the conversion of valuable agricultural production areas, instead utilises land that has been identified as being of "lower value land" in the Virginia Horticultural Centre's 2007 *Development of Horticulture Industries on the Adelaide Plains – A Blueprint for 2030*.
- The provision and use of infrastructure and services will be orderly and efficient, given the proposal's large scale and the guidance provided by the Masterplan and Staging Plan. The infrastructure and services will be benefit the towns of Virginia and Two Wells and their surrounding areas.
- It will achieve a clustering of activities over a large scale proposal, guided by the Masterplan.
- It will include strategies and resources to alleviate social disadvantage, by including Affordable Housing and integrated transport planning for buses, pedestrians and bicycles with land use planning, facilitated by the Masterplan and Staging Plan.
- It will include opportunities for employment integrated with new housing and transport.
- It will provide certainty to investors, facilitated by the Masterplan and Staging Plan.
- It will provide certainty to service and infrastructure providers, facilitated by the Masterplan and Staging Plan.

The site is strategically located within Metropolitan Adelaide as described in Chapter 2.4.2.

19.3 Development of a residential site outside the metropolitan area

Guideline 4.11.3: Justify the development of the Buckland Park site outside the metropolitan area.

The site is located within Metropolitan Adelaide, specifically within its northern region, as described in Chapter 3.1.1, and Figures 3.1 and 3.2.

19.4 Potential zoning changes

Guideline 4.11.4: Describe the potential changes that would need to be made to the zoning of the site.

The site is located within the Horticulture West Zone and the MOSS (Recreation) Zone of the Playford (City) Development Plan.

A Development Plan Amendment would be required to rezone parts of the site to be consistent with the land uses accommodated in the Masterplan.

Connor Holmes has considered the required amendments, using existing policy applied to similar zones located elsewhere within the City of Playford.

They considered inclusion of specific principles to protect existing land uses in the site's locality from the potential impacts associated with the proposal, and to respond to the site's unique context within the City.

The proposed zoning amendments set out zones for each land use accommodated in the Masterplan, for example Residential, Neighbourhood Centre, District Centre, Mixed Use and Employment.

An alternative approach could be the creation of a specific "Buckland Park Zone" containing overarching provisions with a number of policy areas applying to the various land uses accommodated in the Masterplan.

The MOSS (Recreation) Zone will be retained, but is likely it will be modified as detailed design of the proposal's future stages proceeds, with investigations establishing those areas required for biodiversity and those for recreation purposes. The Masterplan accommodates an expansion of the MOSS Zone as a result of the flora and fauna survey work done as part of this EIS.

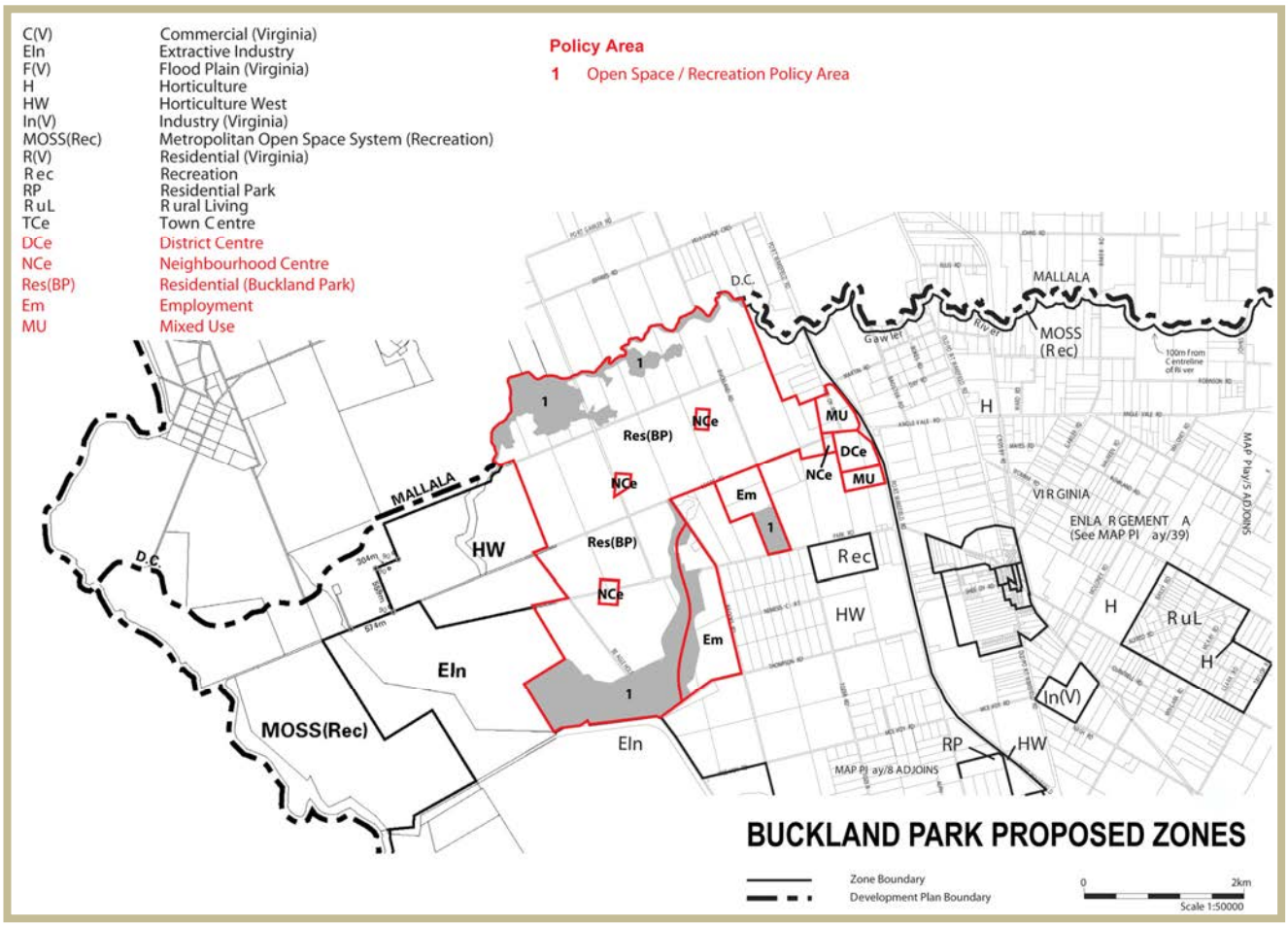


Figure 19.1 Proposed zone amendments

The final outcome will be determined following appropriate investigations as part of the Development Plan Amendment process and would include elements drawn from the Better Development Plan Program.

19.5 Compatibility with State and Commonwealth conservation and environment protection legislation and initiatives

Guideline 4.11.5: Describe the proposal's consistency with State and Commonwealth legislation and initiatives relating to conservation or protection of the biological environment.

A referral in accordance with the *Environmental Protection and Biodiversity Conservation Act* will be made to the Federal Minister for Environmental Protection, Water, Heritage and the Arts. Chapter 10 describes the flora of potential interest to the federal government. The Orange Bellied Parrot is the only fauna of federal significance. The referral will describe the proposal and potential threatening processes.

The Minister will then determine if the proposal is a controlled action as defined in the Act. Appropriate steps to comply with the Act will be taken after his determination.

19.6 Compliance with legislative requirements

Guideline 4.11.6: Describe how the proposal would comply with the requirements under the Environment Protection Act 1993 *and the* Adelaide Dolphin Sanctuary Act 2005 *and the duty of care under these Acts.*

Environment Protection Act 1993

The proposal comprises activities of environmental significance as stated in the *Environment Protection Act 1993* (EP Act).

The objectives of the EP Act are:

- to promote principles of ecologically sustainable development;
- to ensure that all reasonable and practicable measures are taken to protect, restore and enhance the quality of the environment having regard to the principles of ecologically sustainable development, and to prevent, reduce, minimise and, where practicable, eliminate harm to the environment.

In addition, proper weight should be given to both long and short term economic, environmental, social and equity considerations in deciding all matters relating to environmental protection, restoration and enhancement.

The EPA is required to undertake an assessment of risk of environmental harm and ensure that all aspects of environmental quality affected by pollution and waste are considered in decisions relating to the environment.

Each of the proposal's future stages will be subject to compliance with the Act.

In particular, the interaction of the land uses accommodated in the Masterplan and existing, adjoining uses within and adjoining the site, will be subject to consideration. Impacts such as noise, airborne emissions and pollution will be considered as required to ensure compatibility between uses. The provisions of the Act will be used to guide the detailed design of each of the proposal's future stages.

As an example, Section 25 of the *Environment Protection Act 1993*, requires all South Australians to prevent or minimise environmental harm that may be caused by excessive noise. Noise issues are further regulated by the *Environment Protection (Noise) Policy 2007* which came into effect on 31 March 2008.

Similarly, water quality is regulated by the Environment Protection Act. The stormwater and flood management strategy aims to mimic the existing hydrology of the site, and detain the peak flows to match the existing predevelopment peak flows from the site. Minor flows from the site will be treated to meet EPA *Environmental Protection (Water Quality) Policy 2003* requirements prior to discharge into the Thompson Outfall Channel.

The continued compliance with the provisions of the Act by adjoining land uses, such as horticulturalists and Jefferies Composting Facility, will be important in managing potential impacts on the proposal.

The Masterplan design principles include provisions to address the intention of the Act. For example, the inclusion of buffers between residential areas and adjoining land uses, and the inclusion of a stormwater management strategy which ensures stormwater discharged from the site meets relevant criteria contained in the Act.

Dolphin Sanctuary Act 2005

The Adelaide Dolphin Sanctuary (ADS) is 118 km^2 of sea, located adjacent to Gulf St Vincent's eastern shore. The Adelaide Dolphin Sanctuary zoning incorporates the Port River and Barker Inlet including the Port Gawler Conservation Park.

The *Adelaide Dolphin Sanctuary Act 2005* states that the key habitat features such as the Port Adelaide River estuary and the Barker Inlet are maintained, protected and restored. The *Adelaide Dolphin Sanctuary Act 2005* also states that water quality within the region must be maintained for the health and wellbeing of the dolphin community.

Cooe note marine mammals commonly found within Gulf St Vincent include the Bottlenose Dolphin (*Tursiops truncates*) and the Common Dolphin (*Delphinus delphis*). Thirty known 'resident' dolphins have been reported to use Port River/Barker Inlet and Outer Harbour for mating and nursing juveniles (Appendix 11).

The objects of this Act are:

- to protect the dolphin population of the Port Adelaide River estuary and Barker Inlet;
- to protect the natural habitat of that population.

Further recommendations within the Act state threats of serious or irreversible environmental harm that are absent of scientific certainty will not be justified. Issues of litter and possibilities of entanglement through rubbish are also included within the Act.

The site is separated from the coastal plain and coastline as described in Chapter 8. The Cheetham salt pans and private property used for grazing and orcharding, adjoining provide a buffer between the site and the natural coastal and marine ecosystems.

The site's pre and post development hydrology directs water the Thompson Outfall Channel, located to the south of the sanctuary.

Water discharged from the Channel post development will meet the EPA *Environmental Protection (Water Quality) Policy 2003* for water discharged to the marine environment, and will be discharged at rate of 10m3/sc as specified in the Playford (City) Development Plan.

The proposal's new residents will not be able to access the coastal plain or coastline without trespassing over fenced private property on foot for a distance of 2.1 km. Their pets will also have to cover that distance.

The objectives if the *Dolphin Sanctuary Act 2005* have been considered during the proposal's preparation, in particular:

- storm and flood water treatment and management prior to discharge via the Thompson Outfall Channel;
- the rehabilitation and revegetation of the Gawler River corridor and that part of its flood plain closest to the coastal plain. This is important as waters from the Gawler River discharge directly into the coastal plain.

19.7 Compliance with the Environment Protection (Water Quality) Policy 2003

Guideline 4.11.7: Describe how the development would comply with the Environment Protection (Water Quality) Policy 2003.

Please see Chapter 7.4.

19.8 Addressing 'Tackling Climate Change Greenhouse Strategy 2007-2020' issues

Guideline 4.11.8: Describe how the proposal would address the issues within the "Tackling Climate Change Greenhouse Strategy 2007-2020".

Tackling Climate Change: South Australia's Greenhouse Strategy (2007) is the policy framework for South Australia's greenhouse targets and commitments to be met in a comprehensive and coordinated way. It is described as 'South Australia's planned response to climate change'.

The government aims to secure industry commitment in the first instance through collaboration and voluntary participation and is aiming to put programs in place that advise on opportunities for improved energy efficiency in large operations, commercial buildings and businesses.

The strategy takes three key approaches:

- Reducing greenhouse emissions.
- Adapting to climate change.
- Innovating in markets, technologies, institutions and lifestyle.

The *Tackling Climate Change* objective most relevant to the proposal is Objective 7.4:

"To develop sustainable built environments that are responsive to climate change."

This objective highlights the need to complement energy efficient subdivision layouts and urban form with integrated transport strategies, water sensitive urban design and living belts of habitat throughout urban spaces.

The Masterplan and Sustainability Guidelines described in Chapter 9 respond to this objective, in an effort to integrate greenhouse mitigation and climate change adaptation strategies into the implementation of the proposal over a 25-year period.

19.9 Compliance with the *Aboriginal Heritage Act 1988*

Guideline 4.11.9: Describe the actions through which the proponent will ensure that no Aboriginal site, object or remains identified before or during the works will be disturbed, damaged or interfered with, without authorisation by the Minister for Aboriginal Affairs and Reconciliation as required by the Aboriginal Heritage Act 1988*.*

See Chapters 14.6 and 14.7.

Chapter 20 Summary of commitments

This chapter summarises the issues discussed in this EIS, and the key requirements for responding to those issues.

20.1 Road closures

Stage 1

This EIS requests approval for the partial closure of Legoe Road as shown in Figure 1.3 and Figure 3.6.

Commitment: Access to public roads and utilities will be maintained to all properties outside the site during construction and operation.

Commitment: Approval will be sought from all public utility providers with infrastructure in that portion of Legoe Road, including ETSA, SA Water and Telstra prior to commencement.

Future stages

Commitment: Detailed land division plans for future stages will minimise requirements for public road closures.

Commitment: Approval will be sought for the closure of all public roads.

Commitment: Access to public roads and utilities will be maintained to all properties outside the site during construction and operation.

20.2 Stage 1 Neighbourhood Centre, Sales Office and Display Village

Commitment: Detailed architectural and landscape architectural plans for the neighbourhood centre, sales office and display homes will be prepared and submitted for approval. They will detail:

- Signage.
- The use of WSUD.
- The use of indigenous plants.
- Achievement of 5-energy rating as described in the Green Building Code of Australia.
- Use of recycled or energy efficient products.
- Use of architectural detail and materials to achieve a high quality appearance, screen building plant and ensure the roof is not a dominant visual element.
- Use of 5-star rated appliances in internal fitouts.
- Details of screening and shading for the car park areas.
- Pedestrian pathways, including for those with impaired mobility.

Commitment: A CMP will be prepared and implemented during construction which addresses the following:

- Waste Management Plan.
- Construction Traffic and Pedestrian Management Plan.

- Soil, Erosion and Water Management Plan.
- Noise Management Plan.
- Weed Management Plan.
- Consultation Plan.
- Spoil Management Plan
- Dust Management Plan.
- Rubbish Management Plan.
- Cultural Heritage Management Plan
- Flora and Fauna Management Plan.
- Ground Water Management Plan.
- Hazardous Material Storage Plan.
- Vegetation Clearance Plan.
- Emergency Procedures Management Plan.

Commitment: A community worker will be employed to undertake community building activities and support new residents as they establish their new homes. The community worker will commence employment when the first resident arrives.

Commitment: A community bus will be provided and operated, to ensure commuting residents meet the Route 900 bus at Virginia, and children can access Virginia Primary School. It will also be available for other journeys as coordinated by the community worker. Services will commence when the first residents arrive.

Commitment: Community building activities will be undertaken, coordinated by the community worker, including activities focused on the site's environment.

Commitment: A Waste Management Plan will be put in place to minimise the resources consumed by activities within the neighbourhood centre, sales centre and display village.

Commitment: The neighbourhood centre, display village and sales office will operate within the hours given in this EIS.

Commitment: Suitable tenants will be found for the supermarket and speciality shops, including doctors, and assisted into the building, to ensure there are convenience facilities for the first resident.

Commitment: Encourage builders of affordable houses, to display their homes in the display village.

Commitment: The sales office will include displays by the manufacturers of energy efficient building components and appliances, including solar hot water panels with natural gas back up.

Commitment: Encourage builders of energy efficient houses, to display their homes in the display village

20.3 Stage 1 Residential Component

Commitment: Engineering designs for the roads, stormwater and flood management facilities and parks will be prepared, informed by detailed groundwater, geotechnical and soil investigations.

Commitment: Engineering and landscape designs will incorporate the principles of WSUD, and use indigenous or drought tolerant species as appropriate.

Commitment: The land will be reviewed in detail by an ecologist, and any indigenous plants or grasses will be salvaged for reuse in the public domain if practical. If not practical, these species will be included in landscape designs for the public domain, and arrangements will be made with a nursery for their propagation for use in the public domain landscape.

Commitment: Planning will be undertaken with DECs regarding the provision of school places in the locality for Stage 1's children.

Commitment: Planning will be undertaken with all utility and infrastructure providers for the timely provision of utilities and services, particularly:

- DTEI regarding the intersection of Port Wakefield Drive and Angle Vale and Legoe Roads.
- SA Water regarding the provision of potable water.
- ETSA, APA and Telstra regarding the provision of electricity, gas and telecommunications, including:
  - requirements for accommodating utilities in the public domain;
  - promotion of gas powered air conditioners for domestic use.

Commitment: Design Guidelines will be finalised and provided to future residents with the purchase of their allotments.

- Use of indigenous plantings.
- Good watering practices.
- Mosquito screens.
- Energy efficient designs.
- Responsible management of pets.

Commitment: Those allotments nominated as Affordable Housing will be marketing as Affordable Housing to eligible buyers.

Commitment: A CMP will be prepared and implemented during construction which addresses the following:

- Waste Management Plan.
- Construction Traffic and Pedestrian Management Plan.
- Soil, Erosion and Water Management Plan.
- Noise Management Plan.
- Weed Management Plan.
- Consultation Plan.
- Spoil Management Plan
- Dust Management Plan.

- Rubbish Management Plan.
- Cultural Heritage Management Plan.
- Flora and Fauna Management Plan, if required.
- Ground Water Management Plan, if required.
- Acid Sulphate Soil Management Plan, if required.
- Hazardous Material Storage Plan.
- Vegetation Clearance Plan, if required.
- Emergency Procedures Management Plan.

Commitment: A determination under Section 12 of the *SA Aboriginal Heritage Act* will be obtained, and any requirements of that determination will be adhered to.

Commitment: All allotments will connected to mains gas, and recycled water reticulation for connection to a supply at a later date.

20.4 Future Stages

Commitment: Detailed land division plans will reflect the land uses, pedestrian and cycle ways, bus routes, and open space and road hierarchy accommodated in the Masterplan.

Commitment: Detailed land division plans will reflect the distribution of Affordable Housing indicated in the Affordable Housing Distribution Plan. Opportunities will be explored with Housing SA or suitable private providers for the provision of High Needs Housing if required and if appropriate.

Commitment: Detailed land division plans will ensure allotments are oriented to optimise passive heating and cooling.

Commitment: Detailed land division plans will avoid the creation of four way intersections.

Commitment: Detailed land division plans will facilitate the siting of non – residential buildings to minimise potential noise impacts from their operations on nearby residential properties, either within or outside the site.

Commitment: Detailed land division plans will ensure no residential allotment is located within 1.7 km of the Jefferies Composting Facilities northern boundary.

Commitment: Detailed survey work relating to aboriginal archaeology will be undertaken. Applications under the *SA Aboriginal Heritage Act* will be made for determinations under Section 12 of the Act, and the requirements of any determination will be adhered to.

Commitment: Detailed flora and fauna surveys will be undertaken, and used to inform detailed land division designs, and requirements for achieving a significant environmental benefit, including the rehabilitation and revegetation on site, or works undertaken off site if appropriate. The SA government's approval will be obtained for management plans associated with vegetation.

Commitment: Detailed design of storm water and flood management systems will reflect the structure accommodated in the Masterplan and WSUD principles.

Commitment: Detailed civil works will ensure finished surface levels are at 4.0 m AHD and finished floor levels are at 4.25 m AHD, where the site is potentially affected by sea level rise.

Commitment: Detailed design of stormwater capture and treatment wetlands, and aquifer storage and recharge scheme will reflect the structure accommodated in the Masterplan, and will be approved by SA Government.

Commitment: Stormwater generated on the site will be captured and suitable methods for its treatment and storage off site found. Suitable users for the water will be found, if it is not feasible to return the stormwater to the site for re-use.

Commitment: Detailed investigations will be undertaken to confirm the capacity of the aquifer but the aim will be store 50 ML/a of stormwater will be treated in wetlands and stored in the aquifer beneath the site for irrigating parks. Wetlands will be included in detailed landscape plans and stormwater management plans.

Commitment: The detailed stormwater design will be based on achievement of the SA EPA (2003) *Environmental Protection Water Quality Policy – Aquatic Ecosystem ("Marine Waters")* criteria for discharge into the marine environment and Playford (City) Development Plan requirement for the rate of discharge of 10 m^3/second.

Commitment: Civil engineering designs, infrastructure design and the remediation, management or monitoring requirements included in each stage's CMP will be informed by detailed investigations of:

- Geotechnical and soil conditions.
- The presence of acid sulphate soils.
- The groundwater table.
- Potential for salinity.
- The presence of contamination.
- Cultural and archaeological surveys.
- Flora and fauna surveys.

Commitment: All allotments will be connected to reticulated recycled water.

Commitment: All allotments will be connected to reticulated natural gas.

Commitment: Suitable arrangements for the implementation of water, recycled and sewer infrastructure will be made with SA Water.

Commitment: Suitable arrangements for the implementation of electricity, gas and telecommunications infrastructure will be made with ETSA, APA and Telstra, accommodating requirements for land the detailed land division plans.

Commitment: Suitable arrangements for the implementation of community infrastructure including libraries, community halls, passive and active open space, and depots will be made with Playford City Council.

Commitment: Suitable arrangements for the staged implementation of new bus routes and services will be made with DTEI.

Commitment: Suitable arrangements will be made with DEC for the provisions of schools, and private providers if DEC will not be providing the schools.

Commitment: Consult with Cheetham Pty Ltd regarding revocation of that part of PM199 which covers the site.

Commitment: Design Guidelines will be finalised and provided to future residents with the purchase of their allotments.

- Use of indigenous plantings.
- Good watering practices.
- Mosquito screens.
- Energy efficient designs.
- Responsible management of pets.

Commitment: Detailed landscape designs for the public domain will incorporate mosquito buffers in the form of planting or fencing on the western edge of western residential precincts.

Commitment: Detailed landscape designs for the public domain will incorporate drought tolerant and indigenous species wherever possible. Other trees and species will be used to enhance amenity and control environment (for example deciduous species to create summer shade and allow winter sun).

Commitment: Theme urban design, landscaping, street names and precinct names to reflect the site's natural, Indigenous and European Heritage and create a sense of community.

Commitment: Employment, commercial and mixed use precincts and centres will be actively marketed to suitable businesses and industry.

Commitment: 15% of the total, final yield will be provided as Affordable Housing.

Commitment: A CMP will be prepared and implemented during construction which addresses the following as required as a result of detailed investigations:

- Cultural Heritage Management Plan.
- Waste Management Plan.
- Construction Traffic and Pedestrian Management Plan.
- Public Safety Plan.
- Soil, Erosion and Water Management Plan.
- Noise Management Plan.
- Weed Management Plan.
- Consultation Plan.
- Spoil Management Plan.
- Dust Management Plan.
- Rubbish Management Plan.
- Cultural Heritage Management Plan.
- Flora and Fauna Management Plan.
- Ground Water Management Plan.
- Hazardous Material Storage Plan.

- Vegetation Clearance Plan.
- Flora and Fauna Management Plan.
- Acid Sulphate Soil Management Plan.
- Contamination and Remediation Management Plan.
- Emergency Procedures.

Abbreviations

AARD	SA Department of Aboriginal Affairs and Reconciliation
AHA	SA Aboriginal Heritage Act
ASD	Adelaide Statistical Division
ASR	Aquifer Storage Recharge
CEMP	Construction Environmental Management Plan
CHMP	Cultural Heritage Management Plan
Connector	The Northern Connector proposal
CPTED	Crime Prevention Through Environmental Design
DEH	SA Department of Environment and Heritage
DEWHA	Federal Department of Environment, Water, Heritage and the Arts
EPBC Act	Federal Environmental Protection and Biodiversity Conservation Act
FTE	Full time equivalent job
GEL	Geothermal Exploration Licence
GPS	Global Positioning System
GRFMA	Gawler River Flood Management Authority
KHB	Kaurna Heritage Board
kV	kilovolts
LGA	Local Government Area
m/s	metres per second
MASTEM	Department of Transport, Energy and Infrastructure's strategic transport model
mm	millimetres
MMC	Modern Methods of Construction
MOSS	Metropolitan Open Space
NAWMA	Northern Adelaide Waste Management Authority
NEXY	Northern Expressway
PASS	Potential Acid Sulphate Soils
PB	Parsons Brinkerhoff
PEL	Petroleum Exploration Licence
RMS	Roadside Marker System
SA	South Australia
SEB	Significant Environmental Benefit

SKM	Sinclair Knight Merz
SL	Southern Lofty botanical region
UFBP	Urban Forest Biodiversity Programme
UGB	Urban Growth Boundary
VHC	Virginia Horticulture Centre
vph	vehicles per hour
WONS	weed of national significance
WSUD	Water Sensitive Urban Design
y	year

References

Piper Alderman *Native Title Report* May 2008

Australian Cultural Heritage Management *Aboriginal Cultural Survey – Buckland Park* September 2008