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 adaptation measures

<table>
<thead>
<tr>
<th>Projected change</th>
<th>Likely effects</th>
<th>Potential impacts</th>
<th>Likelihood</th>
<th>Consequence</th>
<th>Overall risk</th>
<th>Adaptation measures</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Average rainfall</strong></td>
<td>Decrease in annual totals</td>
<td>Reduced water supplies</td>
<td>A</td>
<td>MJ</td>
<td>E</td>
<td>Encourage household rainwater tanks for non-potable water use.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Promote native landscaping.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Incorporate grey water and recycled water re-use.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Promote drought-tolerant plantings.</td>
</tr>
<tr>
<td></td>
<td>More severe droughts</td>
<td>Stress on ecosystems</td>
<td>L</td>
<td>MD</td>
<td>H</td>
<td>Develop and implement a Local Biodiversity Conservation Strategy.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Changes in regional groundwater levels</td>
<td>P</td>
<td>MN</td>
<td>M</td>
<td>Investigate a stormwater capture and aquifer recharge scheme.</td>
</tr>
<tr>
<td><strong>Temperature</strong></td>
<td>Increase in extremes</td>
<td>Heat stress on vulnerable people</td>
<td>A</td>
<td>MJ</td>
<td>E</td>
<td>Mandate insulation and passive design features in all buildings to improve thermal comfort.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Develop Community Heatwave Emergency Response Plans.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Provide air conditioning in public buildings as heat wave refuges.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Monitor condition of at-risk individuals and groups during heat waves.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Provide adequate shade and drinking fountains in public places.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Increased UV and sun exposure in public places, work, schools etc.</td>
<td>A</td>
<td>MN</td>
<td>M</td>
<td>Implement a shade and sun protection policy for all public facilities.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Increased electricity demand</td>
<td>A</td>
<td>MJ</td>
<td>E</td>
<td>Mandate design features that minimise need for air</td>
</tr>
<tr>
<td>Projected change</td>
<td>Likely effects</td>
<td>Potential impacts</td>
<td>Likelihood</td>
<td>Consequence</td>
<td>Overall risk</td>
<td>Adaptation measures</td>
</tr>
<tr>
<td>-----------------</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>for air conditioning</td>
<td></td>
<td></td>
<td></td>
<td>conditioning.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Building damages from footing movements in dry soil</td>
<td>L</td>
<td>MD</td>
<td>H</td>
<td>Consider potential for footing/ foundation movement in buildings and infrastructure design.</td>
</tr>
<tr>
<td></td>
<td>More fire risk</td>
<td>More frequent and severe bushfire risk</td>
<td>L</td>
<td>MN</td>
<td>M</td>
<td>Locate built up areas away from areas of high fire risk. Identify and control Fire Management Zones. Encourage fire adapted vegetation.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pollution of water supplies due to fires in catchments</td>
<td></td>
<td></td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Heat effects</td>
<td>Accelerated degradation of roads and other infrastructure assets</td>
<td>L</td>
<td>MD</td>
<td>H</td>
<td>Investigate and apply materials and design features to reduce heat degradation of roads.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Putrescibles wastes require more frequent collection and disposal</td>
<td>L</td>
<td>MN</td>
<td>M</td>
<td>Provide more frequent collection of putrescibles waste from restaurants etc.</td>
</tr>
<tr>
<td></td>
<td>Sea levels</td>
<td>Coastline accretion</td>
<td>U</td>
<td>MJ</td>
<td>L</td>
<td>Implement conservation and adaptation management plans for local coastal reserves.</td>
</tr>
<tr>
<td>Increases in level and surge</td>
<td></td>
<td>Increased coastal erosion</td>
<td>P</td>
<td>MD</td>
<td>M</td>
<td>Implement dune restoration programs as appropriate.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Damage/ loss of private properties</td>
<td>U</td>
<td>MD</td>
<td>M</td>
<td>Locate built up areas away from areas of likely inundation.</td>
</tr>
<tr>
<td>Increases in storm surge</td>
<td></td>
<td>Damage/ loss of public infrastructure</td>
<td>U</td>
<td>MD</td>
<td>M</td>
<td>Locate critical infrastructure away from areas of likely inundation.</td>
</tr>
<tr>
<td></td>
<td>Sea level rise</td>
<td>Damage loss of ecological habitats</td>
<td>P</td>
<td>MD</td>
<td>M</td>
<td>Protect buffer vegetation in shore zones.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Saltwater intrusion into estuaries, wetlands and aquifers</td>
<td>P</td>
<td>MD</td>
<td>M</td>
<td>Facilitate change to more salt-tolerant plants.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Reduced water quality in coastal rivers</td>
<td>P</td>
<td>MN</td>
<td>M</td>
<td>Ensure adequate tidal flushing by removing constraints.</td>
</tr>
<tr>
<td>Projected change</td>
<td>Likely effects</td>
<td>Potential impacts</td>
<td>Likelihood</td>
<td>Consequence</td>
<td>Overall risk</td>
<td>Adaptation measures</td>
</tr>
<tr>
<td>-----------------</td>
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<td>------------</td>
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</tr>
<tr>
<td>Storms</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Increased</td>
<td></td>
<td></td>
<td>L</td>
<td>MD</td>
<td>H</td>
<td>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.</td>
</tr>
<tr>
<td>rainfall</td>
<td>Heavier rainfalls</td>
<td>More frequent and severe flooding</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>intensities</td>
<td></td>
<td></td>
<td>L</td>
<td>MD</td>
<td>H</td>
<td>Planning controls to minimise hard surfaces.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Surcharge and deterioration of drainage system</td>
<td>L</td>
<td>MD</td>
<td>H</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Increased sedimentation and erosion in streams</td>
<td>L</td>
<td>MD</td>
<td>H</td>
<td>Ensure all excavated land and exposed stream banks are promptly stabilised to minimise sedimentation risks.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>More frequent sewer overflows</td>
<td>P</td>
<td>MD</td>
<td>M</td>
<td>Allow for increased rainfall intensities under climate change when designing new sewers or upgrading sewers.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>More frequent pollution of waterways</td>
<td>P</td>
<td>MD</td>
<td>M</td>
<td>Community education to encourage waste minimisation.</td>
</tr>
<tr>
<td></td>
<td>More severe</td>
<td>More severe wind storms and hail storms</td>
<td>P</td>
<td>MN</td>
<td>M</td>
<td>Revise design codes to cope with projected increased wind speeds and hail loads.</td>
</tr>
<tr>
<td>wind speeds</td>
<td>storms</td>
<td>Increased demands on emergency services</td>
<td>L</td>
<td>MD</td>
<td>H</td>
<td>Increase council or government support for local emergency services.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>General</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>More frequent</td>
<td>Increased costs to maintain essential infrastructure</td>
<td>L</td>
<td>MN</td>
<td>M</td>
<td>Incorporate adaptation features in all new or refurbished infrastructure to minimise long term maintenance costs.</td>
</tr>
<tr>
<td>storms</td>
<td></td>
<td>Increased building maintenance costs</td>
<td>L</td>
<td>MN</td>
<td>M</td>
<td>Show case Water Sensitive Urban Design in public buildings. Design public buildings to allow for adaptation modifications later on.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Increased cost or unavailability of insurance</td>
<td>L</td>
<td>MD</td>
<td>H</td>
<td>Ensure building and landscape designs include all practical measures to minimise storm damages and losses.</td>
</tr>
</tbody>
</table>

**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

<table>
<thead>
<tr>
<th>Year</th>
<th>Car</th>
<th>Truck</th>
<th>Car emissions</th>
<th>Truck emissions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>VKT</td>
<td>Vh</td>
<td>VKT</td>
<td>Vh</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2036</td>
<td>264,299</td>
<td>5,764</td>
<td>46</td>
<td>13,910</td>
</tr>
<tr>
<td>2031</td>
<td>215,653</td>
<td>4,574</td>
<td>47</td>
<td>11,350</td>
</tr>
<tr>
<td>2026</td>
<td>128,036</td>
<td>2,707</td>
<td>47</td>
<td>6,739</td>
</tr>
<tr>
<td>2021</td>
<td>49,924</td>
<td>1,051</td>
<td>47</td>
<td>2,628</td>
</tr>
<tr>
<td>2016</td>
<td>6,826</td>
<td>156</td>
<td>44</td>
<td>359</td>
</tr>
</tbody>
</table>

Source: Parsons Brinkerhoff

Table 9.3 Annual external based transport trips by car and truck

<table>
<thead>
<tr>
<th>Year</th>
<th>Car</th>
<th>Truck</th>
<th>Car emissions</th>
<th>Truck emissions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>VKT</td>
<td>Vh</td>
<td>VKT</td>
<td>Vh</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2036</td>
<td>1,510,753</td>
<td>21,065</td>
<td>72</td>
<td>79,513</td>
</tr>
<tr>
<td>2031</td>
<td>1,246,341</td>
<td>17,205</td>
<td>72</td>
<td>65,597</td>
</tr>
<tr>
<td>2026</td>
<td>923,899</td>
<td>12,130</td>
<td>76</td>
<td>48,626</td>
</tr>
<tr>
<td>2021</td>
<td>442,858</td>
<td>5,771</td>
<td>77</td>
<td>23,308</td>
</tr>
<tr>
<td>2016</td>
<td>117,541</td>
<td>1,511</td>
<td>78</td>
<td>6,186</td>
</tr>
</tbody>
</table>

Source: Parsons Brinkerhoff
Table 9.4 Annual total transport trips by car and truck

<table>
<thead>
<tr>
<th>Sector</th>
<th>Buckland Park internal trips</th>
<th>Trip into and out of Buckland Park</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2036</td>
<td>40,364</td>
<td>230,722</td>
<td>271,086</td>
</tr>
<tr>
<td>2031</td>
<td>32,934</td>
<td>190,341</td>
<td>223,275</td>
</tr>
<tr>
<td>2026</td>
<td>19,554</td>
<td>141,098</td>
<td>160,651</td>
</tr>
<tr>
<td>2021</td>
<td>7,624</td>
<td>67,633</td>
<td>75,258</td>
</tr>
<tr>
<td>2016</td>
<td>1,042</td>
<td>17,951</td>
<td>18,993</td>
</tr>
</tbody>
</table>

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 greenhouse 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 greenhouse emissions from the proposal will be mitigated through a range of measures.

During construction, greenhouse 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, greenhouse 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 greenhouse 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 greenhouse 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

<table>
<thead>
<tr>
<th>Waste type</th>
<th>Bin type</th>
<th>Collection time</th>
<th>Where to dispose?</th>
</tr>
</thead>
<tbody>
<tr>
<td>General household rubbish</td>
<td>140 litre bin</td>
<td>Weekly</td>
<td>Baled at NAWMA site Elizabeth West Disposed at Balefill Facility at Uleybury</td>
</tr>
<tr>
<td>Recyclable material</td>
<td>240 litre bin</td>
<td>Fortnightly</td>
<td>Materials Recovery Facility at Elizabeth West</td>
</tr>
<tr>
<td>Garden Waste</td>
<td>240 litre bin</td>
<td>Fortnightly</td>
<td>Andrews Road Transfer Station</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Waste stream</th>
<th>Waste</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building waste generated during the construction activities</td>
<td>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.</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Waste stream</th>
<th>Waste</th>
</tr>
</thead>
<tbody>
<tr>
<td>Household waste</td>
<td>Food, paper/cardboard, vegetation waste, hard waste, metal, glass, plastic, soil, wood/timber, vegetation/garden waste, metal, hard waste/bulk waste</td>
</tr>
<tr>
<td>Commercial waste</td>
<td>Food, garbage bags, soil, wood/timber, vegetation/garden waste, rubber/tyres, paper/cardboard, metal, glass, heavy metal, hard waste/bulk waste</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Waste type</th>
<th>%</th>
<th>Estimated additional household waste generated from Buckland Park</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Per year (t)</td>
</tr>
<tr>
<td>Cardboard</td>
<td>4</td>
<td>261.83</td>
</tr>
<tr>
<td>Newsprint</td>
<td>6</td>
<td>392.75</td>
</tr>
<tr>
<td>Other paper</td>
<td>5</td>
<td>327.29</td>
</tr>
<tr>
<td>Contaminated paper</td>
<td>0</td>
<td>–</td>
</tr>
<tr>
<td>CDL</td>
<td>2</td>
<td>130.92</td>
</tr>
<tr>
<td>Other recyclable</td>
<td>13</td>
<td>850.95</td>
</tr>
<tr>
<td>Non-recyclable metal/glass/plastic</td>
<td>6</td>
<td>392.75</td>
</tr>
<tr>
<td>Green waste</td>
<td>12</td>
<td>785.49</td>
</tr>
<tr>
<td>Food waste</td>
<td>34</td>
<td>2,225.56</td>
</tr>
<tr>
<td>Dust/dirt/rock/ash</td>
<td>4</td>
<td>261.83</td>
</tr>
<tr>
<td>Disposable nappies</td>
<td>4</td>
<td>261.83</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Stage</th>
<th>Legislation/target</th>
<th>Mitigation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>South Australia’s Waste Strategy 2005–2010: By 2010, construction waste recovery and re-use will have increased by 50% from 2004 weights</td>
<td>Builders should:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>▪ 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;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>▪ provide an induction and education program outlining waste management objectives and procedures for all construction workers and sub-contractors.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Architects/Designers should:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>▪ reduce resource waste by specifying the correct quantities and specification of particular types of materials, where appropriate;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>▪ 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,</td>
</tr>
<tr>
<td>Stage</td>
<td>Legislation/target</td>
<td>Mitigation</td>
</tr>
<tr>
<td>-------</td>
<td>--------------------</td>
<td>------------</td>
</tr>
<tr>
<td></td>
<td>conversion or extension;</td>
<td>• consider design for disassembly or relocation and re-use of components where possible as an alternative to simply demolishing the structure.</td>
</tr>
<tr>
<td></td>
<td>Supplier should:</td>
<td>• use less packaging and supply materials in the exact quantities required.</td>
</tr>
<tr>
<td></td>
<td>Builder or sub-contractor should:</td>
<td>• reuse soil and stone generated by earthworks, subject to suitability;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• follow best management practice for soil conservation when stripping, handling, storing and replacing soils on site;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• prepare and implement a Construction Waste Management Plan (CWMP) as part of their contract.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The CWMP should consist of the following:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• the volume and type of waste to be generated;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• whether the waste will be re-used, recycled or disposed of;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• building materials and design techniques;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• consider using Modern Methods of Construction (MMC) where possible;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• order construction material in optimal dimensions to minimize cut-off waste;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• maximise the use of building materials with a higher recycled content for example:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• recycled steel reinforcements;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• recycled or plantation timber;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• recycled concrete;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• second hand bricks;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• soil and fill.</td>
</tr>
<tr>
<td></td>
<td>Council encouraged to:</td>
<td>• 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.</td>
</tr>
<tr>
<td></td>
<td>The Designer should:</td>
<td>• provide adequate storage and, where appropriate, sufficient space to allow for on-site treatment of household waste and recyclable waste;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• provide neighbourhood or household composting facilities for garden waste and organic kitchen waste;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• prepare a Waste Management Plan outlining who will be responsible for maintaining and monitoring the waste</td>
</tr>
</tbody>
</table>

**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
<table>
<thead>
<tr>
<th>Stage</th>
<th>Legislation/target</th>
<th>Mitigation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>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.</td>
<td>management system for residential proposals within the Master Plan – such as high density housing. <strong>Householders should:</strong>&lt;br&gt;• place a ‘no junk mail’ notice on all letterbox.</td>
</tr>
<tr>
<td>– Commercial</td>
<td>By 2010, the recovery and use of materials from the C&amp;I sector will have increased by 30% from 2004 weights.</td>
<td><strong>Council encouraged to:</strong>&lt;br&gt;• maintain the current kerbside collection levels of services in order to maximise the recovery of recyclables from commercial properties. <strong>Commercial building owners within the proposal should aim to:</strong>&lt;br&gt;• develop internal building based co-mingled recycling systems (separating recyclable materials and organic material from remaining waste);&lt;br&gt;• work collaboratively with cleaners and waste collection contractors&lt;br&gt;  ◦ 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;&lt;br&gt;  ◦ incorporating contract clauses that require cleaners to support any recycling initiatives implemented in the building, or by individual tenants;&lt;br&gt;  ◦ monitoring waste and recycling amounts - waste and recycling contractors should provide monthly feedback on the volume of material collected;&lt;br&gt;• work collaboratively with tenants&lt;br&gt;  ◦ Inform tenants of the intention to implement a building-wide recycling system;&lt;br&gt;  ◦ Using tenancy leases to motivate tenants to recycle.</td>
</tr>
</tbody>
</table>

*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

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Community</td>
<td>A community with its own distinct identity and character, which provides a good lifestyle, and is integrated with its natural and rural setting.</td>
</tr>
<tr>
<td>Energy</td>
<td>Maximisation of the energy efficiency in all the Master Plan’s built elements, and minimisation of demand for electricity resources.</td>
</tr>
<tr>
<td>Transport</td>
<td>Maximisation of accessibility to public transport, and commercial, employment and community services within Buckland Park and the region and minimisation of fossil fuel use.</td>
</tr>
<tr>
<td>Water use</td>
<td>Maximisation of the water efficiency of the proposal’s built, landscaped and natural elements, and minimisation of water consumption.</td>
</tr>
<tr>
<td>Biodiversity</td>
<td>Protection and enhancement of biodiversity within the site and the region.</td>
</tr>
<tr>
<td>Resources</td>
<td>Minimisation of the proposal’s ecological footprint by minimising waste generation, maximising the use of recyclable materials and sourcing local resources where possible.</td>
</tr>
<tr>
<td>Pollution</td>
<td>Minimisation of potential pollutants including stormwater, light, air quality and waste.</td>
</tr>
</tbody>
</table>

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, the prevalence 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.
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.
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.
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.