Sustainability Planning Report

Manchester Road

300 Manchester Road, Auburn NSW 2144

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SUSTAINABILITY PLANNING REPORT

Activity Schedule

Date	Revision	Issue	Prepared By	Approved By
13.10.2017	1	Preliminary Issue	N.Viselli	A.Girgis
27.11.2017	2	Final Issue	N.Viselli	A.Girgis
28.08.2018	3	Revised Planning Proposal Issue	N.Viselli	A.Girgis

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EXECUTIVE SUMMARY

Northrop Consulting Engineers have been engaged to provide a sustainability assessment to accompany the Planning Proposal submission for the redevelopment of the 300 Manchester Road, Auburn industrial site. The initiatives outlined in this report will be considered to demonstrate the project's Ecologically Sustainable Design (ESD) ambition.

The project will be targeting the following sustainability objectives to enhance the environmental performance of the site:

- BASIX Certification – compliance with the requirements of the NSW SEPP BASIX 2004;
- SEPP 65 – Compliance with the requirements of *SEPP 65 – Design Quality of Residential Apartment Development* and the related *Apartment Design Guide* – Compliance is demonstrated within the Architects Statement attached in Appendix A;
- Additional sustainability initiatives to incorporate Australian Best Practice Sustainability principles within the project design, as listed in Section 1.

This report assesses potential social, environmental and economic impacts and opportunities for the new development, based on the following key areas;

- Energy Efficiency
- Indoor Environment Quality
- Water Management
- Sustainable Transport
- Waste Management
- Materials Selection
- Land Use & Ecology
- Community & Liveability

The measures in this report aim to promote sustainable practices not only on site but also within the wider community of the Auburn Region, and will be investigated during future design development stages:

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1. INTRODUCTION

Northrop Consulting Engineers (Northrop) have been engaged by PAYCE to undertake a sustainability assessment to support the Planning Proposal for the rezoning and redevelopment of 300 Manchester Road, Auburn NSW.

The new development will facilitate urban growth opportunities to suit the diverse socio-economic status of the Cumberland Local Government Area (LGA). PAYCE is committed to provide a world class mixed use development, combining open spaces, employment zones and high density residential areas to meet the varied needs of the population whilst minimising the environmental impact of the site.

Northrop have reviewed consultancy and relevant authority reports for the site in preparation of the development of this report. Sustainability initiatives have been proposed for consideration to future design the development of the precinct.

Eight key areas were explored to consider the potential social, economic and environmental impacts of the site:

- Energy Efficiency
- Indoor Environment Quality
- Water Management
- Sustainable Transport
- Waste Management
- Materials Selection
- Land Use and Ecology
- Community & Liveability

1.1 Site Description

The 14.12 hectare industrial site is bound by Manchester Road to the south, Duck River to the west and a railway sliding/stabling yards to the north and east as shown in Figure 1 below. PAYCE intends to repurpose the land to a mixed use site to facilitate approximately 1,200 dwellings across 8 residential clusters, comprising of buildings ranging between 4 -12 storeys.

Figure 1 Existing Site Conditions

Figure 2 Proposed Masterplan

It is understood that the proposed masterplan consists of the following areas:

- Residential 106,683 m^2 (GFA)
- Retail 1,000 m^2 (GFA)
- Open Space 21,186 m^2
- Employment Land 7 ha

The precinct is placed in an ideal location to create a connected urban hub for new building occupants; including close proximity to Auburn Town Centre, Clyde and Auburn train stations and less than 20 minutes from Parramatta CBD. The Manchester Road development will endeavour to maximise opportunities to link residents to surrounded communities and cities to enable urban development and employment opportunities of the area.

1.2 Sustainability Objectives

This Sustainability Report has been prepared in accordance with the relevant Cumberland LGA legislation; Auburn Development Control Plan (2010) and Auburn Local Environmental Plan (LEP). The Auburn Residential Development Strategy was also reviewed as a guiding document to new residential development in the area. The key message to create good quality residential areas was to:

- Incorporate sufficient open space with good pedestrian and cycle connections;
- Provide employment zones to encourage employment growth and
- Sustainable high density residential areas to support the projected population growth forecasted for the Auburn Region.

The current masterplan has been developed to provide a good quality mix use development in line with the above land use types.

The project will be targeting the following sustainability objectives to enhance the environmental performance of the site:

- BASIX Certification – compliance with the requirements of the NSW SEPP BASIX 2004;
- SEPP 65 – Compliance with the requirements of *SEPP 65 – Design Quality of Residential Apartment Development* and the related *Apartment Design Guide* – Compliance is demonstrated within the Architects Statement attached in Appendix A;
- Additional sustainability initiatives to incorporate Australian Best Practice Sustainability principles within the project design, as listed in Section 1.

1.3 Referenced Documentation

The following documentation was referenced in the development of this report:

- Manchester Road Auburn Services and Flood Advice Report (2018)
- 300 Manchester Road, - Ecological Impact Statement
- Manchester Road Master Plan (2018)
- Manchester Road Planning Proposal Urban Design Report (24.08.2018)
- Auburn Development Control Plan (2010)

- Auburn Local Environmental Plan (2010)
- Auburn Residential Development Strategy – Cumberland Council

1.4 Limitations

Due care and skill has been exercised in the preparation of this report.

No responsibility or liability to any third party is accepted for any loss or damage arising out of the use of this report by any third party. Any third party wishing to act upon any material contained in this report should first contact Northrop for detailed advice, which will take into account that party's particular requirements.

2. ENERGY EFFICIENCY

2.1 Passive Design

The site characteristics and orientations can have a large effect on the amount of energy that is required to heat, cool and ventilate a building.

Key considerations will include designing high performance facades including glazing selection and extent, external shading, daylight direction devices, insulation levels, surface properties and possible natural ventilation openings.

2.1.1 Natural Ventilation

Natural ventilation, unlike fan-forced ventilation, uses the natural forces of wind and buoyancy to deliver fresh air into buildings. Ventilating a building naturally can significantly reduce energy consumption of HVAC systems, whilst providing 100% outdoor air into the spaces it serves, creates a very clean environment for occupants.

In Auburn, the predominant wind directions for the warmer months of the year occur from the south east and south westerly wind and would be the governing factors when considering building orientation on the site as seen in the wind rose diagram in Figure 3. Natural ventilation will be maximised by implementing a precinct wide consideration of wind direction and speeds in preparation of building orientation design to optimise passive cooling opportunities across the site.

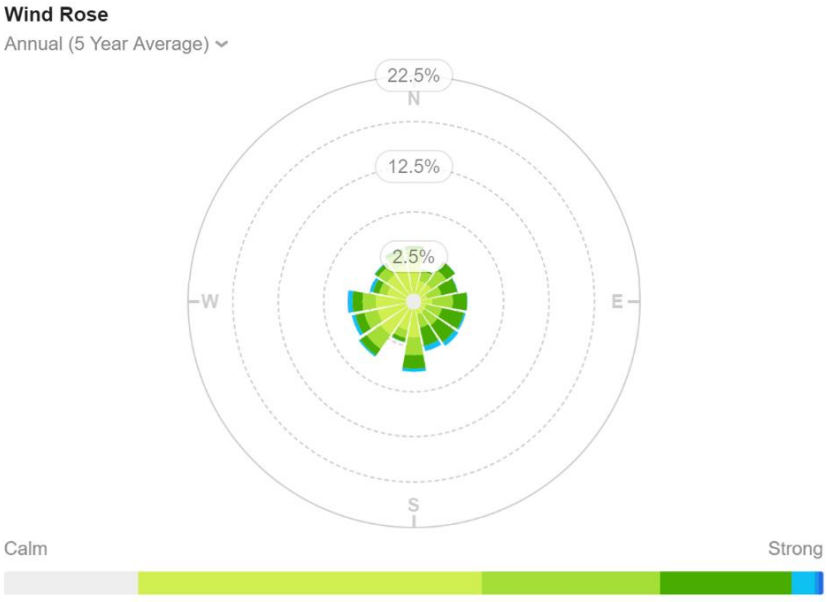


Figure 3: Prevailing Winds (5 year average) – Auburn NSW

2.1.2 Solar Amenity

Good solar amenity is essential for considering passive design principles for the site. A balance between natural daylight and solar access is required to optimise thermal performance of the buildings on the site to create comfortable living environments and minimise the carbon footprint of the development.

Opportunities will be explored as part of the detailed development stage to enhance the solar amenity and exceed minimum planning requirements across the site:

- High performance glazing
- Selection of glazing with high Visual Light Transmittance (VLT);

- Light shelves;
- Skylights and Solar tubes
- Optimised shading.

2.2 HVAC Systems

Typically apartment buildings in Sydney are served by individual reverse cycle split air conditioning systems for each dwelling. While split systems provide high flexibility for individual control and simplicity from a body corporate outgoings point of view, this is not always that best outcome from an energy, operational cost and aesthetic perspective.

Various options will be investigated to provide an improved energy efficient outcome system that provides a better level of control. This will include equipment selection (with priority for higher energy efficiency ratios), control strategies and day/night-time zoning.

Additionally, the feasibility of district heating and cooling systems will be explored to investigate the opportunities to provide the central production and distribution of thermal energy. Chilled or heating water is delivered via an underground insulated pipeline to office and residential buildings to cool the indoor air of the buildings within a district.

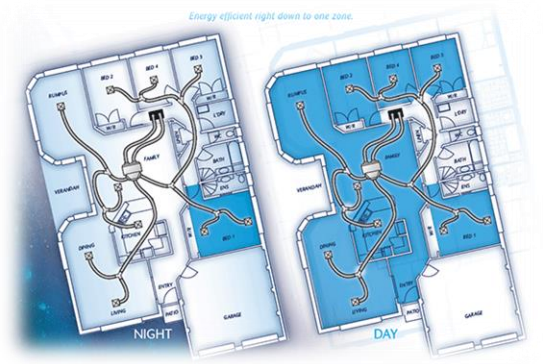


Figure 4 Day/night zoning configuration

2.3 Energy Efficient Appliances

Minimum Energy Performance Standards (MEPS) specify the minimum level of energy performance that appliances, lighting and electrical equipment must meet or exceed before they can be offered for sale or used for commercial purposes.

High MEPS rated appliances will be considered beyond mandatory product ranges in Australia and New Zealand. These products must be registered through an online database and meet a number of legal requirements before they can be sold in either of these countries.

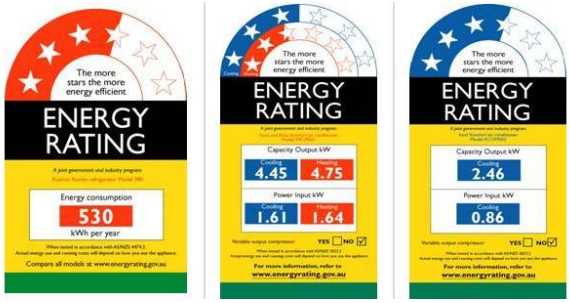


Figure 5: Typical Energy rating labels

2.4 Energy Efficient Artificial Lighting

The provision of highly energy efficient lighting is to be incorporated into the building design to minimise the lighting density over area. In particular, LED lighting provides the maximum efficiency and has become a robust cost effective lighting technology.

Control strategies are also vital to reduce excess energy use, including:

- Daylight sensor and motion sensor control for hallways, lobbies and shared spaces.
- Lift lighting connected to lift call button.
- Motion sensor or time-based lighting for undercover car parking, switch rooms and service areas.
- Motion sensors in fire stairs to trigger between standby (dimmed) and full light outputs
- Daylight harvesting and circadian lighting for commercial areas

2.5 Alternative Energy Sources

2.5.1 Solar Photovoltaic (PV)

Rooftop solar power within the development has the potential to provide a portion of the building energy use across the year. Using a system connected to the base building systems will offset energy used by the central services such as lifts and common area lighting. Rooftop solar will also provide a benefit to the projects BASIX compliance levels for the residential developments of the site and NABERS ratings for commercial office areas.

If there was a desire to maximise the amount of solar PV to be installed, this could be incorporated with an embedded network to allow the use of the output electricity in the precinct.

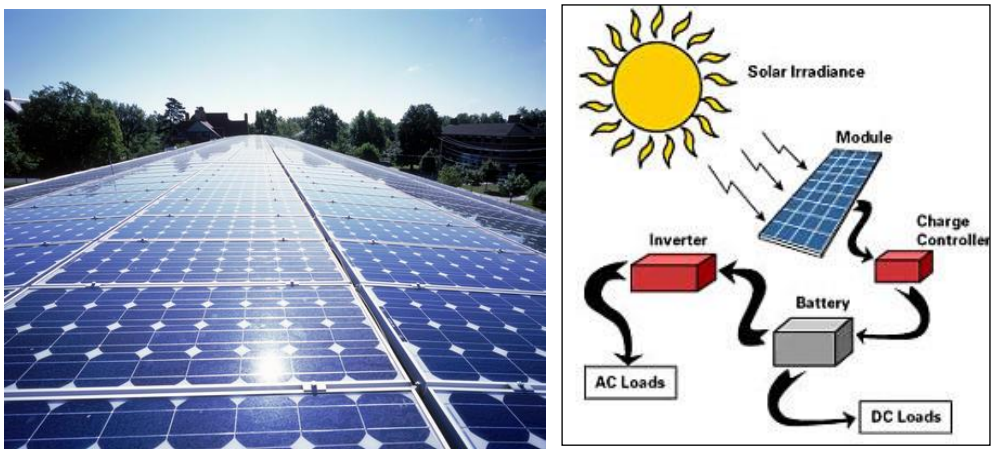


Figure 6: Solar PV components

2.5.2 Integrated Renewable Energy Generation

Building integrated photovoltaics (BIPV) are photovoltaic materials that are used to replace conventional building materials in parts of the building envelope such as the roof, skylights, or facades. The main benefit of BIPV is that it can be used to offset other building materials which helps to subsidise the overall costs of installation. E.g. where BIPV is used as building cladding it may offset the cost of marble or aluminium cladding at a similar cost while providing a revenue stream to the development through the provision of electricity.

BIPV technology will be investigated during the detailed design stage determine the feasibility of implementation in the development.

Figure 7: Integrated PV in shading structure

2.5.3 Domestic Hot Water

As identified in the Services and Flood Advice Report, gas connection to site is possible via the gas main on located on Manchester Road. Solar with natural gas booster hot water heating is one of the most energy efficient ways of heating water for domestic use to minimise greenhouse gas emissions.

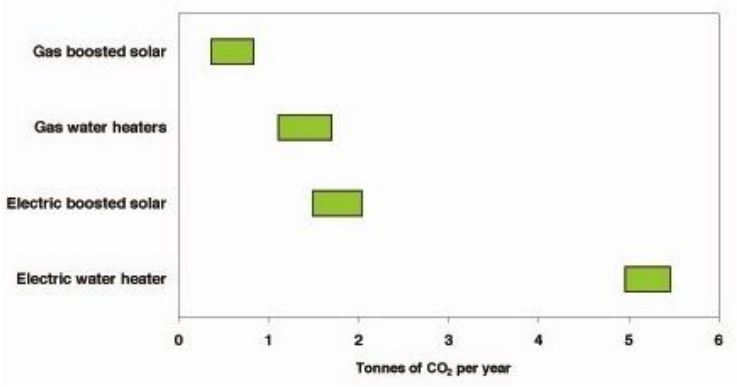


Figure 8: Greenhouse gas emissions of different hot water systems

A centralised solar gas boosted domestic hot water system will be considered for all commercial, residential and common area amenities in effort to minimise the greenhouse gas emissions on site. System components include:

- Solar panels;
- Solar storage tanks;
- Instantaneous gas fired booster units;
- Flow and return reticulation with Authority read hot water meters for billing purposes for each apartments and common area amenities toilets.

2.6 Smart Energy Metering and Monitoring

Metering for each tenant will allow them to monitor their own energy use and result in behavioural or equipment changes. Real-time energy tracking will also raise occupant awareness of the potential excess energy in their everyday environment.

A user-friendly interface for monitoring will also increase interaction with the building and give the tenants a greater sense of control of their space. Display screens located in accessible common areas will be considered to display energy consumption in the building in effort to reduce the carbon footprint of the precinct.

2.7 Embedded Networks

A Micro grid is a private electricity network that uses local energy generation sources (e.g. rooftop solar) which can be connected to battery storage systems and supply loads within that network. An integrated micro grid would allow the precinct to manage the system within its borders and interact with the larger grid network as a single entity under an Embedded Network arrangement.

The embedded network would serve each of the dwellings within the building and connect these to a central connection point. Electricity can be purchased in bulk at a lower cost than is available to individual residents which could potentially provide revenue generation opportunities for PAYCE if managed privately. Billing is then provided by either the building or through a third party (Origin, OC Energy, WIN Energy etc).

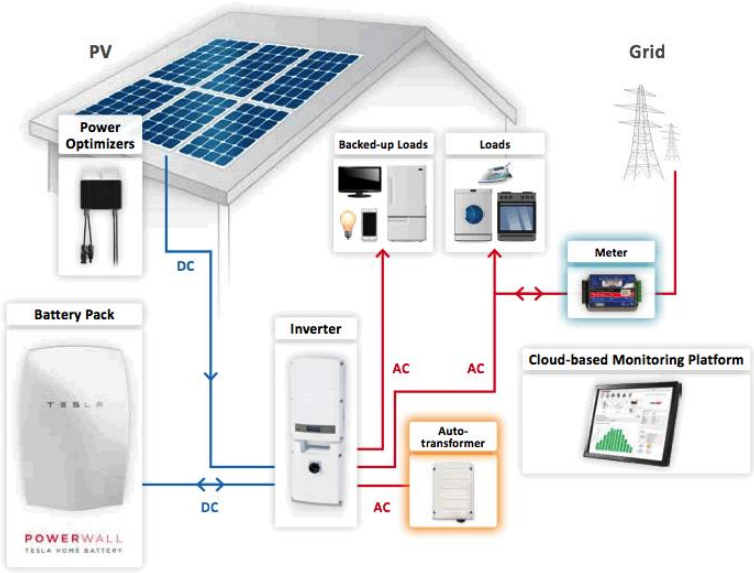


Figure 9 Example of connectivity of an embedded network

These systems are attractive as they can often provide reduced energy costs for residents and can assist in the distribution of onsite energy generation and storage.

Overall the use of an embedded network would allow further exploration of PV generation and the installation of battery storage to provide lower electricity bills for residents.

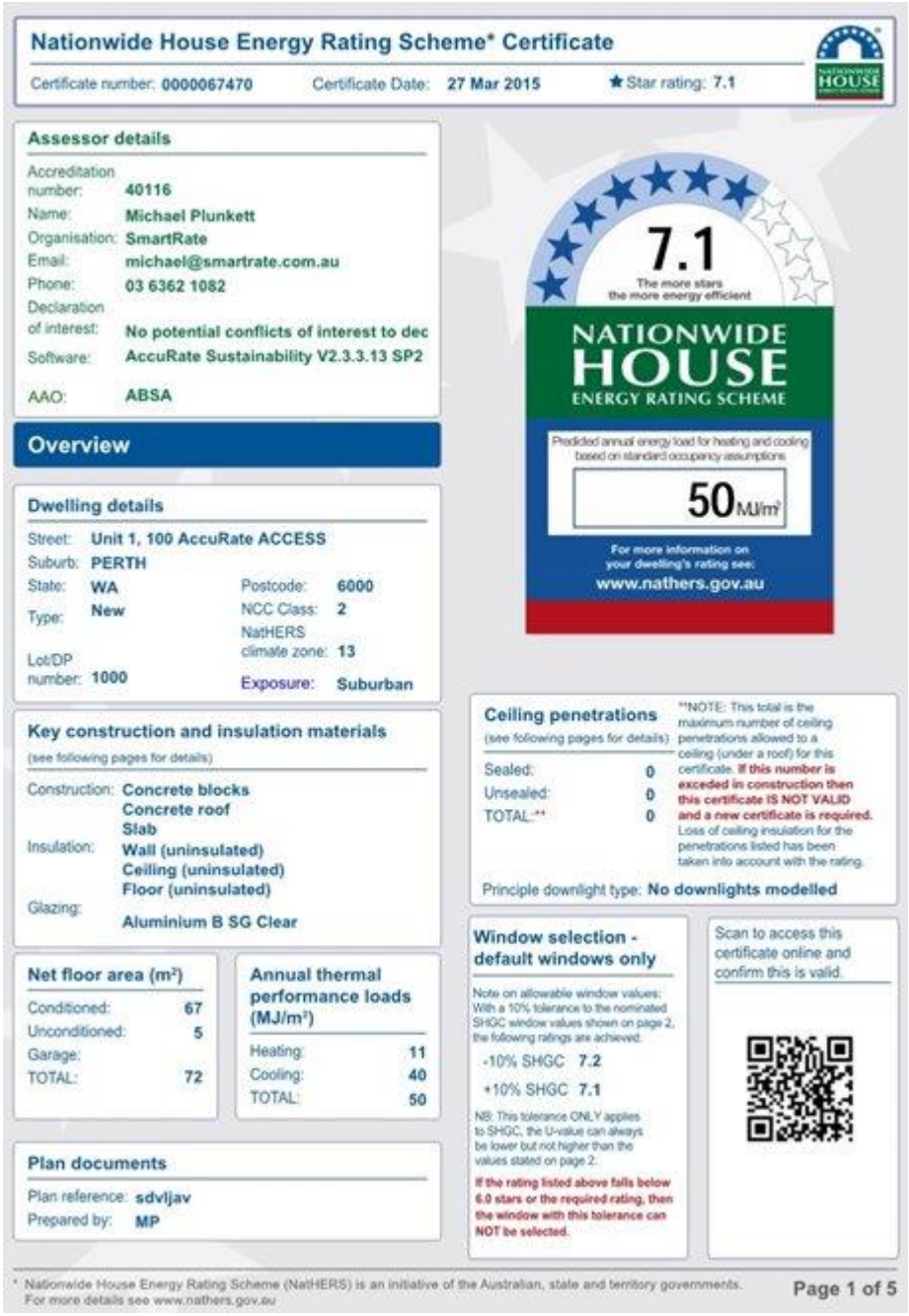
3. INDOOR ENVIRONMENT QUALITY

Comfortable, healthy and enriching spaces are of high significance for their all building occupants. The promotion of indoor environment quality results in a greater liveability of the development.

3.1 Thermal Comfort

Thermal comfort is typically dictated by the building fabric selections, façade performance, air-conditioning system design & selection and individual controls.

The residential portion of the project will consider targeting an average NatHERS rating of 6 stars, which is a step above minimum code compliance. The commercial retail components will target designing systems with optimised air distribution and individual level of control.



Nationwide House Energy Rating Scheme* Certificate

Certificate number: 0000067470 Certificate Date: 27 Mar 2015 ★Star rating: 7.1

Assessor details

Accreditation number: 40116
Name: Michael Plunkett
Organisation: SmartRate
Email: michael@smartrate.com.au
Phone: 03 6362 1082
Declaration of interest: No potential conflicts of interest to dec
Software: AccuRate Sustainability V2.3.3.13 SP2
AAO: ABSA

7.1
The more stars the more energy efficient
NATIONWIDE HOUSE ENERGY RATING SCHEME
Predicted annual energy load for heating and cooling based on standard occupancy assumptions
50 MJ/m²
For more information on your dwelling's rating see:
www.nathers.gov.au

Overview

Dwelling details

Street: Unit 1, 100 AccuRate ACCESS
Suburb: PERTH
State: WA
Type: New
Lot/DP number: 1000
Postcode: 6000
NCC Class: 2
NatHERS climate zone: 13
Exposure: Suburban

Key construction and insulation materials

(see following pages for details)

Construction: Concrete blocks, Concrete roof, Slab
Insulation: Wall (uninsulated), Ceiling (uninsulated), Floor (uninsulated)
Glazing: Aluminium B SG Clear

Ceiling penetrations

(see following pages for details)

Sealed: 0
Unsealed: 0
TOTAL:** 0

**NOTE: This total is the maximum number of ceiling penetrations allowed to a ceiling (under a roof) for this certificate. If this number is exceeded in construction then this certificate IS NOT VALID and a new certificate is required. Loss of ceiling insulation for the penetrations listed has been taken into account with the rating.

Principle downlight type: No downlights modelled

Net floor area (m²)

Conditioned: 67
Unconditioned: 5
Garage:
TOTAL: 72

Annual thermal performance loads (MJ/m²)

Heating: 11
Cooling: 40
TOTAL: 50

Window selection - default windows only

Note on allowable window values: With a 10% tolerance to the nominated SHGC window values shown on page 2, the following ratings are achieved.

-10% SHGC 7.2
+10% SHGC 7.1

NB: This tolerance ONLY applies to SHGC, the U-value can always be lower but not higher than the values stated on page 2.

If the rating listed above falls below 6.0 stars or the required rating, then the window with this tolerance can NOT be selected.

Scan to access this certificate online and confirm this is valid.

Plan documents

Plan reference: sdvljav
Prepared by: MP

* Nationwide House Energy Rating Scheme (NatHERS) is an initiative of the Australian, state and territory governments. For more details see www.nathers.gov.au

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Figure 10 Typical NatHERS home owners certificate

3.2 Trickle Ventilation

A trickle vent is a very small opening within a buildings fabric that allows a small amount of ventilation into spaces when major elements of the ventilation systems, such as windows and doors, are closed. Trickle ventilators can also provide a greater level of control over the provision of outside air to inside spaces. A number of products are available that control ventilation flow based on temperature and pressure, allowing outside air into spaces when it would be beneficial to the internal conditions and automatically shutting this off when it would result in increased heating or cooling costs.

A well-controlled trickle vent will also reduce condensation risk, avoid over ventilation (reducing air-conditioning energy and improve comfort through minimising drafts. The provision of trickle ventilators would not remove the requirements for openable windows but could assist with acoustic and ventilation controls while providing a continuous source of fresh outside air.

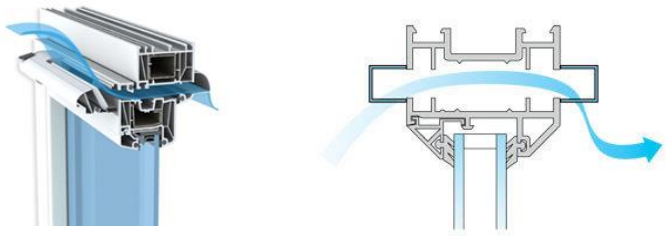

Figure 11 Example of trickle ventilation systems

3.3 Low Toxicity Finishes

Interior finishes such as paints, adhesives, sealants and flooring contain volatile organic compounds (VOC) that are inherent to the use of solvents during the manufacturing process. Consequently, these become sources of indoor pollutants which has health implications. The design team will consider and aim to minimise the VOC and formaldehyde content of all products specified in the design process of the development.

3.4 Acoustic Comfort

Acoustic conditions of the site will be assessed in the future stages of the development to ensure that appropriate internal noise levels and reverberation levels are compliant with AS/NZ 2107:2016 standards.

4. WATER MANAGEMENT

4.1 Water Efficient Fixtures and Fittings

Water Efficient Fixtures and Fittings will reduce the water consumption of the site. As an indication, the following Water Efficiency Label (WELS) rated fittings and fixtures will be considered:

- Wash hand basin taps - 5 star WELS
- General taps - 5 star WELS
- Toilets dual flush - 4 star WELS
- Urinals - 6 star WELS
- Shower heads – 4 Star WELS

4.2 Water Reuse

4.2.1 Rain Water Harvesting

Inclusion of rainwater harvesting in new developments is a condition in the Auburn DCP 2010 and will be implemented for non-potable uses at a minimum, as confirmed in the Services and Flood Advice Report prepared for this Planning Proposal. Possible rainwater reuse opportunities could be to supply irrigation systems, car washing, communal laundries and cooling tower make up supply, to reduce the potable water demand on site and lessen the impact to the local authority networks.

4.2.2 Fire Sprinkler System

During the design of the fire protection design in the consideration of sprinkler systems, the recirculation and storage of sprinkler testing water will be considered. This water can potentially be captured and stored in storage tanks for reuse during the next sprinkler test or connected to the rainwater tank for top up supply.

4.3 Water Sensitive Urban Design

Implementing Water Sensitive Urban Design (WSUD) practices reduces the reliance of stormwater infrastructure whilst enhancing the biodiversity of a site. Special attention to vegetation selection and water quality measures will need to be considered in order to appropriately address the proximity to the adjacent Duck River riparian corridor and local species of the Grey Headed Flying Fox as identified in the Cumberland Ecology *Ecological Impact Assessment* (EIA) provided for this planning proposal. In particular, the EIA recommends implementing a well-considered landscape management plan that does not attract large numbers of flying-foxes to the residential areas to feed.

Figure 12 Bioswales could be located in streetscapes to improve the water quality in the precinct

WSUD options that will be considered as part of this design approach are:

- Rain Gardens or plantings around building entrances;
- Sub-surface stormwater detention systems

- Tree Gardens/pits & Bio swales for storm water runoff treatment
- Native vegetation where applicable

4.4 Smart Water Metering & Monitoring

Water sub-metering with alarms for leak detection for common area facilities will provide a system for effective maintenance of the site. Smart metering which is connected to a monitoring system will allow for real-time consumption tracking and flag potential leaks at the moment they occur, minimising water wastage and protecting the building from water damage.

5. SUSTAINABLE TRANSPORT

5.1 Pedestrian and Cycle Links

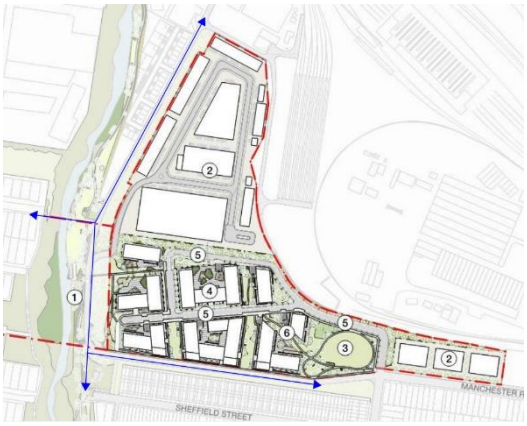

Figure 13 Indicative cycle ways for 300 Manchester Road, Auburn

Pedestrian pathways and cycle ways will be integral to the design of the precinct to encourage public transport use and high urban amenity areas. Cycle ways and pathways can provide a connection to the Auburn Town Centre, Clyde and Auburn train stations, all within 3km of the precinct.

The extensive open space areas will include the provision for cycle ways to enhance the liability of the precinct as shown in Figure 13, where the blue-mark-up lines represent indicative pedestrian and cyclist pathways proposed for the development.

It is opportune for PAYCE to provide clearly marked cyclist pathways and pedestrian access around these areas, designed to include sufficient accessibility to ensure for a resilient and diverse precinct.

5.2 Cyclist Facilities and Access

The practice of cycling assists the environment and human health by reducing pollutants that would otherwise have been release by other transport options. According to the ABS over one third of daily car trips are less than 3km in length. Most of these trips could be replaced with cycling. Providing secure bike storage facilities for residents will promote the use of bicycles as a form of transport.

Providing secure storage either as a communal storage cage in the basement or a nook adjacent to dwelling entries assist in encouraging cycling though the precinct as will the provision of bike racks outside of the main building entries across the site. As seen in figure 14, there is potential to provide creative public places in the precinct.

Figure 14 Hybrid bike rack and bench

5.3 Car share hubs

The provision of a building precinct specific share car network would allow building occupants to relinquish car ownership entirely and would greatly reduce the number of parking spaces required within the building. The provision of a cluster of vehicles could be coupled with a site mobile phone app, allowing for a centralised booking system.

A third party such Go-Get could also be provided with a dedicated space with residents given access to their booking system. This would reduce management requirements and move responsibility for the provision and maintenance of vehicles away from PAYCE or building management.

5.4 Electric Vehicle Charging Stations

Figure 15: Car charging concept

Electric car charging stations will be considered for the residents through provider such as ChargePoint, Better Place or E-Station. This type of facility could promote the use of electric vehicles within the facility as well as the surrounding community. Further investigation is required to determine the feasibility of this initiative with current sub-station capacities for the site.

6. WASTE MANAGEMENT

6.1 Construction and demolition waste

Building materials account for approximately half of all materials used and about half the solid waste generated worldwide incurring significant environmental impacts at each process interval. It is proposed that a significant portion of construction and demolition waste is to be diverted from landfill to reduce the carbon footprint of the site whilst reducing waste fees associated with landfill rates. This commitment could be incorporated in to the head contractors' Environmental Management Plan for the site. Reclamation of high value building materials should be considered first preference. Where reclamation is not viable, materials such as asphalt, bricks, timber, plastics (including PVC) and concrete should be recycled accordingly.

6.2 Waste Sortation

Waste-sorting bins will be considered for all internal and external spaces to enable users to sort their rubbish and recyclables. Back of house areas will require sufficiently sized and conveniently located waste storage and sorting areas for ease of removal by waste contractors.

An organic waste stream could be introduced with a communal worm farm or compost system to support community gardens and educational programs rolled out in the precinct.

Figure 16: Waste stream sortation

6.3 Unified bin design

Unified bin design throughout the precinct is proposed as part of a waste strategy to create a waste sortation culture in the building. Not only should each be a different colour e.g. Red for general waste, yellow for co-mingled recycling, blue for paper and green for organics but should be consistent throughout the site. This is to assist with clarity and develop effective waste sortation prior to disposal. The waste strategy should be as part of the Waste Management Plan and considered during the early stages of the development to ensure appropriate design integration across all building uses.

6.4 Waste compactors

Figure 17 Waste Compactor example

Waste compaction is being considered for the development as a way to reduce the number of traffic movements on site, reduce vermin and rodents and improve cleanliness and sanitation on site.

The Elephants Foot compaction systems offer several options which have the potential to reduce waste services costs up to 75 percent. This would allow the reduction in size of waste rooms, help to minimise the number of collections that are required by the waste contractor and should reduce the waste disposal costs and therefore help to minimise costs to the apartment owners.

6.5 Waste education

Waste educational in terms of effective signage displays or programs would have a positive benefit to the community as part of a wider approach to enhance community participation, create social diversity and provide fun educational activities for residents and surrounding suburbs.

This inititive could be coupled with the digital signage in the common lobbies as a way of updating residents of different waste pick updates or other useful Cumberland LGA initiatives.

Figure 18 Waste Education Programs

7. MATERIALS SELECTION

7.1 Sustainable Use of Resources

When choosing building materials for this project, particular attention will be paid to:

- **Low Embodied CO_2** – Many modern building materials such as aluminium or concrete are high in embodied energy (the energy required to produce, transport and install a material), and with that contribute substantially to the overall carbon footprint of the building.
- **Sustainability of Resource** – many building materials are derived from finite resources and should be avoided or limited. Major building elements should have recycled content where possible (recycled steel and/or aggregates in concrete, recycled timber, cellulose fibre insulation using recycled paper etc.).
- **Health Impact** – All materials should be considered in regard to their impact on occupants' health. Some types of fibreglass insulations have very fine fibres that, once airborne, can easily enter into the lungs and cause severe irritation.
- **Third Party Certifications** – materials which have been certified or approved by independent bodies such as Ecospecifier or Good Environmental Choice Australia should be preferred over non-certified products. These rating systems provide evaluation of various products across a range of environmental performance criteria.
- **Recycled Content** – Recycled content should be specified in:
    - Concrete – flyash and recycled aggregates; and
    - Structural and Reinforcement steel
    - Recycled building rubble

Figure 19 Examples of Third Party Certification Labels

7.2 Locally sourced products

Locally sourcing products for use in the construction of the precinct would help to keep transport and distribution impacts to a minimum. It will also help to support local employment and improve economic resilience of the Sydney manufacturing industry.

Utilising local manufacturing and suppliers should also help to minimise lead time for products, build positive relationships and make supply chain auditing easier. Overall the sourcing of locally sourced products should be explored and implemented where economically feasible.

8. LAND USE AND ECOLOGY

8.1 Increased Ecological Value

Being situated near a retail hub and community infrastructure, the development is considered to have a significant urban activation potential.

The development will significant improve the ecological value of the site with the following being considered;

- Public parks & oval;
- Bio-retention basin;
- Street landscaping;
- Vertical gardens;
- Roof gardens.

Figure 20 Landscape Strategy for the Development

Native vegetation will also minimise the ongoing environmental impact of the project by minimising soil erosion and land degradation, improving water quality and provides habitat for native biodiversity.

The proximity to Duck River could provide educational opportunities for the local community by installing signage displays of the local flora species and encourage volunteer involvement in the restoration program organised to improve the condition of sections of the river banks and further increase the ecological value of the site.

8.2 Native vegetation

Native vegetation plays a key part in the biodiversity and ecological stability of the Cumberland LGA region.

Endemic native vegetation plantings have the benefit of:

- Controls erosion through protecting soils and riverbanks
- Reduces land degradation and salinity
- Improves water quality and availability
- Provides habitat for a wealth of unique biodiversity including threatened species.

In addition, native vegetation stores a significant amount of carbon, mitigating the effects of climate change. The planting of native vegetation throughout the precinct will reduce the water needed for irrigations, reduce vegetation maintenance requirements, promote biodiversity and improve compliance under BASIX.

8.3 Heat Island Effect

Urban heat island effect is defined as hard surfaces within a development heating up due to darker Solar Reflectance Indexes (SRI), compared to a natural area. The results in additional heating generated in the ambient surrounding temperatures as well as allowing more heat to penetrate individual buildings.

The following will be considered in the development to reduce heat island effect;

- Roof Gardens;
- Artificial Water bodies & water courses;
- Increased vegetation areas;
- Selection of paint finishes with high SRI properties such as light coloured exterior finishes.

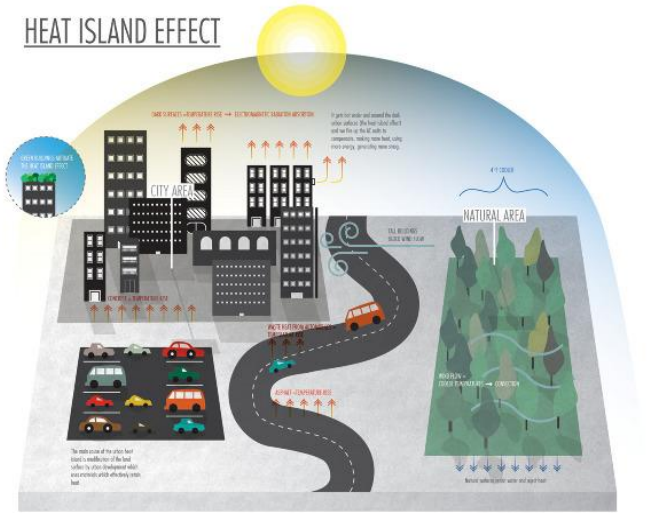

Figure 21: Urban Heat Island effect

8.4 Rooftop Gardens

Plants have the ability to reduce the overall heat absorption of the building which then reduces energy consumption. The primary cause of heat build-up in cities is solar radiation, the absorption of heat by roads and buildings in the city and the storage of this heat in the material. By installing roof gardens, the development is creating a passive solution to this build-up of heat with the plant surfaces cooling the space through the process of transpiration. This will help to minimize temperature rise in these spaces to no more than 4-5°C above ambient improving thermal conditions within the buildings across the site and minimising the precinct effect on urban heat islands.

Figure 22 roof gardens help to cool the space and reduce the urban heat island effect.

8.5 Non obtrusive outdoor lighting

Light pollution revealing up into the night sky (sky glow) or spilling on to neighbouring properties can harm the environment in many ways including effects on:

- Migratory birds – nocturnal birds use the moon and stars for navigation and can become disoriented by lights shining upwards into the sky;
- The disruption of biological rhythms and other effects on the behaviour of nocturnal animals and insects;
- Greenhouse gas emissions are emitted to unnecessarily light the night sky.

Ensuring that no outdoor lights face up into the night sky would not attract any additional costs and would provide ongoing operational and maintenance savings and reduce the sites impact on the natural environment.

9. COMMUNITY AND LIVABILITY

9.1 Communal Gardens & Facilities

The provision of urban agriculture that promotes education and community through the use of roof top garden facilities, will promote community cohesion within the residents of the precinct and provide a valuable educational facility.

The community gardens should be incorporated in to the space design with the overall aim of creating a self-sustaining community initiative managed by the residents of the building. Initially there will need to be a commitment of time and financing for the construction of the physical gardens and for the education of residents regarding the effective management of these facilities.

Overall the benefits of providing the provision for urban agricultural facilities will include;

- Providing residents with access to fresh food,
- Reducing household waste going to landfill though the provision of composting facilities
- Reducing the need to provide private “backyard” space
- Promoting community engagement
- Educating residents about food production; and
- Providing biological diversity across the site.

Figure 23 Community gardens would promote social cohesion and a sense of community

9.2 Environmental Education

To assist the environmental education of building occupants and visitors, the following opportunities will be considered;

9.2.1 Community programs

North Western Sydney is one of the fastest growing regions of NSW so it is crucial that communities are able to provide a sense of place for its residence during this time of change. Scheduled events and programs is a good way to encourage equal access to a diverse range of groups of people in the community; celebrating culture and heritage that drives positive growth and joy in the neighbourhood.

Community events could include sustainable educational workshops with varying topics each e.g. permaculture classes, composting and worm farming to complement the proposed communal rooftop gardens.

9.2.2 Environmental Displays

Creating interactive spaces is an effective way to encourage environmental education whilst providing a fun and vibrant atmosphere. Interactive digital display screens can be used as a tool to provide such a space which provides education to the occupants by making resource savings and consumption data readily accessible in the public space, such as the lobby areas or lifts. Information could for example detail live water and energy consumption data in the form of a touch screen display and relate back to the carbon footprint of the site in context of the individual, building or precinct.

Figure 24: Environmental Displays

9.3 Wayfinding

At its essence, wayfinding is the science of understanding how people perceive the environment and make decisions while navigating unfamiliar spaces and then responding with intuitive signage and information layouts.

Figure 25 Internal Wayfinding example

A high-functioning way finding system makes the environment “unique” and enhances the visitors’ experience as it increases their comfort, builds their confidence, and encourages them to discover unique events, attractions and destinations on their own.

Way Finding can also be utilised to direct occupants to key facilities and amenities in fun and creating ways. Like the interactive façade initiative above, public art incorporated into way finding signage in the building could open opportunities for local schools and community group competitions.

9.4 Facilitated Health Classes

Facilitated health and exercise classes are a fun way to encourage healthy lifestyles in the community. Moreover, it has been proven that community physical activity has improved physical and mental wellbeing as well as improved social cohesion and inclusion. Health classes will be considered to cater for a diverse range of people in the community i.e. for different age groups, race, mums and bubs etc.

Possible class types could include:

- Tai Chi
- Yoga
- Aerobics
- Group mediation
- Interpretive dance
- Health education classes

Figure 26 Encouragement of Diversity in the Community

10. CONCLUSION

The new mixed use development at Manchester Road, Auburn will incorporate a number of key initiatives to reduce the impact on the environment, and enhance the quality of living for the precinct.

Future detailed design stages of the development will explore integrating core Sustainability principles, and firming up a strategy for implementation.