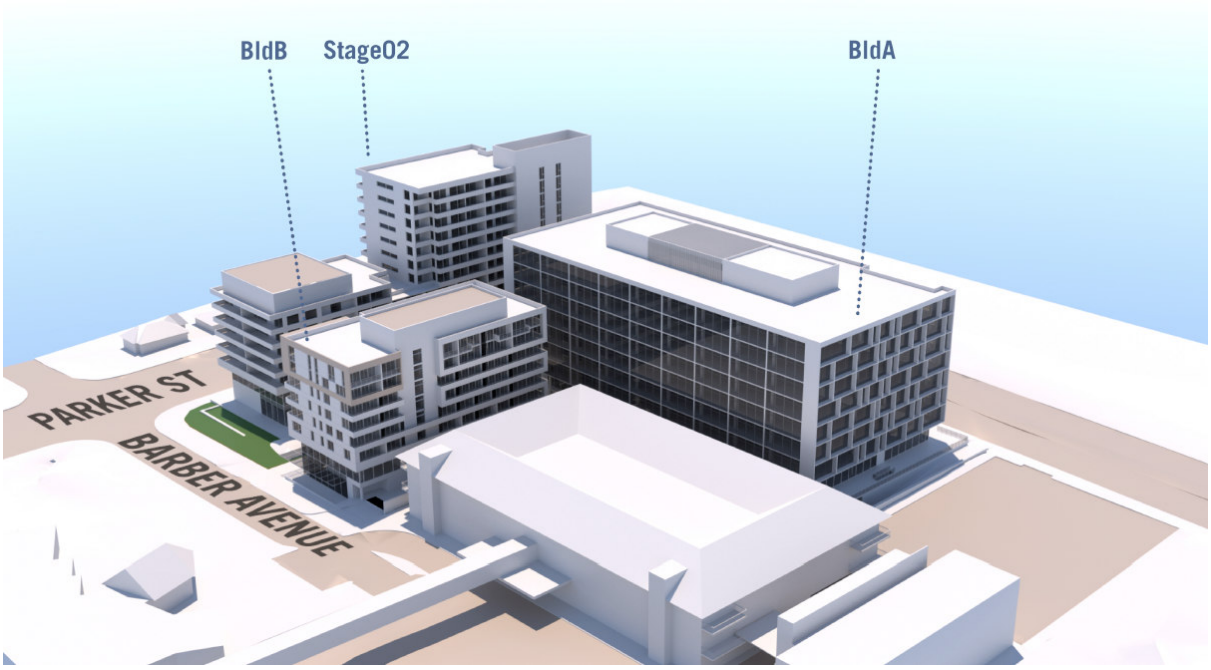
Turner + Associates Architects

Barber Avenue

ESD Report of Barber Ave



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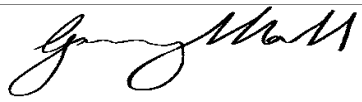
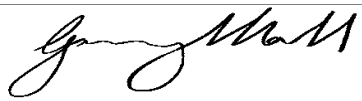
Checker	Garry Wall	
Approver	Garry Wall	

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1 Executive Summary

This report describes the Ecologically Sustainable Design principles proposed to the development of Barber Avenue, Kingswood. The report gives descriptive consideration to the ESD principles including efficient usage of energy, indoor environment quality.

As part of the Director General's Requirements there are two requirements that relate to Ecologically Sustainable Development, it states,

"The EA shall detail how the development will incorporate ESD principles in the design, construction and ongoing operation phases of the development."

"Demonstrate how the proposed development will achieve design excellence including: the sustainable design principles incorporated into the development in terms of sunlight, natural ventilation, wind, reflectivity, visual and acoustic privacy, safety and security and resources, water and energy efficiency"

Design

Throughout design process the building will adopt the best practice items from leading sustainability tools like Green Star ESD items and many of these items have been detailed within this report.

Energy modelling during design will be performed to optimise the buildings systems in terms of energy efficiency. One member of the design team will be an accredited ESD professional to assist in the implementation of the ESD items into the design.

Construction

During construction, waste will be recycled and Environmental Management Plan will be created for the building.

Post Construction

Building tuning of equipment & systems will be performed over the first year to optimise the performance of the building in terms of energy efficiency and a building user guide will be available to the occupants so that the buildings ESD items can be used to their full potential and maintained to optimal performance.

Building Form

The buildings orientation allows for a high level of daylight during normal occupancy hours in all buildings while reducing energy consumption through shading elements. The residential building has openable doors to assist with natural ventilation. The glazing will mainly be double glazed units with low U values and Shading Factors

Water

All fittings and fixtures will be highly efficient in terms water consumption and rain water harvesting will be incorporated into the building to reduce water consumption.

Energy

Throughout the commercial development energy efficient lighting will be installed with zoning control and an efficient layout. Reverse cycle air conditioning systems will be installed that will only run when required within each tenancy which will be highly efficient. There is a central atrium with a glass roof which will reduce the required lighting levels and possible natural ventilation options will be looked at during the design stage.

Within the carpark there will be bicycle spaces for 10% of the building occupants and visitor cyclist facilities outside the entrance to the building

The report herein details each of the ESD items that are to be incorporated into the building and the development as a whole. These ESD items meet the two Director General's Requirements.

2 ESD Review of Barber Avenue

2.1 Introduction

Hyder have reviewed the proposed development at Barber Avenue against the Director Generals Requirements (DGRs), local policy guides, market place benchmarking and good practice ESD principles to assess the level of ESD initiatives that should be incorporated into the design.

The DGR requirements are very broad and do not mention any specific items that are to be included.

There are a couple of ESD tools within the market place that apply to commercial buildings. However since development is to be strata commercial the tools in the marketplace cannot be applied officially.

One of these tools is Green Star that assesses the development against multiple criteria to determine the overall sustainability of the development. Even though the building is strata the development could still be assessed against the tool to determine what ESD items will be beneficial to the development.

The building will have to comply with Section J of the BCA which deals with energy efficiency.

This report details the ESD items that the building will comply with to demonstrate compliance with the Director Generals Requirements.

3 Director General's Requirements

In the director general's requirements for Ecologically Sustainable Development, it states,

"The EA shall detail how the development will incorporate ESD principles in the design, construction and ongoing operation phases of the development."

"Demonstrate how the proposed development will achieve design excellence including: the sustainable design principles incorporated into the development in terms of sunlight, natural ventilation, wind, reflectivity, visual and acoustic privacy, safety and security and resources, water and energy efficiency"

There are also a number of policies and guidelines that need to be addressed.

A review of these policies and guidelines has been carried out and any ESD requirements detailed in the policies, guidelines and DGR's are very broad and do not state specific ESD targets that need to be met or items that need to be included.

Below is list of items throughout the development that demonstrate the ESD principles throughout the development as per the DGR's.

4 Building Description

The project involves the construction of two buildings, a new 9 story office building with retail on the lower ground and ground floor and a 7 story residential building with retail and commercial on the lower ground and ground floor.

The buildings will comprise three levels of basement car park with essential plant and equipment located in single plant rooms on each roof.

The commercial building is predominantly made up of double glazed glass façade that has around a 50% glass to façade ratio. On the north façade there is a shading scheme that utilizes two louvres and on the east and west there are vertical louvres along the full length of the facade.

For details of all windows and balcony doors throughout the project refer to architectural plans prepared by Turner Associates.

This report should be read in conjunction with the architectural plans and details as prepared by Turner Associates, which are not attached to this report.

5 Rating Tools

Commercial

For a Commercial Development there are two recognised sustainability tools that can be applied, Green Star and NABERS Energy.

NABERS is a performance based rating system for existing buildings which rates a building on the basis of its measured operation impacts on the environment. NABERS is run by the Department of Environment, Climate Change and Water (DECCW). This tool can also be applied to new buildings by creating a thermal model of the building during design stage.

Green Star Office Design evaluates separately the environmental initiatives of design, projects and/or buildings based on a number of criteria, including energy and water efficiency, indoor environment quality and resource conservation. Green Star is a voluntary rating system run by a private company called the Green Building Council of Australia (GBCA). For the energy portion

of Green Star it incorporates the NABERS tool to calculate the performance of the building. A Green Star rating will range from 0 to 6 Star with 4 star being the minimum certified rating which includes a minimum requirement of a 4 star NABERS rating.

Since the building will be a strata development a NABERS rating and a Green Star Rating cannot be achieved. This is due to the majority of the air conditioning systems being owned by the tenants and this will result in an unrealistically high NABERS rating and therefore DECCW have excluded Strata Buildings from the NABERS rating system.

Even though the building cannot get a Green Star Rating the building can still be assessed against the majority of the sustainability credits and can be used as a reference for the targets that should be met for this development.

Retail

There is a Green Star tool for retail areas. However due to the size of the retail it is not worthwhile to get a Green Star rating but it will follow the same principles that are incorporated throughout the commercial building.

Residential

The residential portion of the development is classed as a “Hotel” under the BCA. For hotels there are currently no tools available for new builds. However the residential portion will follow the same ESD principles that are incorporated throughout the commercial building.

6 ESD Statement

This rest of the report highlights the ecologically sustainable design principles in the development of Barber Avenue, Kingswood. The appropriate design principles and guidelines for energy conservation and ESD measures shall be applied to the whole building to generate an ecologically friendly building, ensuring at the same time, a high quality of comfort for the occupants. The design shall address the issues of management, indoor environment quality, energy consumption, transport, water consumption, land use and ecology, and emissions.

The building shall be suitably designed and constructed considering present worth analysis of the investment options, energy efficiency, indoor environment quality, ecologically sustainable design principles, and good engineering practice. The project shall be designed to the level of a Grade A building.

Since the building cannot get a official Green Star rating it will be design based on the Best Practice items from leading sustainability tools such as Green Star and NABERS.

7 Passive ESD Design

Passive systems are those in which internal conditions are modified as a result of the behaviour of the building form and fabric. There are appropriate passive strategies for lighting, heating and cooling. The degree of emphasis placed on each in the design of a building depends on the orientation, shading and climate in which the building is to be located. Key inputs from the architect & ESD team are vital to ensure that passive design is optimal from early on in the planning phase. Such aspects of this building shall become the responsibility of the architect and other like designers.

The objective of the passive design section is to assess the strategies developed to improve the performance of the passive elements. Addressed within the passive design are the following systems:

7.1 Building Form

The buildings will be located at Kingswood. All commercial office suites and residential apartments will be susceptible to the solar environment during certain times of the day.

The commercial building has been designed to minimise the east and west peak loads by reducing the east and west façade. The buildings aspect also allows for over 80% of the space to have a direct line of sight to an external view (within 8 meters of a window) to increase the comfort of the occupants.

The residential building has been designed to minimise northern peak loads by reducing the size of the north façade which assists in reducing the peak load during the middle of the day.

Incorporation of appropriate amounts of thermal mass, use of insulation and provision for ventilation are important design features in passive heating and cooling strategies and will continue to be developed for the new buildings. The insulation will meet the Section J requirements and will be low Ozone Depletion Potential.

7.2 Glazing

Glazing on the commercial office building will provide good natural light to the suites over the whole day. The east, west and south façade will be double glazing with a low U value to reduce the heat gain through the glass. The northern façade will have a high U-value which the Section J of the BCA states is best option for the north façade of a building in Sydney.

For the residential building there will be a good level of natural light in the mornings and afternoon when typically tenants are usually occupying the space. The east and west façade will be double glazing with a low U value to reduce the heat gain during the summer months.

Appropriate treatment of all the glazing will ensure reduced levels of solar penetration as well as maintaining high levels of transmisitivity. The Glazing scheme involves a ratio of glazing to façade on all sides to create a good balance between the indoor environment quality and thermal efficiency. Occupant controlled internal blinds will be used to reduce glare throughout the day in both buildings.

7.3 Sun shading

The commercial building will incorperate sun shading schemes on the northern, east and west façades from Level 1 to Level 8. This controls the level of solar radiation penetrating the glass and reduces the direct light penetration throughout the peak times of the year.

The northern shading scheme consists of two 600mm louvres with 1000mm spacing. The east and west façade have vertical louvres running along the length of the façade.

The louvres on the north façade are to decrease the load on the thermal mass in the building, particularly in the mid summer afternoons and the east and west louvres decrease morning and afternoon load. All the louvres are to decrease winter load and to reduce the glare in the winter due to the low lying sun.

In the residential building most windows on the east and west are shaded from the balcony above. There is also a balcony rail on each of the balconies that assists in reducing the load for low lying sun. Between each unit there is a vertical element on the balcony for privacy that also assists in reducing the solar load on the units throughout the day.

8 Building Services

8.1 Mechanical Services

8.1.1 Air Conditioning Plant

There will be one plant room located on each of the roofs. Plant systems will minimise environmental impact and increase indoor environment quality by ensuring;

- The building load incorporates diversity;
- Building loads are reduced by high plant operating differentials where possible;
- Plant equipment is selected with high efficiencies;
- Plant equipment is not oversized;
- Variable speed drives are provided for all the pumps;
- System components are not undersized – correctly sized pipes and valves reduce pressure drop thereby reducing energy consumption of the associated plant equipment;
- Economy cycle operation of all centralised air handling plants.
- The noise levels of the building services will meet the recommended design sound levels provided in Table 1 of AS/NZS 2107:2000.
- All refrigerants will have a zero Ozone Depletion Potential.
- Cooling towers will be selected with water treatment that achieves six cycles of concentration or better.
- Individual reverse cycle systems with a centralised condenser water system. This will allow suites to be turned off when not in use. If one unit is turned on over the weekend for afterhours then the efficiency of the system will still be the same when all units are running.
- Occupant sensors for each unit to modify the unit based on whether the space is occupied or not.

8.1.2 Ventilation and Air Conditioning

Mechanical ventilation systems are provided as required by AS 1668.1 & 2 and the BCA. Fan systems will minimise environmental impact and increase indoor environment quality by ensuring;

- High efficiency motors are considered where fans are constantly running.
- Fans are correctly sized to suit the need associated with each fan.
- Variable speed drives are proposed for fans that are not fully loaded all the time.
- CO monitoring for carpark ventilation systems.
- CO2 monitoring with the space to reduce the fresh air requirement
- Ductwork systems and components are not undersized – appropriately sized ductwork and balancing dampers will reduce the pressure drop thereby reducing the energy consumption of the fan motor;
- Smart diffuser layout to achieve an air change effectiveness greater than 0.95.
- 50% improvement on AS 1668.2 for fresh air supply.

8.1.3 Controls

The mechanical services system includes a DDC base BMS for all the mechanical systems control. The BMS is to incorporate features that can substantially reduce energy consumption. The features include:

- Variable water flow systems.
- Variable flow for cooling tower system.
- Variable carpark ventilation systems.
- Twelve months advance programming with quarterly reviews during the first year of operation.
- Automatic adjustment of times at the start and finish of daylight saving.

8.2 Electrical Services

8.2.1 Lighting

All lighting is to be designed and selected on the basis of maximising lamp life, minimising energy consumption and improving indoor environment quality. The lighting mixture of metal halide, LED, linear fluorescent and compact fluorescent luminaires is to be designed to suit the functional requirements of the space but not be excessive. Switching arrangements for lighting will be such as to permit illumination in an efficient manner with zonal switching. Design features include:

- Lighting performance and loss factors are in accordance with AS 1680.1 Section 12. The provision of illuminance and loss factors in excess of these recommendations is wasteful of energy. Additional cooling capacity (with consequent additional energy use) would be required to remove the heat generated by luminaires in air conditioned spaces;
- Integration of artificial lighting with daylight. Where appropriate controls are to take into account the option to reduce or turn off entire areas upon adequate daylight.
- High Frequency Ballasts for fluorescent luminaires will be used.
- Lighting levels will comply with the requirement of AS1680. 320 Lux will be achieved within open plan office areas.
- Lighting power densities will not exceed 8W/m² for 95% of the NLA
- All individual or enclosed spaces will have individual switches.
- No light beam will be directed up into the sky or over the site boundary.

8.2.2 Controls

The electrical services system includes programmable controls and local switches. These programmable controls and switches incorporate features that can substantially reduce energy consumption. Design features include:

- Control devices such as local switches, time switches, light sensing devices or movement sensing devices, where appropriate, are to be utilised, thereby restricting the unnecessary use of lighting;
- Electrical sub-meters will be used on all substantive energy uses (greater than 100kVa) and tenancy sub-meters will be provided for all floors and tenancies.
- Twelve months advance programming with quarterly reviews during the first year of operation; enabling automatic adjustment of times at the start and finish of daylight saving, shutdown of the lighting on public holidays.

8.3 Hydraulic Services

8.3.1 Cold Water

- Water efficient taps and faucets to be considered throughout the development to restrict flow to the outlets and therefore conserve water consumption.
- The maximum working water pressures will be controlled via adjustable pressure reduction valves.

8.3.2 Hot Water

- Hot water generation for commercial office suites will consist of a centralised gas fired hot water storage systems
- Hot water generation for commercial office suites and residential building will consist of zip units for each office tenancy. Due to the natural of the building being commercial strata the most efficient means to heat the water is using instantaneous gas water heaters.
- Temperature control of hot water to personal hygiene fixtures (basin, bath & shower) shall be in accordance with the intent of AS 3500.4
- Accessible toilets will be provided with thermostatic mixing valve to control hot water temperature to all personal hygiene fixtures at 42 deg C.
- Male and female toilets change rooms amenities will be provided with thermostatic mixing valves to control hot water temperature to all personal hygiene fixtures at 50 deg C
- Water efficient taps and faucets to be considered throughout the development to restrict flow to the outlets and therefore conserve water consumption;
- Hot water pipework to be lagged throughout the development to conserve energy (heat) losses via pipework.

8.3.3 Sanitary Fixtures and Tapware

- All tapware and/or outlets to incorporate flow restriction. All spouts to terminate with aerators.
- All shower and basin tapware to be “AAA” water consumption rating.
- All WC cisterns to incorporate dual flush.
- All Urinal cisterns to be operated via proximity activation sensors.
- All tapware for basins, sinks and showers to incorporate ceramic disc valves, either “single lever mixers” or “half turn”, with adjustable or fixed flow settings.

8.3.4 Internal Stormwater Plumbing & Drainage

- All roof water run-off will be collected via a rainwater collection tank. This water will then be distributed to the toilets, urinals and irrigation. When the tank is full it will be capable of supplying the toilets and urinals for 20 days.
- Tank overflow will discharge into the surface stormwater collecting system prior discharging to the OSD tank and GPT
- All basement areas to be collected and discharged via a gravity oil separator before discharging into the external gravity stormwater system

8.3.5 Fire Protection Services

The building will be fully sprinklered and will be equipped with hydrants, hose reels, stair pressurization systems, smoke detection systems, smoke relief system, EWIS systems and other essential services systems as required by the BCA and other relevant standards.

The test water and maintenance drain-downs will be transferred into the rainwater tank to reduce the water usage of the building.

9 Other ESD Items

9.1 Energy Modelling

During the design stage energy modelling will be performed to assess the energy efficiency of the building and to assist in optimising the design.

9.2 Green Star Accredited Professional

Star Accredited Professional will have intimate involvement during the design stage to assist in implementing all of these items.

9.3 Building Users Guide

A Building User's Guide which includes information on Energy and Environmental Strategy, Monitoring and Targeting, Building Services, Transport Facilities, Materials and Waste Policy, and Expansion/Re-fit Considerations will be supplied.

9.4 Commissioning

There will a contractual requirement with the contractor to have an Environmental Management Plan (EMP) and have an ISO 14001 Environmental Management System Accreditation applicable to the building.

The client will be committed to a firm 12 month commissioning building tuning period after handover with minimum of quarterly reviews.

9.5 Construction Waste Management

A comprehensive waste management plan will be implemented with 60% of all waste by weight being recycled or reused. A dedicated on-site waste management area will be established to sort and segregate the waste. Waste skips or bins will be provided for the following materials;

- Cardboard
- Timber
- Metal
- Soft Plastic
- Polystyrene
- Insulation
- Concrete
- Glass
- Bricks

Records will be kept by the contractor to demonstrate the actual percentage of waste recycled.

9.6 Concrete

To reduce the embodied energy and resource depletion associated with the development 30% of in-situ, 20% of pre-cast and 15% of stressed concrete will be substituted with industrial waste product or oversize aggregate.

9.7 Recycling Waste Storage

A dedicated storage area will be provided for the separation, collection and recycling of office consumables. The storage area will be located in the basement next to the lift shaft to provide easy access for all building occupants and recycling companies.

The storage area will provide recycling bins for the following waste streams, paper, glass, plastics, metals and organic (compost) materials.

9.8 Carpark

The carpark has been designed at the minimum planning allowance to assist in reducing the number of cars. In the carpark 10% of the carparks will be dedicated solely for small cars, carpool participants or hybrid/alternative fuel vehicles.

9.9 Cyclist Facilities

Secure cyclist facilities will be provided to accommodate 10% of the building staff. The facilities will include secure bicycle storage and lockers, accessible showers with changing facilities.

Visitor bicycle storage will be provided in an accessible location, signposted near the main public entrances.