BAPTISTCARE MACQUARIE PARK MASTERPLAN

ENVIRONMENTAL SUSTAINABLE DESIGN CONCEPT REPORT

Final

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BaptistCare Master Plan ESD Concept Report

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1 Introduction

1 Introduction

1.1 Objective

This report has been prepared to accompany a State Significant Development Application (SSDA) for a Concept Master Plan for the site located at 157 Balaclava Road, Macquarie Park. The objective of this report is to present the concept sustainability strategy for the BaptistCare Macquarie Park Masterplan. The concept strategy has been built upon local and international best practice, innovation, and consultation with the design team. This strategy builds off the Baptist Care Vertical Village sustainability strategy to develop synergy across the two projects. The intent is for the strategy to be further developed and implemented during the following stages. To that end, this report develops:

1. Sustainability focus areas, capturing the sustainability objectives of the development through performance outcome goals statements for each focus area
2. Recommended sustainability targets, being quantified performance metrics or definitive outcomes that objectively measure the success of the developments' s sustainability credentials
3. Potential sustainability opportunities and initiatives that could support the objectives identified
4. Consideration of sustainability rating tools
5. Recommended further research, feasibility studies or workshops to develop opportunities and confirm further

This report presents the initial sustainability strategy for the project which will be further developed and refined based on further discussions with the team, the outcomes of the innovation workshops and the design as it develops.

1.2 Project Overview

The **Masterplan** Project is the redevelopment of a prominent aged care campus for BaptistCare which is bordered by Balaclava Road and Epping Road.

The site is located at 157 Balaclava Road, Macquarie Park and is legally identified as Lot 60 in DP 1107965. The site is located near the corner of Herring Road and Epping Road within the City of Ryde Local Government Area (LGA). It is directly south of Macquarie University and in close proximity to Macquarie Shopping Centre. The surrounding area is characterised by a mix of commercial and education uses, as well as student accommodation and residential dwellings.

The site comprises a significant land holding with street frontages to Balaclava Road and Epping Road. It currently accommodates several low-medium density buildings that are connected via internal footpaths and lower order road networks. The total site area of the BaptistCare landholding is 63,871m^2.

The key is sustainability, which simply means ensuring our interactions with and use of the environment around us avoids depleting natural resources. Climate change is a thread to the sustainability of the local environment, community and way of life

- **Planning Ryde Local Strategic Planning Statement 2020**

Existing Site Layout

2 Background Study

2 Context

For the development of the Concept ESD strategy the following has been considered:

- **BaptistCare Macquarie Park Masterplan Council Meeting Presentation May 2022**

  The presentation shared visioning principles for the BaptistCare site:

  1. Community Building
  2. Delivering our Mission
  3. A Smart and Sustainable Precinct (that will positively change people's lives)

- BVN's Sustainability Concept for the Macquarie Park Masterplan

  This sustainability concept explores goals across the following areas:

  - Emerging Patterns
  - Biodiversity Strategy
  - Water Strategy
  - Energy Strategy

- The Australian Governments plan to achieve net zero emissions by 2050
- The NSW Governments Net Zero Plan, Stage 1: 2020–2030
- **City of Ryde Development Control Plan** (See next Section)
- **Ryde Community Strategic Plan 2028**
- **Planning Ryde Local Strategic Planning Statement 2020**
- **Meetings** and **workshops** undertaken to date including:
  - Project Inception meeting (13th May 2021)
  - Sustainability Workshop led by WSP (27th May 2022)

Environment Sustainability Targets from Planning Ryde Local Strategic Planning Statement 2020:

Greenhouse Gasses: By 2050, there will be net zero carbon emissions across the City of Ryde (carbon neutral)

Energy: By 2030, Council operations will use at least 60% of electricity sourced from renewables

Temperature: By 2030, identified urban heat island affected precincts will have been cooled by an average of 2˚C (compared to 2019 levels)

Urban Ecology: By 2030, at least 40% of the City of Ryde will have tree canopy cover, which is an overall increase on 2019 levels

Potable Water: By 2030, there will have been no net increase of Council's annual potable water use based upon 2018 levels

River Quality: By 2025, local communities will be able to enjoy swimming or other water recreation activities at one location along the Parramatta River within the City of Ryde

Waste: By 2025, waste going to landfill will be reduced by at least 20 percent (kg/capita) from 2018 levels

Transport: By 2030, 100% of City of Ryde fleet vehicles will have transitioned to low emissions (or better)

20-year vision from Planning Ryde Local Strategic Planning Statement 2020:

"The City of Ryde will be a liveable, prosperous and connected city, that provides for our future needs while protecting nature and our history. As a city with diverse and vibrant centres, our neighbourhoods will reflect and serve our residents and business. Our well-planned places will enhance the health, wellbeing and resilience of our future community. They will also foster innovation, equity, inclusion and resilience. "

2.1 Global Frameworks

United Nations Sustainable Design Goals (SDG) – In September 2015, world leaders from 193 countries committed to the 17 Sustainable Development Goals (see Figure below). The goals are a series of ambitious objectives and targets across a range of sustainability issues that includes social, financial and environmental objectives. Together, they represent the most pressing challenges facing sustainable development globally.

The scope of these objectives highlights to us that sustainability is more than just being energy efficient and doing some recycling. There is a wide range of challenges to be met and as stakeholders with influence over the future direction of BaptistCare masterplan, **we have opportunity to impact a wide variety of outcomes, many of which can have the effect of creating a cleaner, more equitable, more prosperous and more sustainable world**.

The scope of these objectives also highlights the opportunity that presents given the scale of the precinct and the strategic objectives of the site. Where individual buildings may only have scope of influence inside the front door, or in close proximity, consideration of the precinct as a whole gives additional opportunity to consider the world between the buildings themselves and place greater focus on the public realm, on the community, and on the connective tissue that ties people and communities together.

United Nations Sustainable Development Goals

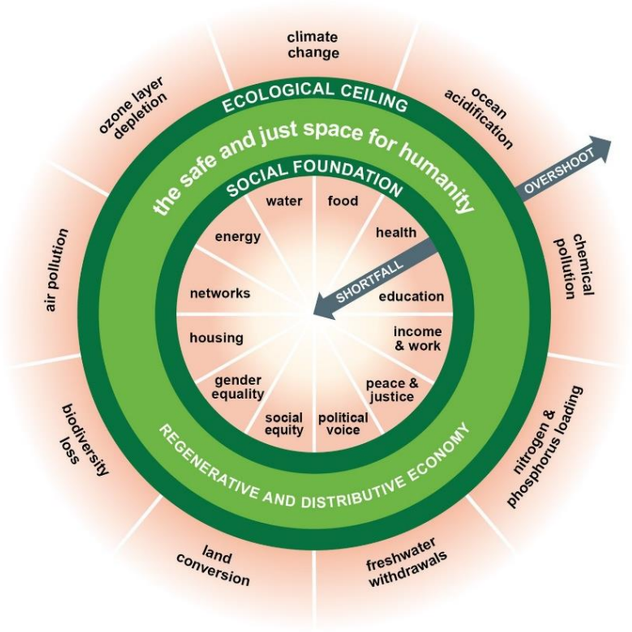
While all 17 of the UN SDGs are important and will be supported through this masterplan, this sustainability strategy for BaptistCare Masterplan is most readily able impact these Goals by leveraging the available opportunities:

UN SDG	BAPTISTCARE MASTERPLAN OPPORTUNITY
3 – Good Health and Well-Being (Society)	Active lifestyle precinct and strengthened community ties
6 – Clean Water and Sanitation (Biosphere)	Water conservation and reuse strategy
7 – Affordable and Clean Energy (Society)	Cheap, abundant and resilient renewable energy
11- Sustainable Cities and Communities (Society)	Sitewide Sustainability Strategy for optimised sustainability and resilience through buildings, infrastructure, public realm and mobility
12 – Responsible Consumption and Production (Economy)	Refine site consumption patterns for opportunities to incorporate circular economy principles
13 – Climate Action (Biosphere)	Net zero emissions in operation
14 – Life Below Water (Biosphere)	Creek restoration
15 – Life on Land (Biosphere)	Native landscaping, green connectivity and enhanced biodiversity
17 – Partnerships for the Goals	Stakeholder collaboration between community, council, planners and developers

UN SDG significance for BaptistCare masterplan

UN SDGs in a triple bottom line framework (Stockholm Resilience Centre)

2.2 Doughnut Economics



The Doughnut has gained rapid traction internationally since it was first published in 2012. It has reached cities, the UN General assembly, educators, activists and governments.

The framework consists of two concentric rings: a social foundation, to ensure that no one is left falling short on life's essentials, and an ecological ceiling, to ensure that humanity does not collectively overshoot the planetary boundaries that protect Earth's life-supporting systems.

Cities internationally such as Amsterdam, Brussels, Melbourne, and Portland are scaling this framework to the city level to support policy development and service delivery. Their methodology sets out four lenses to view city performance through two domains (social and ecological) and two scales (local and global).

1. What would it mean for the people of this precinct to thrive?
2. What would it mean for this precinct to thrive within its natural habitat?
3. What would it mean for this precinct to respect the wellbeing of people worldwide?
4. What would it mean for this precinct to respect the health of the whole planet?

Embodying the principle of the Doughnut is vital to developing a thriving and sustainable mixed-use precinct, to develop beyond the minimum standards of living within the global limits of pressure that Earth's life-supporting systems can endure. This will create a resilient and future ready campus for BaptistCare in Macquarie Park that will serve its communities holistically.

2.3 Policy Context

The DCP for North Ryde *Part: 4.5 Macquarie Park Corridor* provides sustainability guidance through the following directives:

General

- Facilitate **healthy and active living** and encourage **social connectivity** within the precinct and community
- Create an **accessible** environment
- Minimise greenhouse gas emissions
- Promote **renewable energy** initiatives

Urban Ecology

- To protect and enhance the **natural habitat**
- To create and maintain **bio-links and canopy connections** to vegetation communities in the Macquarie Park Corridor and Lane Cove National Park.

Public Domain and Open Space

- Public access and engagement with the **natural** and built environment **heritage** of the site and area
- Encourage **mental and physical wellbeing**
- Utilise prevailing wind directions to improve local **micro-climate** conditions
- **Social cohesion** and **connectedness**
- Oriented for **sunlight access** in winter

High Performing Building and Site Resilience

- **Minimise carbon emissions, energy and water use, and waste generation**.
- Maximise **thermal comfort**
- To protect **water quality**
- Minimise the impacts of **drought**
- **Maximise solar access** to living areas, managed via optimised shading, for thermal comfort and daylighting
- Procure **efficient products** with energy star ratings of ≥ 4.5 stars
- Minimise impacts from **severe storms** or **flooding** events
- Reduce fossil fuel reliance on-site

2.4 Sustainability Trends

The world is changing rapidly, and it is increasingly important that we prepare not just for the challenges and needs of today but also for what the future may bring. By preparing for the challenges and embracing the opportunities, we can maximise site amenity and value. Observing trends through a sustainability lens prioritises some key trends:

Federal and State Net Zero Emissions targets: In line with the Australian Government's plan to achieve net zero emissions by 2050, embracing low carbon development throughout the lifecycle of the Macquarie Park Masterplan will not only prepare for a future that values net zero carbon operation, but also sets an example and precedent for other aged care developments to stay ahead of the transition.

Climate Change Adaptation: Observing changing climate trends and preparing for the operational, commercial and safety risks that accompany those trends will create a precinct that is best prepared for potential future changes in climate. The risks to be considered include greater number of hot days, increased urban heat island, bushfire and associated air quality risk and flooding. WSP has recently undertaken a series of research projects for Waverley council looking at the performance of typical Sydney residential building designs under future climate scenarios. These have shown a distinct trend towards greater cooling demands and lower heating demands, as expected with climate change predictions.

Operational and Community Resilience: The industry is taking a wider view of potential existential threats to continuous and safe operation. Consideration of issues such as health pandemics, cyberattacks, terrorism, infrastructure breakdown and disaster preparedness are more prevalent.

Resource Circularity: The typical process of product creation, use and disposal is a hallmark of the developed world, but one that is rapidly changing. Within Australia, the newly established Australian Circular Economy (ACE) Hub in 2020, is demonstration of the important yet emerging nature of this movement. Continued focus on reusing, repurposing and integrated resource cycles brings opportunity for additional business and value.

Technology and Data: The internet of things puts technology at the fingertips of us all, intended to make our lives more efficient. Managing and leveraging data at a precinct scale offers possibilities for insights and trends into behaviour and performance that can be used to improve sustainability outcomes.

Electric and Autonomous Vehicles: Electric vehicles will be the most prevalent form of transport within a generation. Combined with the developing concept of autonomous vehicles, the opportunity for safer and more environmentally efficient transport is near.

Health and Wellbeing: Modern life brings convenience and also the pitfalls of poorer diet and exercise regimes for many. In addition to recent global experience of health pandemics, health and wellbeing will continue to be an important focus for many.

Indigenous Culture: Engagement with indigenous history and culture is critical to Australia's continuing reconciliation journey.

2.5 Precedents and Examples

Typically to date, incentives to deliver high performing residential buildings, including. aged care, have been less prominent than for other building types, e.g. commercial buildings. Going beyond minimum compliance for residential and aged care is not therefore common practice.

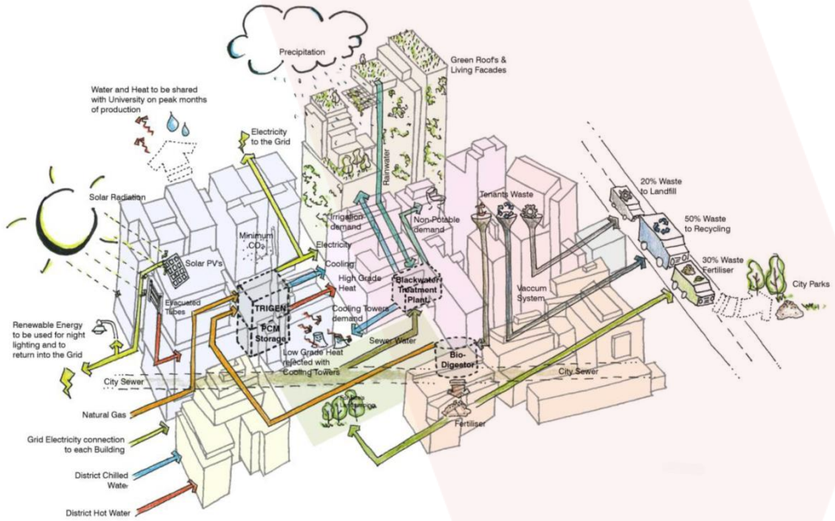
This site provides opportunities due to its precinct scale nature. Taking a precinct scale approach to sustainable development can unlock more opportunities than are typically available at a building development or individual project scale. The trade-off is typically additional foresight and planning to allow space for opportunities to be properly assessed and partnerships between required stakeholders to be formed.

It is therefore useful to examine and consider where and how other precincts and aged care facilities have been successful. It is less important to focus on the actual initiatives, as it is to understand why these case studies are a success and what lessons can be learned that can be leveraged into BaptistCare's Macquarie Park Masterplan.

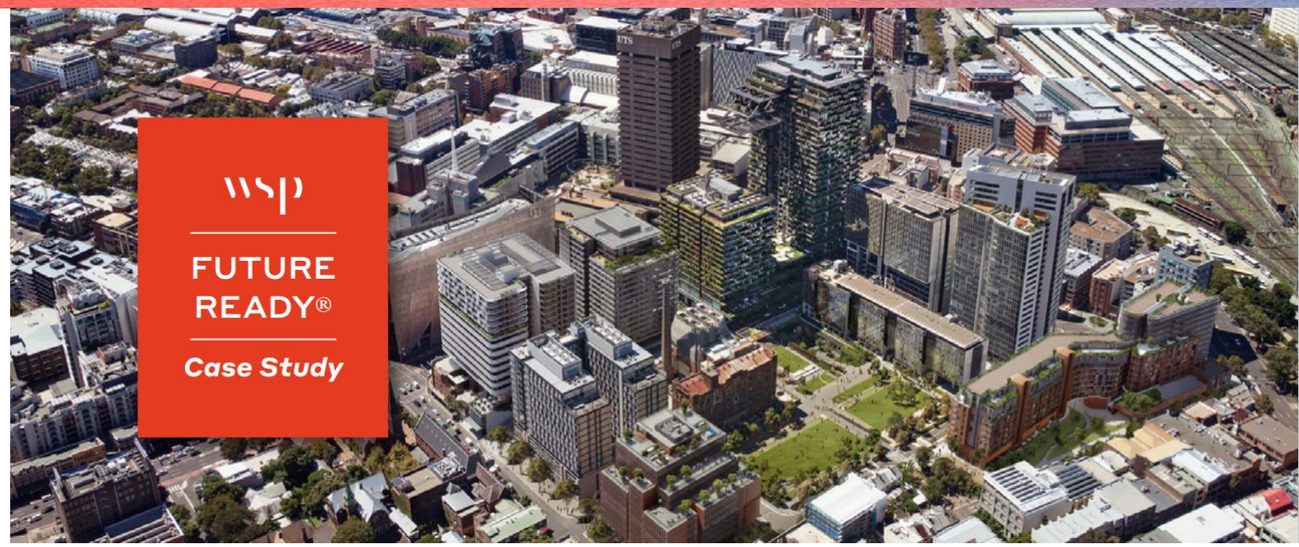
This section presents high level overview and notes on sustainability for a range of aged care development and precincts, some local, and some international, but each with some element of similarity to BaptistCare's Macquarie Park Masterplan. More case studies are provided in the Appendix.

The following case studies are summarized on the following pages:

1. Central Park, Sydney
2. King's Cross Precinct, London UK
3. Hammarbry Sjostad, Stockholm
4. Marrick & Co – Mirvac – One Planet Living
5. Parklands 'Smith Collection' Precinct, Gold Coast
6. Bahnstadt Precinct, Heidelberg, Germany



Central Park Precinct Concept Sketch



2.5.1 Central Park, Sydney

Central Park Precinct is the largest urban regeneration project of its kind in Sydney – breathing new life into the former 5.8 hectare Carlton United Brewery site in Chippendale to create a people-centric destination. With an abundance of public parkland, the area is comprised of mixed-use residential (including student accommodation), commercial, hospitality and retail facilities, and a unique public recreational activity area. WSP has been involved since conception, providing precinct master planning, sustainability, mechanical, hydraulics, fire safety and protection, ASP level 3, electrical, vertical transportation, Green Star and lighting services for the 255,000m^2 site. While the initial engagement was to help our client develop a site-wide infrastructure solution that supported low-carbon energy and recycled water, the project evolved into a decade-long collaboration; as the site evolved, our engagement evolved over separate buildings across the precinct.

The engineering heart of Central Park is the Central Thermal Plant (CTP) - a fully integrated thermal energy, electricity and water utility system. Financed by one of the first low-carbon environmental upgrade agreements in New South Wales and enabled by a ground-breaking precinct governance framework, it pioneered the delivery of district infrastructure in an urban regeneration context.

Key Innovative Sustainability Initiatives:

- **Emissions:** Central thermal plant provides gas fired trigeneration, providing heating, cooling and electricity from a central facility, saving on overall site emissions but also on installed plant capacity.
- **People:** Mix of scales from heritage townhouses and food market lanes to larger apartment blocks, centred around a parkland, providing respite from the busy Parramatta Road and opportunity for community events.
- **Water:** Central water treatment and non-potable water reuse within buildings to irrigation, toilet flushing, laundry and cooling towers.
- **Biodiversity:** External green wall on largest tower, enhances microclimate performance (reducing UHI) and improving biodiversity in the city.

What Future Trends Did We Consider?

Climate	Society	Resources
More Extreme Weather	Health & Wellbeing	Circular Economy
Hotter & Drier	Densification	Water Scarcity
		Declining Biodiversity

Climate

In responding to predicted hotter and drier conditions as well as more extreme weather events in the future, we provided an integrated service that embeds environmental sustainability in all aspects of the precinct development. Buildings achieved higher resilience to temperature extremes through improved fabric and architectural design and the precinct infrastructure reduces reliance on the grid for electrical and thermal demands. We coordinated the Green Star strategy across the precinct and acted as liaison with the Green Building Council of Australia. Our role included rationalising precinct infrastructure within the building-based sustainability assessment tools and coordinating precinct and building specific project teams to deliver the precinct's Green Star ambitions.

Society

Health & Wellbeing – This is addressed through improved internal environments in the buildings such as access to daylight and natural ventilation, improved thermal comfort and materials selection focusing on indoor air quality and amenity. The precinct also provides for active living such as bicycle parking, walkable neighbourhoods and exercise amenities.

Densification – The project provides a blueprint for addressing future trends for urban Australia, servicing increased density with low impact energy and water systems while improving public amenity and liveability. Making the precinct liveable and connected is a central element of the masterplan.

Resources

Circular Economy – Like the energy strategy, the on-site water cycle focused on the concept of a circular economy with water. Wastewater from the buildings is collected in the treatment plant, treated to Grade-A quality and reticulated back to the buildings for non-potable demands.

Energy Generation & Water Scarcity – The precinct utility provides affordable, low-carbon energy and a reliable and sustainable source of non-potable water through a 24 MW central thermal plant, 2.2 MW tri-generation and 500 kL/ day district water recycling and re-use system. The CTP provides the benefits of reduced carbon emissions (60% compared with BAU on buildings) and peak demand whilst also providing future flexibility for space requirements, ongoing maintenance and redundancy.

The precinct was the first in Australia to reuse recycled water on such a large scale and to such an extent. The precinct achieved potable water demand reduction in excess of 60% and almost 100% non-potable water demands were met with recycled water – identifying it as an exemplar for recycled water use for future developments. This was assisted by driving the initiative to connect residential washing machines to recycled water – a design strategy not previously undertaken for an urban precinct development in Australia.

Declining Biodiversity – The iconic and internationally recognised green walls create a mini microclimate and reduces heat from the building. The 300 species included in the plantings increase biodiversity and provide habitat for birds, bees, butterflies and insects, plus supporting frogs and falcons.

Image courtesy of Frasers Property Australia and Sekisui House Australia

2.5.2 King's Cross Precinct, London UK

The King's Cross Precinct is an exemplar innovative sustainable precinct, not only through 'outstanding' BREEAM buildings populating the area, but also through infrastructure that creates a vibrant community with rich preserved history and culture. Notably, it encouraged activation of the area prior and during construction (e.g. through community events), connecting people to place before the development was even completed.

Key Innovative Sustainability Initiatives:

People:

Design for community engagement – King's Cross public arts programme encouraging community involvement in precinct development such as the KX pond club natural swimming pond design.

Energy and Health:

40% of the precinct is designated to public open green spaces to encourage outdoor and active lifestyles, including a green canal corridor along the river. Construction of floating islands in the river have become popular nesting sites and wetland habitats for native birdlife.

History & Heritage:

As part of the King's Cross regeneration, 20 historical buildings were completely refurbished for the public. Precinct Park designs included the addition of educational heritage walking trails for public use.

2.5.3 Hammarby Sjostad, Stockholm

Urban renewal of a previously industrial area, known for being polluted and unsafe. Located on the edge of the city providing access to both city services and nature, with a focus on culture and entertainment.

Key Innovative Sustainability Initiatives:

Wastewater Treatment:

Site wastewater is treated, with sludge by-product used as fertiliser[1], biogas collected for reuse as fuel for vehicles and heating. The purified water product then acts as a heat source or sink for centrally generated thermal energy.

Green & Blue Infrastructure:

Green roofs and landscaping perform the role of water treatment and retention. Hard surface runoff is treated and then permeated to ground.

Energy:

All heating targeted from renewable or waste sources: 34% from purified wastewater, 47% from combustible household waste, 16% from biofuel. Hydrogen fuel cells, PV panels and solar hot water provide significant renewable energy and storage.

[1] Collecting waste from recycled water (biosolids) and turning it into fertiliser is common in Australia. Public and private water companies have done this in several occasions. E.g. Altogether collects waste (sludge) from its plants (including the one in Central Park, Sydney) and sends it to Loop Organics' facility which process it to be able to be used as fertiliser to rehabilitate former mines in the Hunter region.

2.3.4 Marrick & Co. Marrickville

The first residential development in NSW to be certified as a One Planet Living community.

Key innovative sustainability initiatives:

- Electric car charging points
- Bicycle storage
- Worm farms and composting facilities
- Roof top kitchen with urban agriculture
- Free battery recycling service
- 95% diversion of construction waste
- Rainwater capture and reuse
- Free fitness classes

One Planet Living Principles: carbon, waste, transport, materials, food, water, wildlife, community, economy, and happiness.

2.3.5 Parklands 'Smith Collection' Precinct, Gold Coast

As one of the most significant urban renewal projects to be undertaken in the region, the Parklands Project is innovative on several fronts, most notably in its vision of creating a vibrant and sustainable mixed-use community for the Gold Coast, which was successful in its delivery due to undertaking a holistic approach to sustainability.

Key innovative sustainability initiatives:

Green & Blue Infrastructure: Planting 136,420 new trees across the site, re-establishing a natural creek and floodplain storage, and creating large green spaces and various recreational spaces across the site.

Social and Heritage Outcomes: A successful Reconciliation Action Plan and an Indigenous Participation Plan as well as community partnerships with several local organisations; sustainability awareness / education centres on site that inform people about the sustainability features of Parklands; and acknowledging and integrating culture, heritage and community identity in it's design.

Sustainability Standards: Green Star Communities 6 Star rating, EnviroDevelopment Mixed Use 6 Leaves rating tool, and NatHERS rating of 6 or above as well as adopting smart metering that aims to decrease energy and water consumption.

2.3.6 Bahnstadt Precinct, Heidelberg, Germany

Bahnstadt is the largest Passiv Haus community in the world. Every building within the precinct is Passiv Haus certified, with extremely low energy usage (~10% of energy usage in standard houses in Germany) whilst achieving high thermal comfort levels.

Key innovative sustainability initiatives:

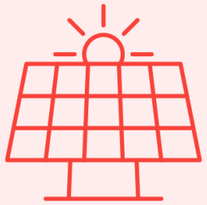
- Housing designs include a mix of scale, style and affordability to integrate people of varied intergenerational and socioeconomic backgrounds into the precinct community. 20% of overall costs put towards construction of social housing.
- Designing for connected communities through the construction of varied multipurpose community spaces such as the B3 community centre, a 3-in-1 centre for education, day-care and community. All events are published in a public precinct calendar.
- 66% of buildings in Bahnstadt have green roofs to reduce the heat island effect and increase evaporation during higher temperatures. These green roofs have become havens for native wildlife and plants. Water filtration pond systems have been specifically designed to maintain the groundwater quality.
- Reduced energy costs for residents, enable a more affordable lifestyle without giving up indoor comfort and occupant health and well-being.
- Overall costs allowed 20% of Bahnstadts homes to be designated to social housing to promote the precinct to people of varied socioeconomic backgrounds.
- Achieving circular economy through the use of biowaste to fuel the Combined Heat and Power plant that gives the precinct all its energy.

3 Sustainability Strategy

3 Sustainability Strategy

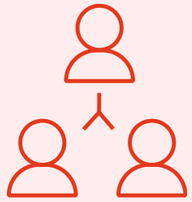
3.1 Overview

The ESD Concept Design Report is built around eight focus areas, as follows:

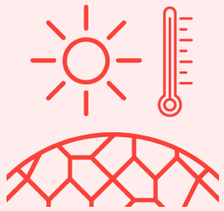


1. Energy & GHG Emissions

2. Health & Wellbeing



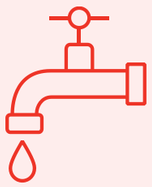
3. Community



4. Resilience

5. Nature

6. Waste & Circular Economy



7. Water

8. Mobility

Each of these focus areas has the following:

Performance Outcome Goal: The desired outcome for each of the focus areas

Potential Targets: A quantifiable goal if appropriate for the focus area

Initiatives: An overview of the design and performance opportunities that could be influenced by goals and metrics contained within this focus area

Approaches: Analyses that will need to be undertaken to identify specific initiatives required to achieve the targets and performance outcome goals and demonstrate compliance with them.

3.2 Energy & GHG Emissions

Performance Outcome Goal

A precinct that reduces greenhouse gas emissions throughout its lifecycle from construction, through operation and disposal of assets

Potential Targets

- Net Zero Carbon in operation
- Powered by renewable electricity (on site / off site) – *Exact percentage of offsite renewable energy procurement is to be confirmed by BaptistCare and their ESG team*.
- 100% renewable electricity procurement during construction
- Highly efficient buildings
- Low Global Warming Potential (GWP) refrigerants
- Maximise use of low embodied carbon materials

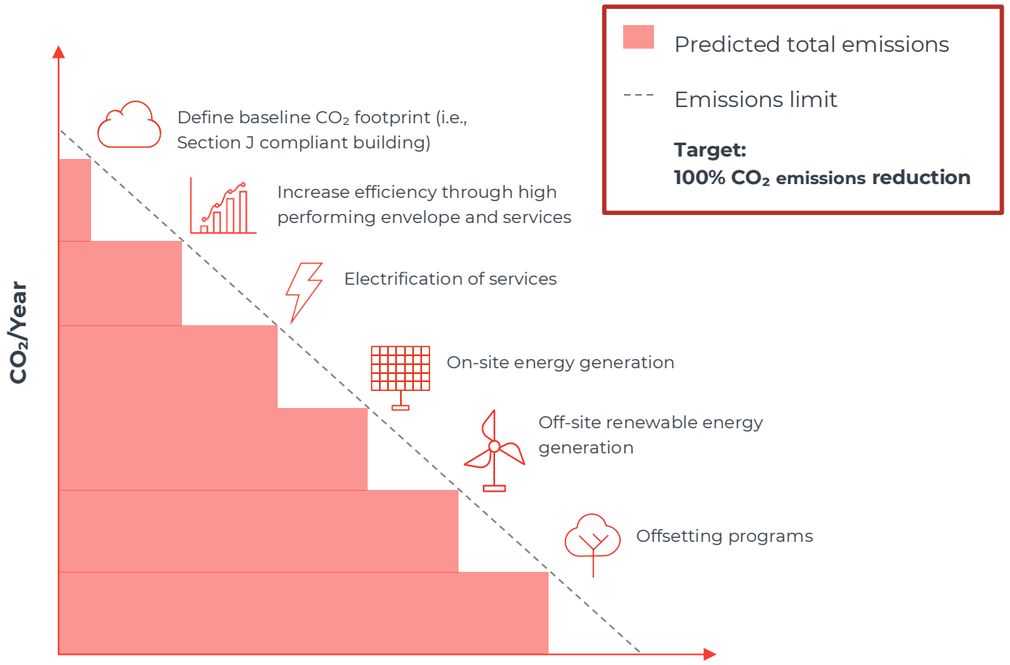
Initiatives

- Passive design (masterplan and individual buildings)
- Ground source heat pumps
- Community battery or individual batteries
- Demand response capability
- Micro grid
- Use solar panels for landscape shading

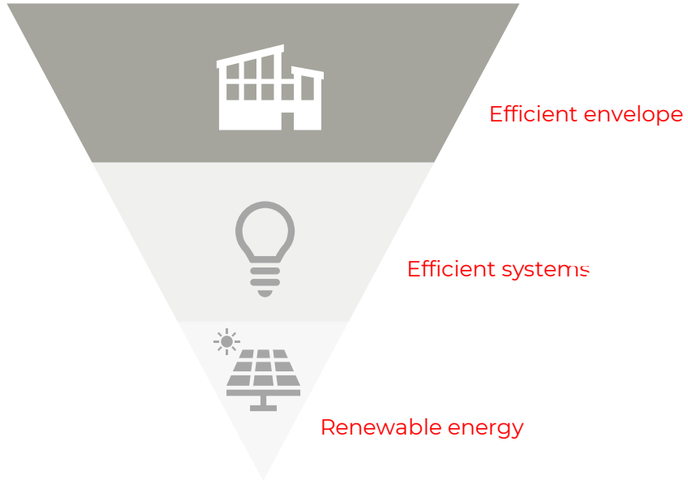
Approaches

- Site wide energy / emissions analysis evaluating passive solutions, efficient systems and renewable energy
- Life cycle analysis of major building design components evaluating structural mass

Zero Carbon Pathway



Design considerations **Operational considerations**



Net Zero Energy

3.3 Health

Performance Outcome Goal

A precinct that fosters opportunity for healthy habitats and healthy living for the residents and wider community

Potential Targets

- Public domain promoting active living
- Public domain to support healthy minds

Initiatives

- Speed limits, footpaths, signage, landscape, water fountains, safe streets
- Extensive landscape
- Spaces for community gatherings
- Water fountains to be provided in the public domain
- Open areas to optimise solar access (control in summer, allow in winter)

3.4 Community

Performance Outcome Goal

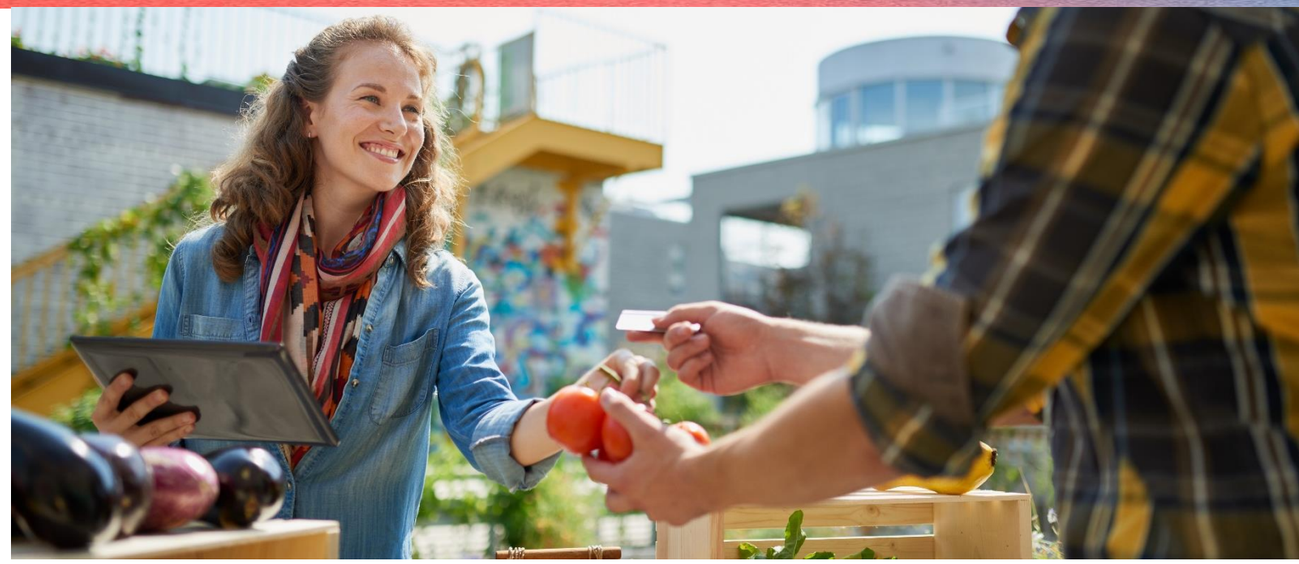
A comfortable, healthy, vibrant, inspirational development facilitating hobbies, interests, play, social and intergenerational human interaction and contributes to social sustainability outcomes

Potential Targets

- To foster a sense of place and belonging
- To encourage active citizenship
- To enhance local culture, heritage and sense of place
- To nurture a new culture of sustainability

Initiatives

- The design process will engage with and more importantly, be guided by Aboriginal community and recognised knowledge leaders
- Sensory garden (for kids and adults)
- Veggie gardens and fruit trees in landscaping, including native edible plants to support educational opportunities; community gardens could be included on the roofs
- Encourage community connection with areas for community gatherings.
- Opportunities for exercise
- Educational opportunities regarding local history and sustainability
- Partnership with Macquarie University and local schools to create art and further connections between place and community
- Inclusive design
- Activate spaces with pop-up restaurants, kiosks, and festivals.



3.5 Resilience – Climate, Operations and Community

Performance Outcome Goal

A development that is resilient to potential future changes to climate and other shocks and stresses

Potential Targets

- Future climate responsive design
- Mitigated urban heat island effects – 75% of the total site area to have a Solar Reflectance Index (SRI) greater than 64
- Development to be a community asset in times of emergency (such as bushfire, pandemic)

Initiatives

- Light coloured finishes
- Design dwellings to abate higher temperature through passive design measures
- Systems to be designed based on future peak temperatures
- Focus on material/building longevity and optimised life cycle
- Wastewater collection and treatment for irrigation use (to be investigated further) and supplementing natural stream flows in advance of future climate scenario requirements
- State of the art internet, 'fibre to the premises will maximise future-proofing and 'work from home' options and global connectivity.
- More initiatives to be confirmed following resilience assessments

Approaches

- Climate change risk assessment
- Community resilience assessment
- Operations resilience assessment

3.6 Nature

Performance Outcome Goal

A development that provides regenerative nature, biodiversity, clean waterways, protects and enhances local species and connects people to nature

Potential Targets

— 30% tree canopy cover and 20% deep soil zone for the precinct

Note: it was discussed with the team whether a percentage of landscaped area target for the site would be appropriate. Feedback obtained from Arterra (landscape architects) was that the project should focus on quality of landscape and tree canopy cover rather than a percentage of landscaped area.

Initiatives

— Incorporate biophilia principles in the design of buildings and open spaces, such as material selection, build form and plant inclusion

— Provision of urban agriculture

— Improve soil health

— Regenerate biodiversity with native planting to attract wildlife, particularly with focus on native endemic plant communities

— Vegetation is to be irrigated to ensure survival through extreme heat events and to keep transpiring during summer conditions to support urban cooling through evapotranspiration

— The original water way is to be re-imagined and re-expressed on the surface. This is achieved in a series of artificial ponds and managed water features, connected via a naturalistic stream that winds its way through the eastern portions of the site

— Green roofs to improve PV efficiency

— Protection and retention of existing trees

— Natural landscape reduces need for fossil fuel intensive maintenance and chemical use

— Power lines undergrounded to allow for larger trees to be planted and to reduce pruning requirements

— Provision of vegetable gardens in roofs of residential buildings to engage tenants with nature connection

Approaches

— A Biophilia plan must be provided which demonstrates inclusion of biophilic elements

3.7 Waste and Circular Economy

Performance Outcome Goal

A precinct that maximises opportunities to reduce material use, and reuse typical waste products within the development or as useful inputs to other precinct or external processes and needs

Potential Targets

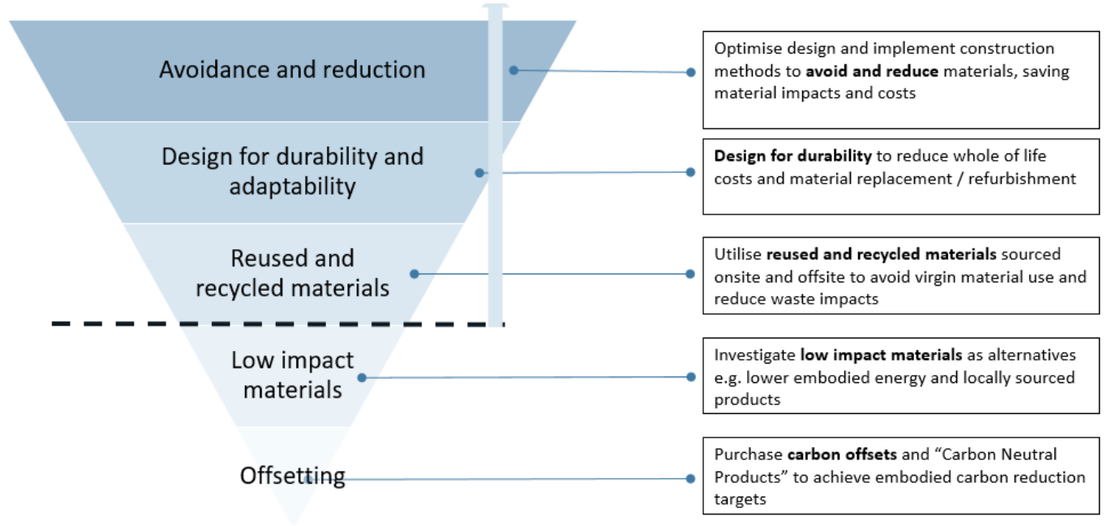
- 100% onsite organic waste management
- Zero single use plastic site across all spaces such as in café's and public areas
- Reduce construction waste

Initiatives

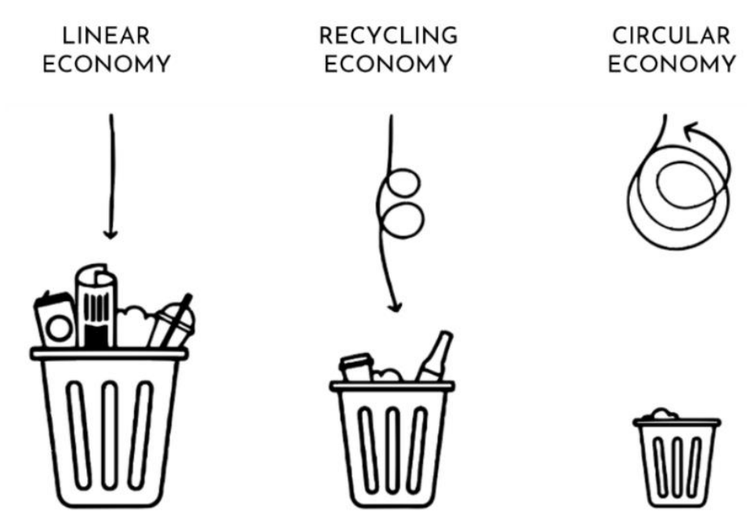
- Smart bins
- Selection of materials that consider life cycle and end of life options: Durability, Adaptability, Low maintenance

Approaches

- A holistic waste management strategy to:
  - Review site waste operations, operational procedures, and policy
  - Reduce consumption to reduce cost and spatial requirements for waste
  - Promote stream separation for increased diversion from landfill
  - Implement efficient waste equipment and loading arrangements to improve efficiency, reduce cost, increase safety



Process to reducing impacts from material use



3.8 Water

Performance Outcome Goal

A development that is an exemplar custodian of water, limiting use of fresh water sources and maximising reuse opportunities

Potential Targets

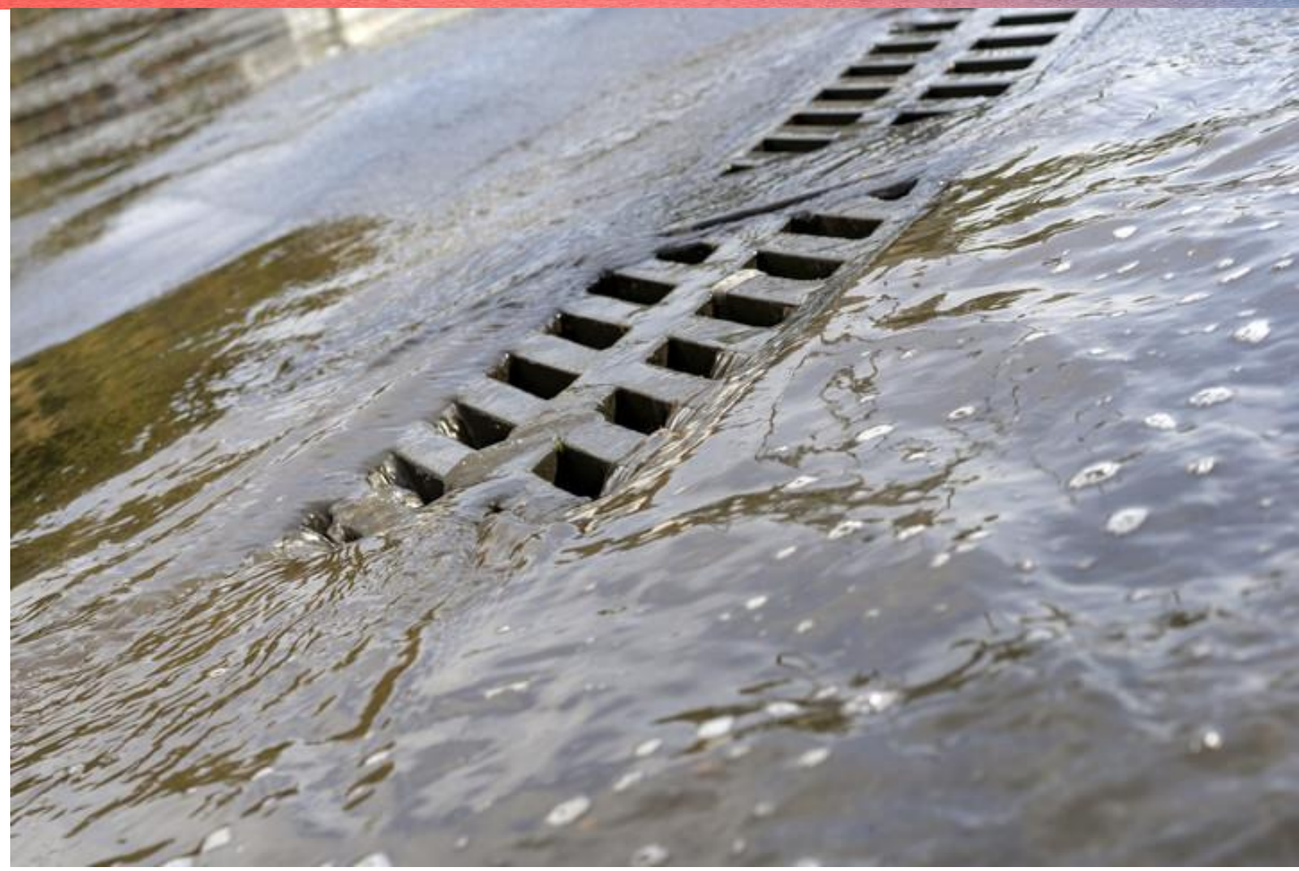
- Significant reduction of site water demand (>30%)
- 100% of the irrigation demand to be met with non-potable water
- Stormwater runoff to be reduced by 40% or 80%
- Appropriate stormwater quality targets to be identified

Initiatives

- Site wide water and stormwater strategy
- Xeriscape landscape for all plants outside urban agriculture gardens – highly efficient irrigation system where required
- Passive irrigation systems and permeable paving to redirect stormwater to adjoining planted areas.
- Water efficient fixtures and fittings, and appliances where these are provided
- Provision of buyer information guides for appliances purchased by owners
- Water Sensitive Urban Design opportunities to be investigated further, such as permeable paving
- Roof water capture for re-use in irrigation

Approaches

- Water balance to estimate the potable and non-potable water demand to confirm the targets and size rainwater tanks appropriately
- Review of wastewater recycling options
- Civil / landscape design to include WSUD principles



3.9 Mobility

Performance Outcome Goal

A development that encourages alternatives modes of transport that promote activity and reduce impact to the environment

Potential Targets

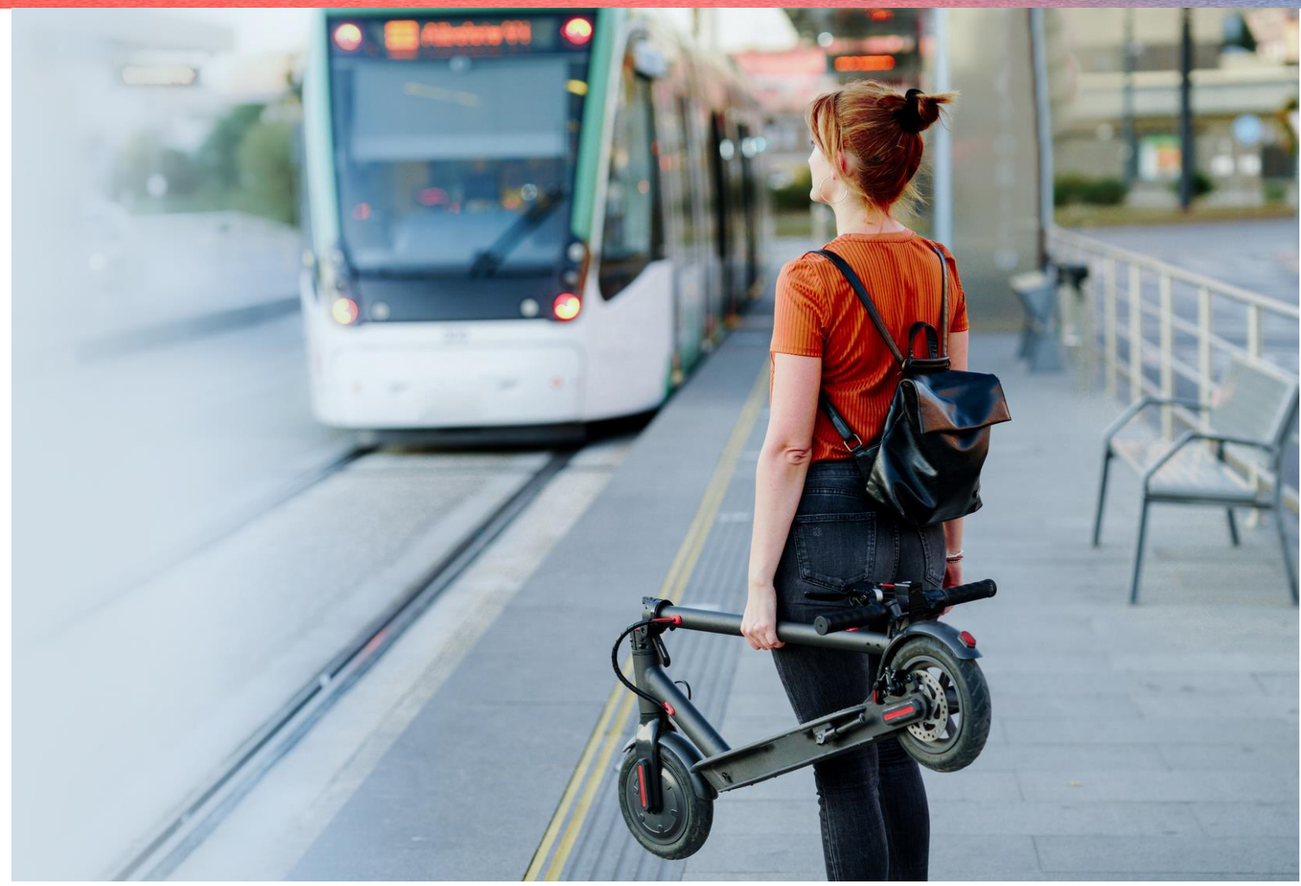
- 10% of the car park spaces provided to be Electric Vehicle charging stations.
- Considerations and feasibility for 100% of car park spaces to have provisions for future EV charging capabilities.
- 10% car share spots

Initiatives

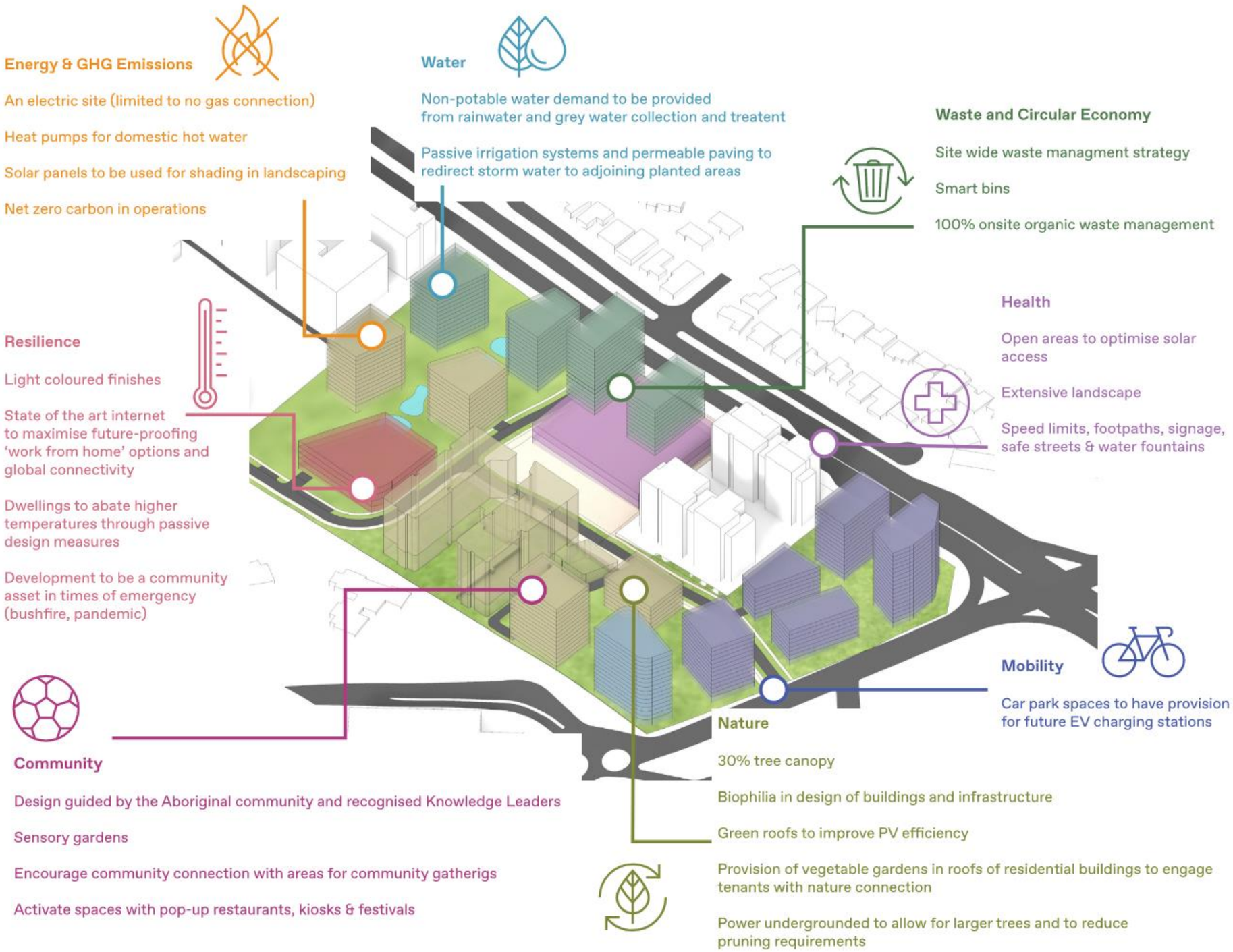
- Site wide transport strategy
- Promote walkability by direct, attractive pedestrian routes on-site
- Paths to be wide enough and are suitable for wheelchairs, prams, and mobility devices
- Appropriate, legible wayfinding
- Safe streets (CPED assessment)
- Car share programs
- Opportunities for living, working and recreation within short distances minimises car usage

Approaches

- Transport plan identifying likely quantities of mode share now and in the future, and confirm percentage of EV spaces and car share spots



Summary of key sustainability initiatives



4 Building Opportunities

4 Building Opportunities

4.1 Net Zero Emissions Operation Buildings

Net zero emissions buildings are being increasingly required either through voluntary certification systems such as Green Star, or currently being integrated into planning systems such as City of Sydney net zero energy performance standards. **BaptistCare has set a target to become carbon neutral by 2030, therefore any new developments should reflect and facilitate this target**. Net zero emissions can be typically achieved using:

1. Efficient electrified building design and operation
2. Onsite renewable energy and storage
3. Offsite renewable energy sources

.

Next Steps

Consider formalising a commitment to net zero emissions for Macquarie Park Masterplan. As part of that commitment, formalise energy efficiency targets for each building on site – review industry benchmarks for minimum performance including Green Star Buildings and City of Sydney's net zero energy performance standards among others. Consider potentially adding emissions from building refrigerants and transportation as emissions requiring carbon offsets. Consider requirements for Climate Active certification. **Conduct feasibility study for NZE buildings.**

4.2 Electrification

Business as usual residential buildings typically use fossil fuels for energy needs such as domestic hot water and cooking. As the availability of renewable energy increases, there is an emerging cost and emissions imperative to switch away from all fossil fuels in buildings.

Currently, BaptistCare would like to allow for some gas connection on site and continue investigating the implications of electrifying the whole site (i.e. do not provide any gas connection infrastructure) further.

The following areas are currently planned to have a gas connection:

- Back of House operations

All other uses will be electric only, such as:

- Space heating and cooling
- Domestic hot water
- Cooktops in ILUs (induction cooktops are recommended to maximise efficiency and safety)

The following is to be considered by BaptistCare as the design progresses:

The technology to fully electrify all new buildings exists. Benefits from electrification include:

- Investors are looking for assets that are on a clear decarbonisation pathway.
- All-electric buildings that use renewable energy will be able to access sustainable finance.
- Using natural gas in buildings generates toxic air pollutants. All-electric services eliminate these pollutants, improving the health and wellbeing of building occupants.
- Carbon neutrality typically requires the purchase of carbon offsets to achieve the emissions which cannot be offset by renewable energy (on site or offsite). Carbon offset pricing has had upward trend with predictions that their price will keep going up, therefore reducing the amount of offsets that would need to be purchased future proofs BaptistCare's corporate operations.
- Retrofitting gas infrastructure in the future will increase capital spending for the project.

The Green Building Council of Australia has released a guide, ("A practical guide to electrification", 2022) to help project teams (building owners, developers, facilities managers, consultants or building professionals) understand that steps involved in delivering an all-electric new building. The following Table provides a summary of some impacts and benefits of electric commercial cooking compared to gas.

Table 1 Commercial cooking - impacts and benefits from electrification compared to gas (adapted from the GBCA's "A practical guide to electrification", 2022)

Item	Impacts and benefits of induction cooktops
Space	Smaller extract ducts Smaller kitchen possible
Capital costs	Higher initial investment
Energy costs	Similar (currently)
GHG Emissions	Potential to achieve zero emissions without the use of carbon offsets (through Green Power, Power Purchase Agreements, or as the grid decarbonises)
Other benefits	Easier to clean Reduced fire risk Lower heating / pre-heat time – faster cooking Lower operational costs. Payback period up to 3 years Less heat in space leading to even lower operational costs for air cooling

Currently according to the GBCA's guide, commercial kitchens and retail food and beverage use some gas for cooking. This is changing as the many benefits of all electric kitchens become apparent. Chefs are now training to use all-electric equipment and changing cooking techniques to suit. Those that do are finding all electric kitchens provide a safer, healthier, and more productive kitchen.

Figure 1 - Actions toward decarbonization of the built environment

Next Steps

Next steps may include:

- Examine cost and services impacts from providing gas to aged care for limited number of years and then convert to electric.
- Analysis of likely building loads on site to provide a high-level overview of the site building demands that would be electrified under such an approach.
- Preparation of case studies and examples of electrified buildings and retail operations, particularly food and beverage, and success stories of induction cooking.

4.3 Central Plant

Some considerations in relation to central plant that have the opportunity to be explored include:

- Ownership models: BaptistCare have the option to design, building and maintain the central plant or adopt a BOOM (Build, Own, Operate, Maintain) or BOOT (Build, Own, Operate, Transfer) models, where an external company would build, own and operate the central plant asset for a number of years and either keep or transfer. There are a number of models available to BaptistCare which would need to be reviewed for their financial viability in discussions with Contractors.
- Building load distribution: a site load diversity should be reviewed to assess the most appropriate buildings that could be connected to the plant to take advantage to of diversities
- Location of the plant: the Central Plant would take a significant amount of space, therefore viable locations should be reviewed

Next steps

- Review ownership models to assess financial viability
- Review feasibility of a central plant, including:
  - Load diversity and potential buildings that could be connected
  - Potential location of the CTP
  - Spatial requirements

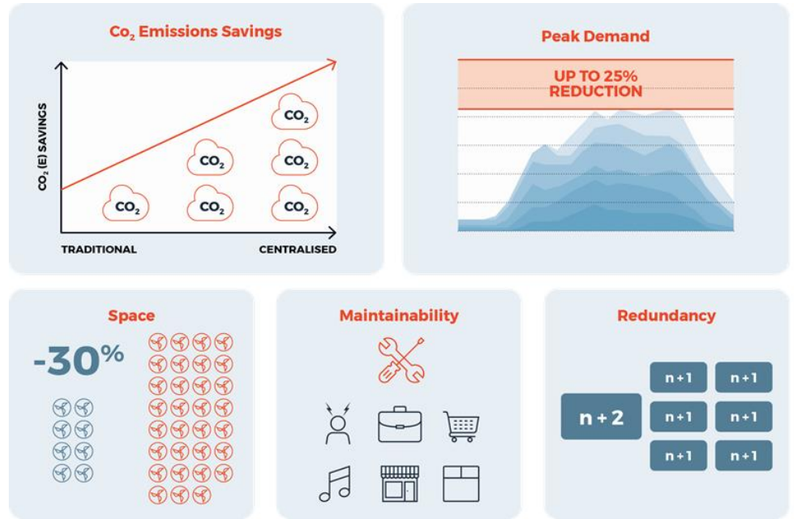


Figure 2 Central Plant opportunities vs decentralised systems

5 Water

5 Water

5.1 Minimum Potable Water Demand Performance

Water consumption will be minimised through the adoption of water conscious approaches that will include high efficiency fixtures, fittings and equipment and rainwater collection and reuse. Wastewater treatment (i.e. all waste water from toilets, showers, kitchen etc that would otherwise go to the sewer) has been suggested for the site.

In addition, energy strategy solutions that do not use water for heat rejection, e.g. ground source heat pumps do not use water for heat rejection which would reduce the water demand for the site further.

5.1.1 Water Balance

A typical water balance for an aged care development has been used to undertake an initial assessment of the site to determine the likely needs and sources of different grades of water. The irrigation demand will be highly dependent on the extend of the landscape and the types of plants used as well as the type of irrigation system.

Green Star potable water calculator was used to estimate the water demand, and an internally developed tool for the estimation of the rainwater tank size.

The following flow rates were used for the calculations:

- Toilets – 4 star WELS rating
- No urinals
- Indoor taps – 6 star WELS rating
- Showers – 7.5 l/min
- Washing machines – 4 star WELS for ILUs and 5 star for RAC
- Dishwashers – 4 star WELS for ILUs and 6 star for RAC
- Irrigation – drip irrigation – 80% efficient

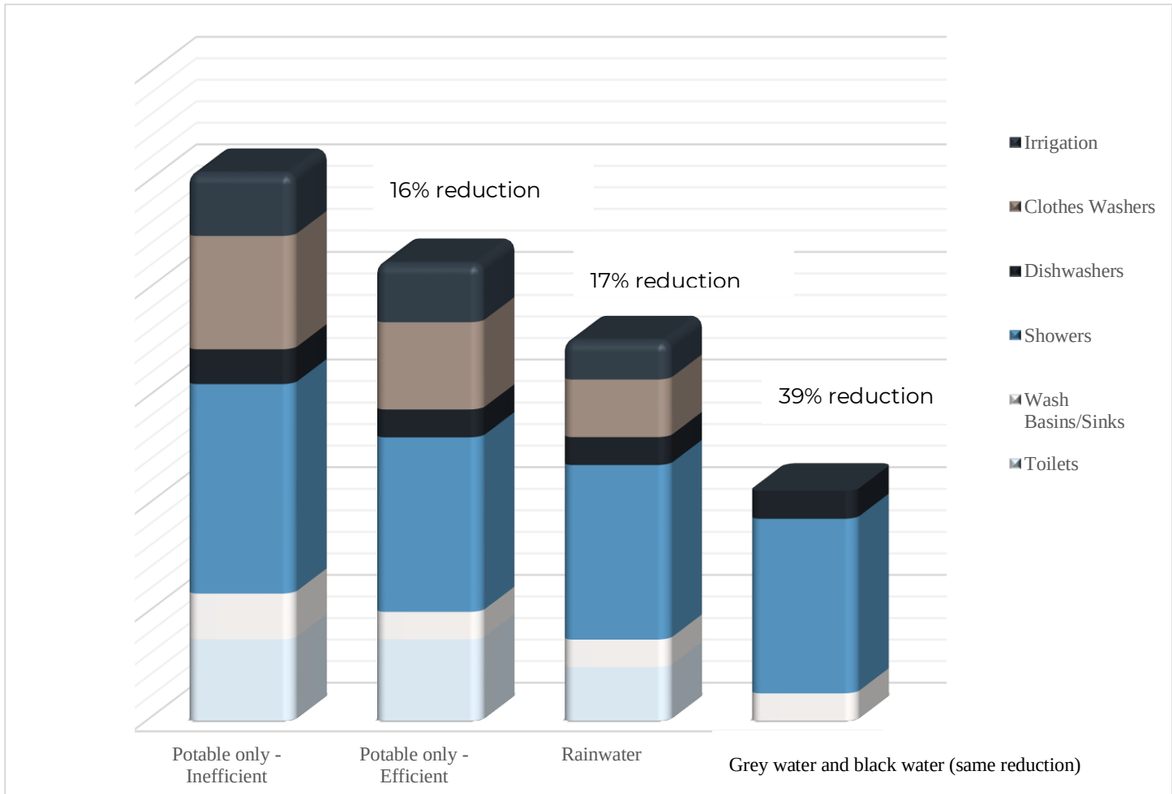
The Figure on the right shows the water demand results. From this, it can be seen that the predominant water use is the showers followed by the washing machines.

Rainwater harvesting could reduce the potable water demand by 17% compared to the “efficient” scenario. Waste water treatment could reduce it by a further 39%. Therefore, waste water treatment can have significant benefits in relation to potable water consumption. Greywater and blackwater both seem to achieve the same reduction in potable water use. Therefore, it is recommended that blackwater or greywater feasibility should be reviewed in more detail. However, additional considerations should be discussed, such as:

- To avoid increase capital costs and space requirements, the waste water treatment plant would need to be centralised
- There are increased complexities with approvals to treat and supply waste water – it is recommended that a specialised waste water treatment company is engaged to review feasibility, including management arrangements, capital and running costs
- Greywater might have lower capital cost for the treatment plant however additional piping would need to be provided to building (to separate waste water from toilets that would be directed to sewer and waste water from other uses which would go to the greywater plant)

Next Steps

- Detailed water balance can be undertaken accounting for the specific uses on site – to be discussed with the team
- Further details to be explored and included in subsequent detailed SSDA’s



5.2 Site Stormwater Management Strategy

An integrated site stormwater strategy offers efficiency in planning for onsite water treatment and detention. Integration of passive stormwater management strategies within building and landscaping design can reduce the overall need for hard stormwater infrastructure or offer additional levels of resilience against future rainfall and flooding events.

Water Sensitive Urban Design (WSUD) seeks to manage site stormwater flows with natural detention and filtration systems, integrating green infrastructure initiatives into the public realm such as bioswales, raingardens, constructed wetlands, ponds, sedimentation basins and porous pavement. Such systems can also be integrated with site wastewater flows and treatment systems and in addition to providing a water treatment function, add to the aesthetic of the site and support additional biodiversity.

Bioswale example

Next Steps

Develop a stormwater strategy that prioritises water sensitive urban design practices, integrates with site wastewater strategies and supports biodiversity objectives. It is recommended that WSUD opportunities are investigated further, these include:

— Permeable paving

— Use of landscape to filter stormwater

The stormwater strategy should also incorporate risk management strategies from climate change risk and adaptation studies.

The impact of development (such as increased runoff from hard surfaces) directs pollutants into our stormwater drains, which discharges into local creeks

- **Planning Ryde Local Strategic Planning Statement 2020**

6 Nature and Biophilic Design

6 Nature and Biophilic Design

6.1 Site Native Landscaping

Landscaping that is native to the area should be able to survive on available rainfall without the need for supplementary irrigation (beyond the plant establishment phase). Using native drought resistant plants in landscaping on site will reduce the site's water needs and inherently make the site more resilient to potential future droughts.

For further details of the Nature and Biophilic Design strategy, please refer to the Landscape Report provided by Arterra.

Next Steps

Establish site landscaping plan that prioritises local native plants that are endemic to the area that are most able to support local biodiversity without ongoing irrigation and maintenance requirements.

6.2 Tree Canopy Cover Minimums

Extensive tree canopy cover throughout the precinct (>30%) will provide a breadth of human health and well-being outcomes, as well as other environmental benefits. Cooling benefits have physiological and psychological outcomes on humans, as well as benefits such as extending the material life of asphalt pavements, reduce VOC from hot surfaces, and the need for conditioning.

Next Steps

Identify landscaping plan that identifies trees for retention and points for new tree growth and installation.

6.3 Identify space Urban / Community Agriculture

Dedicating space within the precinct for the inclusion of small-scale agriculture that could be managed by a local co-operative, provides a catalyst for local user interface, as well as a way to manage and reuse local organic waste composting and generate healthy food produce local use, markets or businesses.

Next Steps

Identify space for potential urban agriculture and review precedent operational models.

6.4 Biophilic Design Philosophy

Biophilic design examines ways to enhance the human connection with nature, embedding natural patterns, textures and colours and strengthening relationships with place and nature. As noted by the book '14 Patterns of Biophilic Design':

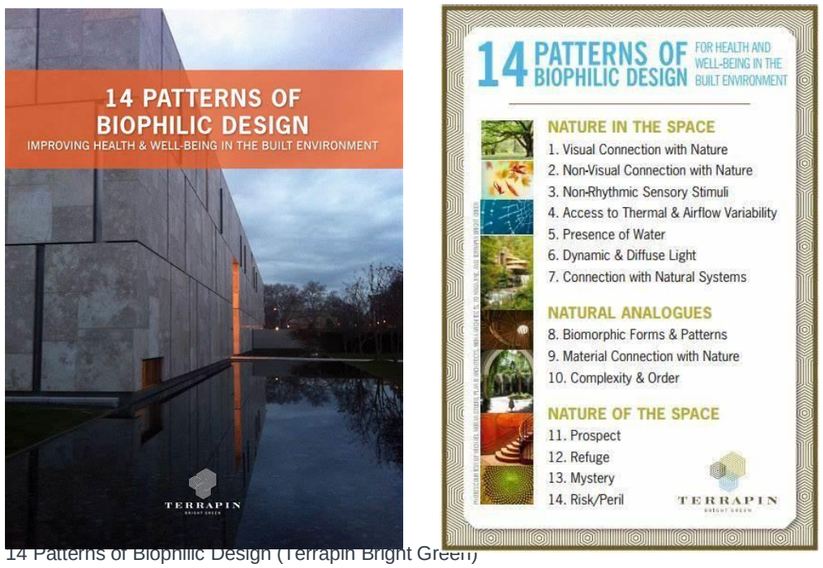
"Biophilic design can reduce stress, improve cognitive function and creativity, improve our well-being and expedite healing; as the world population continues to urbanize these qualities are ever more important"

"Biophilia is humankind's innate biological connection with nature. It helps explain why crackling fires and crashing waves captivate us, why a garden view can enhance our creativity, why shadows and heights instil fascination and fear; and why animal companionship and strolling through a park restorative, healing effects"

Opportunities to implement biophilic design elements abound at both the precinct level, in the public domain, and at the building design level.

Next Steps

We recommend that BaptistCare's Macquarie Park Masterplan embrace biophilic design philosophies in the development of the site's public domain and buildings. While many aspects of biophilic design may have been incorporated into design steps so far, we suggest the approach is formalized and steps taken to mirror the requirements of the above referenced imperatives from Building Challenge.



14 Patterns of Biophilic Design (Terrapin Bright Green)

7 Mobility

7 Mobility

7.1 Active Transport Infrastructure

Facilitating access to the site by means of active transport modes (i.e. cycling, walking, jogging, e-bikes/scooters) will not only increase site patronage but encourage emission free transport and support healthy lifestyles of local park users. Infrastructure includes safe, well-lit, wide, pathways that can accommodate the different speeds and needs of alternative transport modes. Infrastructure might also include safe and secure bicycle storage and/or charging facilities for e-bikes/scooters.

For further details of the Mobility strategy, please refer to the Traffic Report provided by JMT.

7.2 Electric Vehicle infrastructure

During the formative years and emergence of redeveloped BaptistCare's Macquarie Park Masterplan, we will see a rapid adoption of electric vehicles as cost, performance and availability of electric vehicles improves substantially. Supporting the adoption of electric vehicles with charging infrastructure on site, and providing that energy from renewable sources such as photovoltaic energy, will facilitate the transition and reduce indirect emissions of the site's transportation impacts. Including electric vehicle charging infrastructure also invites cars to be a part of the central energy system and microgrid, adding resiliency and efficiency to the grid.

7.3 Public Transport Access

Review available public transport options to and from site. This includes current and planned bus routes, train routes, taxi, ride share and car share services. Ensuring these services are readily accessible, safe, weather protected and regular will provide many potential visitors the convenient means of accessing the site while minimizing use of cars.

Next Steps

Generate a transport plan for BaptistCare's Macquarie Park Masterplan that identifies:

- Potential modes of transport and opportunities for improving site access vis active transport modes
- Potential modes of transport and opportunities for prioritising electric vehicles over internal combustion vehicles
- Potential modes of transport and opportunities for improving site access via public transport. Consult and interface with relevant public transport authorities

8 Rating Tools

8 Rating Tools

It is understood that BaptistCare are interested to pursue an approach that would align with a minimum of 5-star Green Star Buildings certification, and an aspiration of 6 stars, however **formal certification is not to be pursued** at this stage.

The following is provided for information.

Several industry certification schemes offer the opportunity for BaptistCare's Macquarie Park Masterplan to seek 3rd party sustainability assurance through its design, construction and operational life.

- **Green Star Communities**
- **WELL Communities**
- **Fitwel Communities**
- **One Planet Living**
- **Living Community Challenge**

In addition, each of these tools also have equivalent tools applicable to individual buildings. These rating systems prioritise different aspects of sustainability. Seeking a sustainability rating using one or more of these tools offers several benefits that should be considered by BaptistCare.These include:

- Industry developed and reviewed benchmarks and processes
- 3rd party reviewed, assurance and certification
- Market recognition of the standards of sustainability attained

The following key reasons have been identified as benefits to BaptistCare of pursuing a formal rating:

- The rating tool can provide **Design Guidance**, e.g. in order to provide healthy indoor environments the design team needs to consider good daylight levels, indoor plants etc
- **Benchmarking**, e.g. specific daylight levels targets or number of plants
- **Marketing and Assurance**, i.e. help with the marketability of the development and also with Corporate reporting and targets.

Next Steps

Following the SSDA, work with BaptistCare to:

- Work with BaptistCare and the design team to develop a 5 and 6 star Green Star Buildings pathway to provide guidance to the design (no formal certification)

9 Conclusions

9 Conclusions

The core of the sustainability plan presented in this document, consists of the focus areas, outcome goals and targets and metrics identified in Chapter 3. Additional discussion has been provided to dive into some of the initiatives further.

Next steps in the development of the sustainability strategy for BaptistCare's Macquarie Park Masterplan, include:

1. Firstly, agreement on the focus areas, outcome goals, targets and metrics as nominated in this document
2. Following this, further clarification of the site's sustainability direction, including assessing appropriateness of 3rd party building sustainability frameworks
3. Feasibility studies as identified in this document, such as Climate Change Risk and Resilience studies

APPENDIX

Case Studies

PRECINCT SUSTAINABILITY INITIATIVE CASE STUDIES

NAME OF PROJECT	COUNTRY	LINK TO WEBSITE	SUSTAINABILITY INITIATIVES OF INTEREST
Regis Aged Care	Australia	https://www.regis.com.au/sustainability/	• LED lighting and solar installations • EnviroSaver Ozone Laundry Disinfection - ozone washing technology that saves water, waste, electricity and gas • IAQ monitors • Harvest Garden Project – community vegetable garden using organic fertiliser and horse manure Engagement/education programs • Sustainability Month – Bake Day competition, Clean Up Australia Day Volunteering, Sustainability Ideas poster • Waste program – no disposable cups, recycling of e-waste and toner cartridges, donations of electronic equipment
Brandywine Living **LEED Silver**	US	https://www.wohlsenconstruction.com/project/brandywine-senior-living-brandywine-at-mahwah/ https://www.brandycare.com/brandywine-living-at-livingston-awarded-prestigious-leed-silver-building-certification/	• Indoor living wall • Biodiverse vegetation areas • Dark-sky-compliant site lighting • Low-flow water fixtures • High efficiency HVAC and lighting • Increased air quality with the use of low VOC finishes and cleaning products • Convenient access to public transportation • Exterior views • Over 95% of the construction waste was recycled
Kendal at Ithaca **LEED Gold**	US	https://kai.kendal.org/news/kendal-at-ithaca-apartments-awarded-leed-green-certification/	• Water-efficient kitchen and bathroom fixtures, Energy Star dishwashers and clothes washers • High-efficiency condensing gas furnaces, split-system air conditioners and tightly sealed ductwork. • Coated windows to reduce heat loss/gain • Energy Star appliance and lighting, motion- and light-sensors • Low VOC paints and adhesives, Green Label carpeting and padding • Recycling and Waste Management Plan • Airtight heating and cooling, continuous low level exhaust, carbon monoxide detectors, bathroom and kitchen exhaust fans vent directly outside

Atria Senior Living **LEED, Energy Star**	US	https://www.atriaseniorliving.com/about-us/our-green-practices/	• Energy Star® – Rated Appliances & Equipment • Renewable energy initiatives (i.e. solar) • Recycling programs • Ecological housekeeping and landscaping methods • Energy-efficient lighting and windows • Energy-efficient heating and cooling systems • Sustainable copier operations • Drought-tolerant landscaping with drip irrigation • Green-certified products: 100% recyclable carpet, zero-VOC paints, LED light bulbs, high-performance exterior doors, low-flow plumbing fixtures • Green cleaning practices • Sustainability clauses in vendor contracts • Integrated Pest Management (IPM) program
Countryside Senior **LEED Silver**	US	https://www.mercyhousing.org/lakefront/countryside-senior/	• Geen spaces with native plantings, • High-efficiency heating and air conditioning systems • Solar thermal panels on the roof used for heating water • Energy Star lighting fixtures • Community recycling program.
Eden Meadows	US	https://healthcaredesignmagazine.com/architecture/green-design-better-senior-living/ https://www.aplaceformom.com/caregiver-resources/articles/green-house-project-long-term-care https://www.iadvanceseniorcare.com/design-2011-merit-winner-eden-rehabilitation-suites-and-eden-green-house-homes-oshkosh-wisconsin/ https://www.miravidaliving.com/eden-meadows-green-houses/	• 100 strategically placed high-performance windows that reduce glare, provide daylight and views access while reducing heat gain/loss • Man-made pond that operates as the main storm water detention basin, and serves the geothermal system to provide heating and cooling • Light-colored membrane roof at flat areas • Low-flow plumbing fixtures and dual-flush toilets • Energy-efficient light fixtures and digital temperature controls • Materials with high recycled content, low VOC • Multiple lighting levels in resident rooms and common areas, occupancy sensors in storage rooms • Energy recovery ventilators capture waste heat and temper incoming fresh air. • Low-maintenance, native vegetation
McKenzie Street Aged Services Centre	Australia	https://drivenxdesign.com/gov18/project.asp?ID=17343	• Recycled, sustainably resourced timber (either FSC certified, locally sourced or recycled and end-of-life recycle-ability has been taken into consideration) • Low VOC timber coatings and natural oils.

Clyde E. Lassen State Veterans' Nursing Home **LEED BD+C Gold 2011**	US	https://clientarea.tambourine.com/HarvardJolly/sitefiles/expertise-healthcare-veterens-hospital.php https://ufdcimages.uflib.ufl.edu/AA/00/06/16/51/00001/Chen_Kezhen-Final-MRP.pdf	• Pinwheel layout grouped in 6 houses, - Functional and homelike, made to encourage communication and improve mental health. Also improves staff efficiency due to reduced travel distance - Each house has central living room where residents can talk/visit - Each house has private walking garden • IAQ Management Plan • Low emitting materials • Natural and native plantings in walkways, gardens, and sitting area
Armstrong Place, Senior Housing **LEED NC Gold 2011**	US	https://www.nibbi.com/projects/armstrong-senior-housing/ https://ufdcimages.uflib.ufl.edu/AA/00/06/16/51/00001/Chen_Kezhen-Final-MRP.pdf https://bridgehousing.com/properties/armstrong-place/ https://www.archdaily.com/153359/armstrong-place-senior-housing-david-baker-partners	• Senior apartments overlook the park, central courtyard, or a landscaped mews that runs between the building and the family townhouse development. • The landscape reduced 50% potable water consumption for irrigation with a courtyard rain garden and saved 30% water by using dual-flush water closets and faucets with flow restrictions • Access to daylight in 75% of spaces and outside views for 90% of spaces • Solar water heating system and photovoltaic panels • LED lights • 50% FSC certified wood for all cabinets, doors, and formwork • Low VOC materials • 75% of all construction waste was diverted from landfills • Transit-oriented – one block away from LRT line, parks, medical centers Economic/Social Sustainability • 23 apartments set aside for formerly homeless seniors participating in San Francisco's Direct Access to Housing Program
Darcy Gardens, Dagenham	UK	https://www.barbourproductsearch.info/darcy-gardens-dagenham-essex-news017948.html https://www.matec-conferences.org/articles/matecconf/pdf/2018/33/matecconf_ecce2018_01032.pdf https://www.ecogreenroofs.co.uk/case-studies/case-studies-archive/darcy-gardens-dagenham	• Green roofs, solar panels, wind turbines • Recycled vegetation in lower block

Kendal-Crosslands Communities (Kendal at Longwood and Crosslands) **LEED Silver** **Part of their mission is to "support the concepts of ecological understanding and sustainability, including energy conservation."**		https://www.architectmagazine.com/project-gallery/cottages-at-kendal-at-longwood https://kcc.kendal.org/news/community-sustainability-kendal-crosslands-communities/ https://loveandcompany.com/2017/04/trend-green-communities/ https://kcc.kendal.org/2020/11/30/sustainable-energy-programs-on-campus/	New cottages in Kendal at Longwood • Stormwater percolated back into the ground to recharge the aquifer • Drought-tolerant native plants • Geothermal HVAC systems • Physical activity is encouraged by seamless, stepless pathways to the community's activities center • Sited in the rolling terrain so that each one has natural vistas rather than views of adjacent houses • High-efficiency appliances and plumbing fixtures that achieve 25-30% water savings. Existing / renovations • Recycled and local materials • Level II Arboretum on campus. Certified Wildlife Habitat • LED bulbs, faucet aerators, efficient-flow showerheads • Level II electronic vehicle charging stations Community projects • A dedicated group 10 residents devoted to develop ways to pursuit sustainability • Installation of a TV screen displaying the levels of energy consumption on campus
Nursing Home Passivhaus, Camarzana de Tera **Spain's first Passivhaus-certified nursing home**	Spain	https://www.construction21.org/france/case-studies/es/passive-house-for-the-elderly.html https://www.archdaily.com/938691/nursing-home-passivhaus-cso-arquitectura	• Prefab wooden framework • Greenhouse and vegetable growing area • Energy-positive building through active and passive strategies Active: • 18 kW of photovoltaic solar panels • 20 thermal solar panels • Mechanical ventilation through heat recovery units • Aerothermal air conditioning for underfloor heating-cooling Passives: • Facade over-insulation U: 0.195 W / m2K; Solera U: 0.18 W / m2K; Extensive green roof 0.195 W / m2K • Wood joinery with triple glass • Natural ventilation • Rainwater harvesting for irrigation • Solar control through porches

- Greenhouse in the dining room area that tempers the existing air in winter (taking advantage of the north window), while in summer it allows cross ventilation.
- Medicalization of architecture so that it would help daily wellbeing
    - Small warm “home” spaces instead of large cold spaces “hospitals”. The objective is that the residents sit in their own home (with the possibility of bringing their own furniture), for this, wood and light are used through large windows to the south, introducing the nature of the patios inside the building through transparencies.
    - Heat recovery units, filters and hermeticity of the building, as well as an energy improvement, allows obtaining an optimal warm air for this type of buildings, avoiding respiratory allergies to users, as well as improving the prevention of covid-19.