PRECINCT 75

75 Mary Street, St Peters 2044

Ecological Sustainable Design (ESD) Report

Job Number: EN - N14_100
September 2015
Rev 2.0

VALUE | INNOVATION | TRUST

Level 7, 2 – 14 Kings Cross Road
Potts Point, NSW 2011
Phone: +61 2 8488 4600
Fax: +61 2 9475 4588
Email: admin@igs.com.au
Web: www.igs.com.au
linkedin.com/company/3213174
ABN: 68 163 019 029

Document Control

Version	Date	Author	Reviewer		
01	31 October 2014	Mays Chalak	MC	Joseph Hanna	JH
02	04 September 2015	Mays Chalak	MC	Joseph Hanna	JH

CONTENTS

1. INTRODUCTION

1.1 General

Tonkin Zulaikha Greer has commissioned IGS to carry out an Ecological Sustainable Design (ESD) report of the new mixed use planning application proposed for 75 Mary Street, St Peters NSW on behalf of JVMC Pty Ltd. This report has been prepared solely for JVMC Pty Ltd. No warranty is provided to third parties who rely on this report for any other purpose.

The planning application will predominantly consist of:

- Adaptive reuse of some of the existing buildings (Buildings 1, 2, 6, 7 and 8) predominantly for commercial, retail and residential uses;
- Approximately 180 apartments in new buildings (Buildings A, B and C) and adaptive reuse of Building 8; and
- Basement carparking for approximately 339 cars (residential, retail, commercial);
- Community centre and other amenities to cater for the occupants of the precinct and neighbours in the direct vicinity of the precinct (eg. open air cinema, through site links and open landscaped spaces.

It is proposed the development will incorporate a range of sustainable design initiatives that promote resource efficiency, reduced environmental impact and improved indoor environment for the occupants.

This report summarises the sustainability provisions for the project including energy, water and waste efficiency, Indoor Environment Quality (IEQ) and other sustainable design initiatives for the development which demonstrate an overall commitment to environmental sustainability.

The sustainability targets for the development will be achieved in an integrated and staged approach through minimising the need for consumption (via passive measures) and then consumption optimisation (resource efficiency), performance management and ongoing monitoring.

The initiatives presented in this report demonstrate a wide range of measures which will result in high levels of environmental performance and an improvement on occupant's health, productivity, comfort and satisfaction. More specifically, the following sustainability areas will be considered by the design team during the design stages of the development.

- Energy - energy consumption and greenhouse gas emissions will be minimised. The building envelope and services will be integrated to ensure the building is controlled to maintain the desired conditions whilst optimising the energy efficiency of the buildings.
- Indoor Environmental Quality - buildings will be designed to maximise occupant comfort addressing issues of thermal and visual comfort and indoor air quality.
- Water - potable water consumption will be minimised through water efficiency measures for the development.
- Material - waste will be minimised and the design will encourage reuse and recycling of materials and use low environmental impact materials.

1.2 Mandatory BCA Energy Efficiency Requirements

Mandatory BCA Energy Efficiency requirements are as follows:

- Part J1 – Building Fabric;
- Part J2 – External Glazing;
- Part J3 – Building Sealing;
- Part J5 – Air Conditioning and Ventilation;
- Part J6 – Lighting and Power;
- Part J7 – Hot Water Supply.

Additional Requirements:

- BASIX (residential);
- NaTHERS (residential);
- NABERS (commercial/retail);
- SEPP65 (residential).

2. THE PRECINCT

The precinct is located to the northern side of Mary Street, and extends all the way to Edith Street (refer to Figure 1).

Figure 1 – Site Photograph (Source: TZG Report)

The precinct exhibits generally above road level, sloping topography (from Edith Street - north to Mary Street – south). The level difference from Edith Street to Mary Street is 4 – 5 metres.

The precinct is located in a mixed use area with commercial/industrial buildings at the western end of Mary Street and all along Unwins Bridge Road and residential uses to Edith Street and down the eastern end of Mary Street.

The precinct is located within 5kms of the Sydney CBD and Sydney International and Domestic Airports. It is also in very close proximity to Sydney's major arterial road networks (Princes Hwy and M5 Motorway). In addition to this it is also within 5 minutes of St Peters and Sydenham railway stations.

3. ESD INTENT

The project architect and consultants will strive to design the buildings based on the Environmentally Sustainable Design (ESD) principles which exceed the minimum benchmarks.

Based on the proposed concept designs, the facade and floor plans are designed with the vision to give occupants the very best in terms of passive heating and passive cooling. This, when combined with other energy efficient strategies (listed later in the report) will lead to low energy demands for the tenants and base building and therefore lower greenhouse gas emissions for the development.

Natural lighting will be utilised very effectively throughout the whole development. In addition to thermal comfort, energy and water efficiency, the proposed building design will provide sustainable and efficient operation to the occupants. Sound and proven sustainability principles have been integrated into the building design, in part through smart technologies (building services) and in part through excellent passive design initiatives (architectural).

The proposed sustainable design initiatives will not only improve the building services life but are low-cost, low maintenance and reliable, especially when compared to often prohibitively complex and expensive retrofits. Furthermore, the passive design principles will facilitate a low-energy and cost-effective operation for the occupants.

The following are some design initiatives which will improve the environmental performance of the development and deliver long term financial benefits:

- Optimising the size of the mechanical plant to ensure the plant is working at its peak efficiency and minimise the capital cost of the plant;
- Variable Speed Drives (VSD) controls the speed of pumps, fans and other mechanical plant to ensure that they only using as much power as it is needed;
- Having high efficiency lighting and air conditioning equipment will reduce the energy consumption of the buildings;
- Commissioning of all building systems to ensure their correct operation;
- A high performance façade will limit the heat entering the buildings, reducing required plant sizes and the energy use over the year;
- A mixed mode approach allowing the buildings to be naturally ventilated when outdoor conditions are suitable allowing significant energy reduction by not requiring the air conditioning system to operate at all times;
- Rainwater harvesting and efficient water fixtures, representing significant potable water conservation.

4. OBJECTIVES

4.1 Design Principles

Environmental sustainability for the proposed development will be achieved in accordance with the following ESD principles:

- Reducing greenhouse gas emissions (energy conservation) through passive building design and efficient building engineering services;
- Maximising indoor environmental quality (IEQ) factors such as internal air quality, light and comfort, which are key considerations for residential developments;
- Water conservation and management;
- Careful selection of materials to minimise environmental impacts;
- Minimising natural resource consumption, waste, pollution and toxicity during the refurbishment and operation of the facility.

It is also recognised that the development of ESD solutions will be an integrated approach with the architecture and the building services as they progress further.

4.2 Integrated Design Approach

The integrated design process is a process by which all of the design variables that affect one another are considered together and resolved in an optimal fashion. Often referred to as holistic design, this approach considers the development as a whole with the emphasis on integrating the different aspects of building's design.

For instance day lighting, thermal comfort and water conservation cut across multiple disciplines. Day lighting in particular affects virtually every design discipline including architecture (building envelope and orientation), mechanical (reduced internal heat loads and modified fabric loads), electrical (lighting design and lighting controls), structural (floor-to-floor heights and external shading) and interiors (interior colours and reflectivity).

Each of these key points are interrelated, a building with good daylight will provide better occupant comfort and well-being as well as reducing energy consumption.

4.3 Green-House Gas Emission Reduction

Greenhouse gas emission reduction is achieved in a staged approach:

- First, reduction in overall energy consumption through demand reduction, passive design and energy efficiency, then;
- Reduction in electricity and gas utility consumption by utilising waste products, rainwater harvesting.

The integrated response to energy proposed for this project is summarised below:

1. Load Reduction and Passive Design;
2. System Efficiency;
3. Capture Waste.

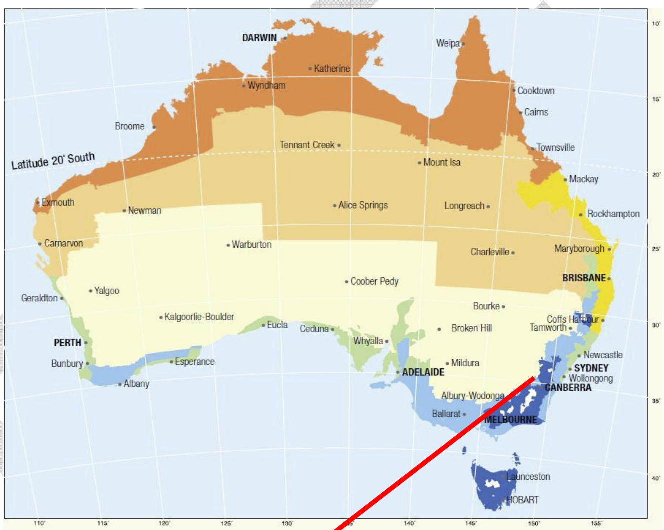
Energy consumption will be reduced through the efficient design of lighting, air-conditioning and ventilation systems, as well as energy efficient water heating.

The development will consider Greenhouse Gas emission reduction in design and operation through utilising initiatives described in the following sections.

5. OBJECTIVES

The proposed development is located in St Peters, NSW which is within the NCC climate zone 5 (warm temperate) and will comprise the following:

- Residential units;
- Commercial/Industrial/Retail tenancies;
- Landscaped / recreational areas as located in the surrounding site area, generally between the respective buildings.



ZONE	DESCRIPTION
1	High humid summer, warm winter
2	Warm humid summer, mild winter
3	Hot dry summer, warm winter
4	Hot dry summer, cool winter
5	Warm temperate
6	Mild temperate
7	Cool temperate
8	Alpine

6. ECOLOGICALLY SUSTAINABLE DEVELOPMENT (ESD) INITIATIVES

The design team will focus on a wide range of ESD strategies which will result in high levels of environmental performance and an important on occupant's health, productivity, comfort and satisfaction.

The following sections of the report outline the sustainability initiatives that will be considered by the design team during the design stages of the development.

6.1 Building Envelope

The BASIX certificate sets out parameters for the residential building envelopes.

The building envelope is designed to reduce heating and cooling requirements through passive design principles. The role of the building envelope is to block solar gains from penetrating the building fabric in summer while optimising daylight and minimising glare. The glazing performance and shading configuration for each orientation have been optimised to ensure that thermal comfort is achieved and solar gains are adequate for the efficient operation of the mechanical system.

Glazing properties have been specified in conjunction with the shading arrangement on each orientation to control solar loads imposed on the mechanical systems, ensuring thermal comfort, optimising daylight penetration and preventing glare. This strategy effectively minimises direct solar loads whilst maximising daylight penetration and access to views.

The building envelopes will be treated with the required levels of thermal insulation to reduce heat gains in hot days and to minimise heat losses in cold days through conduction. This will have significant impact on reducing energy consumption.

6.1.1 Insulation

Insulation reduces the heat transfer between the internal and external conditions. The BASIX certificate shows adequate insulation will be allowed for the ceilings, floors and walls to reduce the heating and cooling load of the buildings and to reduce the ongoing operational costs. This has a twofold saving through a smaller mechanical system capacity along with operating energy consumption reduction.

All insulation installed are required to meet NCC and AS/NZ 4859.1 and the builder is required to ensure compliance, during construction.

Care should be taken when installing insulation to ensure a continuous envelope between a conditioned space and either the outside environment or a non-conditioned space. Insulation is required to be fitted tightly to each side of framing members but need not be continuous over the framing member.

6.1.2 Glazing and Window Framing

The BASIX certificate identifies when adequate performance glass will be provided to reduce excessive heat gains in hot conditions, increasing periods when natural ventilation will be able to restore thermal comfort, and therefore reducing the frequency of air conditioning use.

The following glazing parameters have been considered:

- U-Value: a measure of how much heat is passed through the glass;
- Solar Heat Gain Coefficient (SHGC);
- Visible Light Transmission (VLT): the percentage of visible light transmitted by the glass.

Where possible, the glazing will have a low SHGC to avoid heat gains in the summer, and a low U-value to reduce losses in the winter through the glass. The performance of the proposed glazing systems (glass and frame) are required to comply with NFRC100-2001 conditions and using the tested NFRC values.

Furthermore, the architectural design incorporates effective shading features into the facade to maximise the natural daylight.

6.2 Indoor Environmental Quality Initiatives

6.2.1 Thermal Comfort

Thermal comfort can be provided by passive and mechanical means. Passive design initiatives have been considered before the design of the mechanical systems to reduce operational energy costs, with potential reductions in the air conditioning size and ongoing maintenance.

Thermal comfort is a function of the following factors:

- Radiant temperature (45% of net comfort effect);
- Air temperature and humidity (35% of net comfort effect);
- Air movement, clothing and activity (20% of net comfort effect).

Passive heating and cooling design strategies which will improve occupant thermal comfort include:

- Roof insulation not only reduces heat gain and loss, but will also moderate radiant temperatures from the walls, floor and ceiling;
- Building facades with high performance glazing and window frames will have a combination of external shading and high-performance glass to reduce heat transfer and radiant temperatures in proximity to the windows.

6.2.2 Effective Daylighting / Natural Lighting

Daylighting is the architectural and services design to allow maximum daylight penetration into a building whilst minimising heat gain and thereby reducing indoor lighting loads.

Daylighting strategies will be considered to allow effective control of indoor lighting levels whilst minimising power consumption for buildings. High level of architectural input in regards to design, orientation and external shading have been considered to effectively maximise natural lighting for the
buildings.

Daylighting strategies combined with dimmable lighting systems will allow high control of indoor lighting levels whilst minimising power consumption for the buildings.

6.3 Materials Initiatives

To minimise the environmental impact of the development, preference will be given to environmentally responsible materials during the selection process, according to the following principles:

- Avoidance of ecologically sensitive products (such as scarce minerals and old-growth forest);
- Selection of materials with a low embodied energy and high recycled content;
- Low toxicity material selection;
- Low impact on the indoor environment;
- Durability, flexibility and recyclability;
- Emissions in manufacture and composition, including greenhouse gases and ozone depleting substances;
- Waste reduction - utilising prefabricated construction will minimise construction work and waste on site.

6.3.1 Zone Depletion Materials

Selection of insulation will be targeted to minimise Ozone Depletion Potential (ODP).

6.3.2 Timber

Where possible, timber will be supplied from sustainable sources including Forestry Stewardship Council (FCS) certified plantation timbers and recycled products. No timber (either solid or veneer form) will be sourced from rainforests or old-growth forests.

6.3.3 PVC Minimisation

PVC is being phased out in the European Union, as there is widespread evidence to its harmful environmental impact, particularly during disposal or fire. PVC is used in almost all electrical and data cabling and for drainage pipework. Alternatives to PVC products will be used where feasible:

- HDPE and polypropylene pipe work instead of PVC pipe for water supply and drainage systems;
- Linoleum and other natural products instead of vinyl floor coverings;
- Composite materials for electrical cabling.

6.3.4 Volatile Organic Compounds (VOC) & Formaldehyde Minimisation

To ensure long term comfort of occupants, all due care will be taken to minimise VOC and formaldehydes used within the building. Maintaining VOC limits below the recommended levels will assist in reducing any potential detrimental impacts on occupant health arising from products which may emit volatile pollutants.

VOC's are commonly found in carpets, paints, adhesives and sealants uses in construction and extensive exposure to VOC's can cause Sick Building Syndrome effects (eye, nose and skin irritation, headaches lethargy etc).

Formaldehydes are found within composite wood products and extensive exposure can cause irritation to eyes, nose and throat, lead to skin ailments and respiratory system ailments such as asthma.

Contamination of indoor air by common indoor pollutants will be minimised in this development by careful material selection, including:

- Use of low-VOC and water-based paints rather than oil-based paints, stains or sealants, reducing indoor air contamination and consequent side-effects including sick-building syndrome and respiratory problems;

- Selection of low-VOC carpets and adhesives;

- Selection of low formaldehyde composite wood products, avoiding the carcinogenic effects of formaldehyde off-gassing.

6.4 Energy Efficiency Initiatives

The following energy efficiency initiatives will be incorporated in the building services design.

6.4.1 Efficient Artificial Lighting

High efficiency lighting and effective control initiatives such as daylight and movement sensors will be considered to reduce artificial lighting energy consumption and allow maximum advantage to be taken of natural lighting.

Energy efficiency for the internal lighting throughout the building is required to be in accordance with NCC energy efficiency requirements and the following:

- High quality LED lighting where applicable;

- High efficiency lights including T5 fluorescent or compact;

- fluorescent lights (CFLs), incorporating high frequency ballasts;

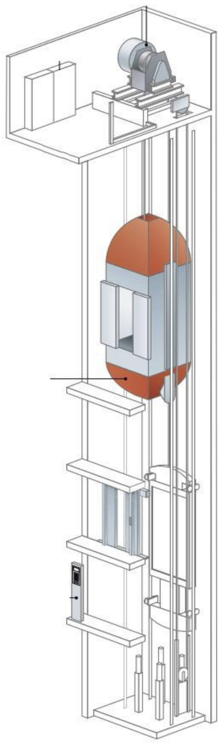
- Efficiency controls including dimming controls, timers and motions detectors in infrequently used areas.

6.4.2 Efficient Lift Technology

The machine-room-less, VVVF lift technology is proposed for this development. A summary of the energy efficiency benefits of this technology is provided below.

With AC Variable Voltage Variable Frequency Drive (VVVF), the drive system's motor speed is controlled by varying the frequency and voltage of the applied Alternating Current (AC) supply. The system allows optimum frequency to produce the desired motion. The advantages of VVVF drive includes low starting current (about 1.8 x rated current); high power factor and efficiency; and good ride quality and floor levelling.

The integrated traffic management system optimises traffic efficiency and saves energy by grouping passengers going to the same destination floor. The system's advanced software drives a powerful logic program to manage the complexities of traffic patterns as they change throughout the day.



By selecting the destination floor before entering the lift, passengers going to the same floor will be directed to take the same lift. The system reduces the number of intermediate stops for each round trip, enabling the lift to return to the main lobby sooner to collect more passengers.

Furthermore, the proposed technology offers the following benefits:

- Regenerative drive;
- Improved power factor performance and minimised harmonic distortion;
- Reduction in peak starting current;
- Reduced heat dissipation;
- Use of motor generator set eliminated (standby power reduced);
- Improved reliability of electrical components and data communication;
- Improved speed control, levelling accuracy and ride comfort;
- Reduced wear and tear.

6.4.3 Efficient Heating, Ventilation & Air-Conditioning

Heating and cooling of the building accounts for a large portion of the buildings' energy use throughout the year. Selection of highly efficient HVAC equipment with high performance levels not only minimises energy consumption, but also reduces operational energy costs.

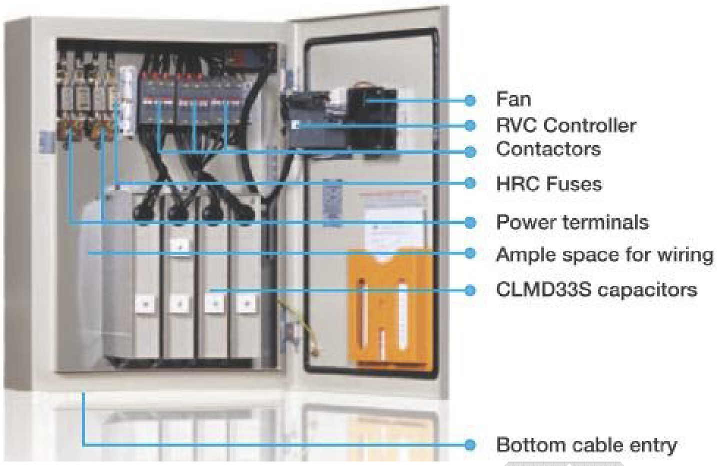
The energy rating for air condition systems and fan selection will be superior to the minimum requirements of the National Construction Code (NCC) and relevant Australian Standards including but not limited to AS1668.1, AS1668.2, AS 1682 and AS3666.

Car park exhaust and supply will be provided for the basement car parking areas. The car park ventilation system will be provided with Variable Speed Drives (VSD) motors and CO sensors as per AS1668.2, NCC requirements to minimise energy use and limit overall system noise levels.

6.4.4 Power Factor Correction

To reduce maximum kVA demand on the electricity grid and lower the demand charges, power factor correction units will be provided at the main switch board(s) in accordance with the NSW Installation and Service Rules.

The power factor correction units proposed will improve the power to a factor of 0.98 or higher.



6.4.5 Domestic Hot Water

The energy needed to meet DHW demand can be greatly reduced by the use of renewable energy technologies such as heat pumps.

A heat pump is a planted system whereby heat from the ambient air is absorbed by a refrigerant gas which is then compressed using a small compressor which causes the gas's temperature and pressure to be raised. This results in a higher temperature and pressure for the gas. This temperature increase then transferred to the water.
Benefits of heat pump technology include:

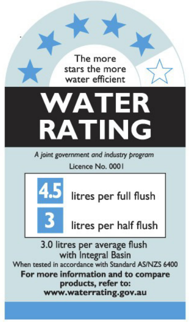
- Substantial savings in hot water related expenses over the long term;
- A heat pump produces approximately 4 times the amount of renewable energy than electricity required to power the unit;
- A heat pump is effective even in low temperatures;
- It is an environmentally friendly hot water option given the reduction in greenhouse gas emissions through less energy requirements;
- Ease of installation as a heat pump uses the same connections as an electric hot water system;
- No roof space or panels will be needed.

Although heat pump technology is more expensive than electric or gas hot water systems, significant energy savings can be achieved with attractive pay-back periods considering the level of demand for hot water in residential buildings. Feasibility of this initiative will be investigated by the hydraulics consultant based on space availability and air ventilation requirements.

6.5 Water Conservation & Management Initiatives

6.5.1 Reduction in water usage

Water usage will be reduced with the installation of low flow equipment such as taps and shower heads. The following measures will be incorporated into the design where possible:



- Showerheads: 3 Stars WELS rated or higher;
- Toilets: 4 Stars WELS rated or higher;
- Kitchen taps: 4 Stars WELS rated or higher;
- Bathroom taps: 4 Stars WELS rated or higher;
- Water efficient landscape requiring minimum amounts of irrigation.

Dual flush toilets will significantly reduce water usage and are already compulsory for all new installations. Appliances such as washing machines will be selected based on their level of water efficiency.

6.5.2 Rain water collection and recycling

Collecting rainwater from roof runoff is a common way to recycle water. In addition to saving drinking water, it allows preparation for times of low rainfall, so landscapes will be maintained throughout the year. It also reduces loads on storm water systems because roof runoff is not flushed into the drains. Rain water will be collected from roof runoff and piped to storage tanks and will be used on site.

Ultra-violet (UV) treatment is the disinfection process of passing water by a special light source. Immersed in the water in a protective transparent sleeve, the special light source emits UV waves that can inactivate harmful microorganisms. This method of treatment is growing in popularity because it does not require the addition of chemicals.

With treatment to Class A, recycled water will be used on an unrestricted basis for irrigation and garden watering.

6.5.3 Water consumption tracking and monitoring (Smart Water Metering)

Smart Water Metering will identify abnormal usage patterns usually associated with leaks, helping to reduce the considerable water lost in this way. In addition, it would allow water efficiency measures to be monitored and tracked for the facilities.

6.6 Environmental Management Initiatives and Performance Monitoring

6.6.1 Energy Sub-Metering

Sub metering to be provided to monitor lighting, mechanical board and general power consumption for the base building.

Smart metering could be provided for a visual display of the consumption for Electricity, Gas, CO2 emissions and Water. This will enable the building managers to analyse and monitor the consumption at regular intervals (i.e. daily, weekly, monthly quarterly or annual).

The visual display will also be able to provide information on the costs associated with this usage, to encourage reduced consumption.

6.6.2 Waste Management System

To encourage and facilitate effective waste management once the development is in operation, sufficient spatial provision will be made to allow for the effective separation of waste from recycling. Dedicated waste recycling rooms allow space for the separation and storage of recyclable waste during the building's operation, allowing for the following waste streams to be separated:

- Glass;
- Cardboard;

- Paper;
- Organics;
- Plastics;
- Metals.

Waste management solutions are varied and dependant on the extent of commitment of the end user. Recycling, reuse and composting are examples of waste management options.

6.6.3 Environmental Management and Maintenance

Effective environmental and waste management will be implemented throughout the demolition, construction and operational stages of this development.

The aforementioned EMP shall include a Waste Management Plan, specifying recycling targets for demolition and construction waste. It is recommended that construction and demolition contracts stipulate a minimum 80% target for diversion of waste from landfill. This may be achieved through recycling or reuse.

- Identification of appropriate waste sub-contractors for recycling, costs of collection and timing of collection service;
- Participation in waste minimisation training for contractors and sub-contractors;
- Published waste minimisation plan to reduce site waste to landfill;
- Provision of separate waste skips for cardboard, timber, metal, soft plastic, polystyrene, insulation, concrete, glass and bricks.

6.7 Emissions

In addition to the reduction in greenhouse emissions as a result of lower on-site energy usage, emissions to land, air and water will be minimised in the following ways:

- Where available, thermal insulation products should be selected which have a low Ozone Depletion Potential in their manufacture and composition, reducing the impacts of insulation on the atmosphere;
- Where feasible, refrigerants will have an Ozone Depletion Potential of zero; and integrated refrigerant leak detection will ensure early identification of leaks;
- Estimated wastewater discharge to sewer will be significantly reduced relative to a standard building through the implementation of water efficiency measures;
- External light pollution will be controlled by careful lighting design, in accordance with AS 4282-1997.

6.8 NABERS

The commercial/retail/industrial portions of the development will target a 4.5 Star rating as a minimum and set a new best practise benchmark in the Marrickville LGA.

7. CONCLUSION

Ecological Sustainability for the Precinct75 development is achieved in an integrated and staged approach:

- Reducing the need for energy and water consumption through building fabric optimisations, passive solar design, demand reduction and energy & water efficiency;
- Optimising electricity, water and gas consumption by utilising waste products and rainwater harvesting.

Various passive and active sustainability design initiatives will be considered for the development such as:

- Building Fabric;
- Indoor Environmental Quality (IEQ) and Thermal Comfort;
- Effective Natural Lighting;
- Energy Efficiency;
- Water Efficiency;
- Material Initiatives and Waste Minimisation;
- Environmental Management.

Lighting energy efficiency design and control strategies will be considered to reduce artificial lighting energy consumption and allow maximum advantage to be taken of natural lighting.

Consumption of potable water will be significantly reduced by utilising water efficient fixtures and equipment within the buildings. Collection and treatment of rainwater for the use of irrigation will further reduce the overall water consumption of development.

A wide range of environmental management initiatives will be considered for the development, such as:

- Energy and Water sub-metering;
- Waste Reduction Management;
- Environmental Management for the residential buildings and common areas.