

SSDA ESD Report

Aspect Industrial Estate Lot 4



Prepared for:
Mirvac

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Acknowledgment of Country

In the spirit of reconciliation, Stantec acknowledges the Traditional Custodians of country throughout Australia and their connections to land, sea and community. We pay our respect to their Elders past and present, and extend that respect to all Aboriginal and Torres Strait Islander peoples.

Disclaimer

This report has been developed based on the development level information provided to Stantec. Stantec has taken every effort to ensure the information presented in this report is an accurate reflection of the development but cannot guarantee the final performance of the building. The content of the development, including systems, materiality and finishes is subject to final architectural and client approval and subject to change.



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1 Executive Summary

This Ecological Sustainable Development Report has been prepared for Mirvac for the proposed new Warehouse 4 at Aspect Industrial Estate development located at 788-882 Mamre Road, Kemps Creek NSW 2178. This report is intended to provide an overview of the ecologically sustainable design (ESD) principles and greenhouse gas and energy efficiency measures that will be implemented and is intended to form part of the Environmental Impact Statement (EIS) in support of a concurrent Concept Proposal modification application to SSD-10448 (MOD 12) and a SSD application to SSD-98407710 to update the Warehouse 4/Lot 4 development layout within 788-882 Mamre Road, Kemps Creek (Lot 301 DP1305254, Lot 105 DP1305965, Lot 305, DP1305254 and Lot 104, DP1305965) known as Aspect Industrial Estate (AIE).

This is a direct design response to the ESD and energy efficiency components of Planning Secretary's Environmental Assessment Requirements (SEARs) issued for the proposals SSD-98407710 and SSD-10448, and also to other regulatory frameworks as listed below. Information contained within this report has been prepared in direct response to:

- The Secretary's Environmental Assessment Requirements (SEARs) for the development (SSD-98407710 and SSD-10448);
 - » Greenhouse gas and energy efficiency;
 - » Ecologically sustainable development.
- The NSW Environmental Planning and Assessment Act 1979;
- The NSW Environmental Planning and Assessment Regulation 2021;
- State Environmental Planning Policy (Industry and Employment) 2021;
- Section 3.2(1) of the State Environmental Planning Policy (Sustainable Buildings) 2022;
- Penrith Development Control Plan (DCP) 2014; and
- Mamre Road Precinct Development Control Plan (DCP) 2021.

The report includes:

- An overview of the sustainability drivers for the project (both regulatory & identified project drivers);
- Detail regarding specific ecological sustainable development initiatives through all phases of the project;
- Initiatives that will minimise the consumption of energy, water and material resources, whilst maintaining a high indoor environmental quality for occupants.

In order to achieve the above main goals, drivers and SEARs requirements, the project will implement a number of greenhouse gas and energy efficiency initiatives and sustainable design principles, including:

- Buildings to be net positive for carbon emissions where determined by Mirvac to be appropriate;
- On-site Renewable Energy Production: minimum 200kW Solar System for Warehouse 4;
- Environmental outcome benchmarked to a minimum of 5 Star Green Star Buildings;
- Smart metering;
- Electric car and truck charging dedicated bays;
- Rainwater harvesting and reuse for irrigation;
- Explore opportunities to reduce embodied energy reduction associated to construction material selection;
- Others as presented in the following Sections.

2.1 Site Description

2.2 Project Description

The proposed State Significant Development (SSD) Development Application (DA) seeks approval for the construction of a warehouse or distribution facility at Lot 4/Warehouse 4 (SSD-98407710) as established under the concept plan SSD-10448 MOD 12.

2.2.1 SSD-10448 MOD 12

A change to the warehouse footprint and on-lot configuration of Lot 4 and Lot 5 will be sought under SSD-10448 MOD 12 intended to be lodged concurrently with the Warehouse 4 SSDA. The modification will seek to consolidate the warehouse built form from two (2) buildings, as currently approved, into a single building identified as Warehouse 4.

This modification will also seek to amend the alignment of the Automated Guided Vehicle network at the eastern boundary of Lots 4 & 5 to be consistent with the approved AGV alignment within the GPT approvals to the north and Barings approvals to the South.

2.2.2 Warehouse 4 (SSD-98407710)

Warehouse 4 on AIE Lot 4 will comprise one (1) warehouse building. It is proposed to be used for warehouse and distribution premises 24 hours a day, 7 days a week. The proposed development will comprise:

- Construction and fitout of a warehouse building, comprising 30,095sqm of Gross Floor Area (GFA)
- Ancillary two level office space, comprising 700sqm of GFA
- Ancillary dock office space, comprising 200sqm of GFA
- Hardstand comprising of 21,950sqm
- Landscaped Area of 16,890sqm, comprising 24% of site area
- Car parking area, including 128 spaces on the southern side of the proposed warehouse.



Figure 2. Lot 4 Site and Warehouse Plan (SBA Architects)

DEVELOPMENT SCHEDULE	
SITE AREA	69,755 m ²
SITE COVERAGE	45%
WAREHOUSE GFA	30,095 m ²
OFFICE (2 LEVELS)	700 m ²
DOCK OFFICE GFA (2 OFF)	200 m ²
TOTAL GFA:	30,995 m²
BUILDING AREAS - GFA (GFA assumptions: All walls are 150mm thick and stairs/lifts and void spaces in the office total 70sqm)	
WAREHOUSE AWNINGS	4,015 m ²
HEAVY DUTY PAVING	17,345 m ²
LIGHT DUTY PAVING	4,605 m ²
LANDSCAPING (24%)	16,890 m ²
(INCLUSIVE OF LANDSCAPE WITHIN FREIGHT CORRIDOR: 2,825 m²)	
PARKING	
CAR PARKING RATE: 1 SPACE PER 300 m² OF WAREHOUSE GFA + 1 SPACE PER 40 m² OF OFFICE GFA CAR PARK DIMENSIONS: 5.4m X 2.5m CAR PARK BAY MIN. 6.5m WIDE CAR PARK DRIVEWAY & AISLES	
CAR PARK REQUIRED	124
CAR PARK PROVIDED (INCLUSIVE OF DISABLED AND EV SPACES)	128
CYCLE PARKING	30

Table 1. Warehouse 4 Areas (SBA Architects)

3 Sustainable Design Framework

The proposed sustainability response for the project includes various associated drivers, including the following regulatory frameworks:

- The Secretary's Environmental Assessment Requirements (SEARs) for the development (SSD-98407710 and SSD-10448);
 - » Greenhouse gas and energy efficiency, reflecting the Government's goal of net zero emissions by 2050;
 - » Ecologically sustainable development.
- The NSW Environmental Planning and Assessment Act 1979;
- The NSW Environmental Planning and Assessment Regulation 2021;
- State Environmental Planning Policy (Industry and Employment) 2021;
- Penrith Council Development Control Plan (2014);
- Penrith Council Local Environmental Plan (2010); and
- Mamre Road Precinct Development Control Plan (DCP) 2021.

3.1 Secretary's Environmental Assessment Requirements for the development (SSD-98407710 and SSD-10448)

The following key issues from the Secretary's Environmental Assessment Requirements SSD-98407710 and SSD-10448 are addressed in this report:

- **Greenhouse gas and energy efficiency** – including an assessment of the energy use of the proposal and all reasonable and feasible measures that will be implemented on site to minimise the proposal's greenhouse gas emissions, reflecting the Government's goal of net zero emissions by 2050.

The NSW Government has committed to an aspirational objective of achieving net-zero emissions by 2050. The intent of this aspirational objective is to provide a clear statement of the government's intent, commitment, and level of ambition and to set expectations about future emissions pathways that will help the private sector and government agencies to plan and act. It is consistent with the Paris Agreement which the Commonwealth Government has committed to ratifying, and is intended to complement, rather than replicate or duplicate the Commonwealth Government's shorter term national emissions reduction targets.
- **Ecologically sustainable development** – including a description of how the development will incorporate the principles of ecologically sustainable development in the design, construction and ongoing operation of the development.

3.2 The NSW Environmental Planning and Assessment Regulation 2021

Schedule 193 of Division 5 of Part 8 of the Environmental Planning and Assessment Regulation 2021 states:

193 Principles of ecologically sustainable development

- The principles of ecologically sustainable development are the following—
 - » the precautionary principle,
 - » inter-generational equity,
 - » conservation of biological diversity and ecological integrity,

- » improved valuation, pricing and incentive mechanisms.
- The precautionary principle is that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.
- In applying the precautionary principle, public and private decisions should be guided by—
 - » careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment, and
 - » an assessment of the risk-weighted consequences of various options.
- The principle of inter-generational equity is that the present generation should ensure the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations.
- The principle of the conservation of biological diversity and ecological integrity is that the conservation of biological diversity and ecological integrity should be a fundamental consideration.
- The principle of improved valuation, pricing and incentive mechanisms is that environmental factors should be included in the valuation of assets and services, such as—
 - » polluter pays, that is, those who generate pollution and waste should bear the cost of containment, avoidance or abatement, and
 - » the users of goods and services should pay prices based on the full life cycle of the costs of providing the goods and services, including the use of natural resources and assets and the ultimate disposal of waste, and
 - » established environmental goals should be pursued in the most cost effective way by establishing incentive structures, including market mechanisms, that enable those best placed to maximise benefits or minimise costs to develop their own solutions and responses to environmental problems.

3.3 State Environmental Planning Policy (Industry and Employment) 2021

Chapter 2 Western Sydney employment area of the State Environmental Planning Policy (Industry and Employment) 2021 states:

Part 2.4 Principal development standards

2.19 Ecologically sustainable development

The consent authority must not grant consent to development on land to which this Chapter applies unless it is satisfied that the development contains measures designed to minimise—

- the consumption of potable water, and
- greenhouse gas emissions.

3.4 State Environmental Planning Policy (Sustainable Buildings) 2022

Section 3.2 (1) of the State Environmental Planning Policy (Sustainable Buildings) 2022 states:

3.2 Development consent for non-residential development

(1) In deciding whether to grant development consent to non-residential development, the consent authority must consider whether the development is designed to enable the following—

- the minimisation of waste from associated demolition and construction, including by the choice and reuse of building materials, - refer to 4.6 Waste Management
- a reduction in peak demand for electricity, including through the use of energy efficient technology, - refer to 4.2 Greenhouse Gas Emission Reduction & Energy Efficiency
- a reduction in the reliance on artificial lighting and mechanical heating and cooling through passive design, - refer to 4.2 Greenhouse Gas Emission Reduction & Energy Efficiency
- the generation and storage of renewable energy, - refer to 4.2 Greenhouse Gas Emission Reduction & Energy Efficiency
- the metering and monitoring of energy consumption, - refer to 4.2 Greenhouse Gas Emission Reduction & Energy Efficiency
- the minimisation of the consumption of potable water. - refer to 4.3 Water Efficiency

In addition, schedule 3 Energy use of the State Environmental Planning Policy (Sustainable Buildings) 2022 states:

(1) The standard for energy use for development for the purposes of prescribed office premises is a **5.5 star NABERS energy rating**.

Schedule 3 Water use of the State Environmental Planning Policy (Sustainable Buildings) 2022 states:

The standard for water use for large commercial development is a **3 star NABERS water rating**.

3.5 Penrith Development Control Plan (DCP) 2014

The Penrith Development Control Plan 2014 has been prepared in accordance with Section 74C of the Environmental Planning and Assessment Act 1979 and clause 16 of the Environmental Planning and Assessment Regulation 2000.

Chapter **C1 Site Planning and Design Principles** of the Penrith Development Control Plan 2014 states:

1.2. Design Principles

B. Objectives

- b) To ensure that development is designed on a 'whole of building' approach by:
 - ii. responding to climatic and contemporary environmental conditions by:
 - encouraging passive solar building design;
 - allowing reasonable daylight access to all developments and the public domain;
 - reducing the necessity for, or improve the control of, mechanical heating and cooling;
 - reducing the energy consumed by installed appliances and equipment;
 - improving the indoor environmental quality of occupants;
 - minimising greenhouse gas emissions;

1.2.2. Built Form – Energy Efficiency and Conservation

- a) The selection criteria for construction materials, including internal fit-out work, should include detailed documentation of their energy efficiency properties.
- b) Buildings should be designed on passive solar design principles which:
 - Respond to orientation to maximise the northerly aspect and solar access in the cooler periods;

- Reduce overheating in summer and promote solar gain in winter; and
 - Ensure there is adequate cross flow of air by utilising natural ventilation, resulting in a reduction in the use of mechanical ventilation and/or air-conditioning systems.
- c) The future use and occupants of the building should be considered in the design and location of building services/equipment to ensure that:
- The thermal comfort of occupants is optimised through zoning sections of the floor area to
 - of building services is provided enable individual control of heating and cooling;
 - Lighting systems and fittings have reduced energy consumption that are also appropriate for the use/activity located in that part of the building;
 - The equipment or service will be used and its future use will not affect other elements of sustainability; and
 - Sub-metering to individual tenancies within the development to enable individual monitoring of consumption performance.
- d) Common and service areas in the building should incorporate energy and water efficiency/conservation measures in their design and location.

Chapter **C3 Water Management** of the Penrith Development Control Plan 2014 states:

C. Controls

3) Proposed Industrial Land Uses

The following controls apply to new industrial buildings and significant alterations/additions to industrial buildings:

- b) All proposed industrial sites with a hard surface area (including roof area, driveways, parking areas, loading bays, covered storage areas, etc.) greater than 1,000m² shall submit a water management plan which estimates required water needs, and includes an investigation into the feasibility of the measures listed below, outlines those to be adopted on the site and explains why any measures not adopted were unable to be implemented:
- Rainwater tanks connected to roof and gutter systems and installed to enable reuse of rainwater for irrigation, industrial processes, toilet flushing or other non-drinking purposes;
 - Stormwater detention systems installed and maintained to enable the reuse of stored water for irrigation, industrial processes, toilet flushing or other non-drinking purposes, and to minimise the impact of runoff from the site;
 - Roof gardens, either for recreational purposes or as a means to reduce hard stand area.

3.6 Penrith Local Environmental Plan (LEP) 2010

Part 7.4 of the Penrith Local Environmental Plan 2010 states:

Part 7 Additional local provisions

7.4 Sustainable development

In deciding whether to grant development consent for development, the consent authority must have regard to the principles of sustainable development as they relate to the development based on a “whole of building” approach by considering each of the following—

- conserving energy and reducing carbon dioxide emissions,
- embodied energy in materials and building processes,
- building design and orientation,
- passive solar design and day lighting,

- natural ventilation,
- energy efficiency and conservation,
- water conservation and water reuse,
- waste minimisation and recycling,
- reduction of vehicle dependence,
- potential for adaptive reuse.

3.7 Mamre Road Precinct Development Control Plan 2021

The Mamre Road Precinct Development Control Plan 2021 provides detailed planning controls for industrial development in Mamre Road Precinct within the Western Sydney Employment Area.

Chapter 4 General Requirements for Industrial Development of the Mamre Road Precinct Development Control Plan 2021 states:

4.2 Built form design controls

4.2.5 Building Design

Objectives

- a) To encourage innovation and a high standard of architectural design, utilising quality materials and finishes.
- b) To ensure buildings achieve a high level of sustainability and environmental performance.
- f) To embed circular economy design principles to maximise recycling and reuse of materials.

Controls

1) Developments with a construction cost of \$1 million or more are to demonstrate a commitment to achieving no less than 4 stars under Green Star or 4.5 stars under the Australian Building Greenhouse Rating system (now part of the National Australian Built Environment Rating System (NABERS)).

Siting/Building Orientation

2) Buildings should take advantage of a north or north-easterly aspect to maximise passive solar illumination, heating and natural cross-ventilation for cooling.

Architectural Design

- 7) External finishes should contain a mix of materials and colours and low reflectivity to minimise glare and reflection.
- 11) Energy efficient design principles shall be employed in all building designs (Figure 3).
- 17) Roof design must provide natural illumination to the interior of the building.

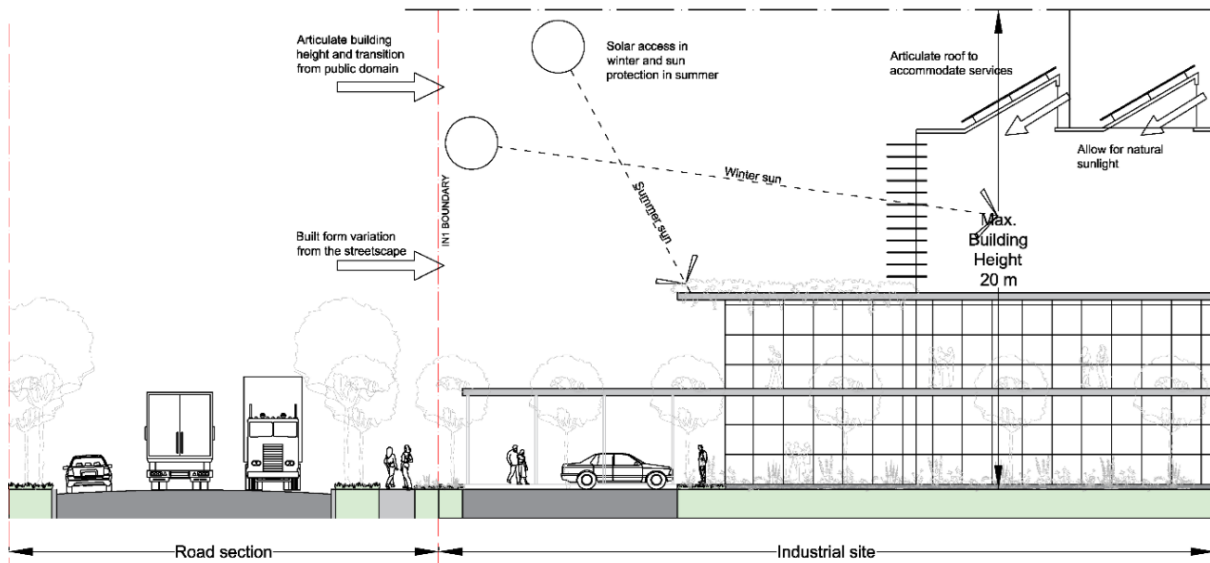


Figure 3. Energy Efficient Design (Source: Mamre Road Precinct DCP 2021)

Environmentally Sustainable Design

18) Development applications shall demonstrate Ecological Sustainable Design (ESD) measures have been incorporated into the design, including a consideration of:

- Building and window orientation;
- Window size and glass type;
- Materials, colour and surface treatment (note control 19 in relation to roof colour);
- Insulation;
- Landscaping and trees to provide shade and moderate the building microclimate;
- Natural ventilation and light with generous, all weather openings;
- Utilise extensive roof areas for energy and water collection;
- Air flow, ventilation and building morphology to support cooling; and
- Circular economy in the design, construction and operation of buildings, public domain, infrastructure, and energy, water and waste systems.

19) Light coloured materials should be used in roof construction to reduce the urban heat effect.

20) Building services, excluding manufacturing plant and operations, should promote:

- Separate metering of water and electricity for multiple uses or tenants;
- Shut-off valves at stormwater outlets to trap toxic spills;
- Waterless urinals;
- Energy efficient lighting;
- Gas boosted solar hot water for staff amenities (kitchen, toilets, showers);
- Rainwater and recycled water for toilet flushing, irrigation or other non-potable uses;
- Waste heat recovery systems;
- Integrated systems for energy generation- waste and water;
- Air-cooled systems, ground source heat rejection or pond heat rejection; and
- Energy storage systems combined with the use of photo voltaic cells for roof areas.

21) Measures to improve air quality and visual and thermal comfort to be considered include:

- Low VOC paints and low-formaldehyde floor covering, adhesives and furniture;
- Glazed facades to be shaded and/or use performance glass to control radiant heat;
- Occupant control of comfort parameters (e.g., operable windows, control of air flow);

- Protection from noise (e.g. open windows or between production and office areas);
- Provision of high quality landscaped outdoor amenity areas for staff;
- Hydronic heating and ceiling fans; and
- Materials with low reflectance values.

4.6 Access and Parking

4.6.1 Parking and Manoeuvring Areas

Objectives

8) Parking areas should incorporate dedicated parking bays for electric vehicle charging.

25) The following bicycle destination facilities for staff are to be provided:

- For ancillary office and retail space with a gross floor area over 2500m² , at least 1 shower cubicle with ancillary change rooms; o For industrial activities with a gross floor area over 4000m² , at least 1 shower cubicle with ancillary change rooms;
- Change and shower facilities are to be located close to the bicycle storage areas; and
- Where the building is strata-titled, the facilities are to be available to all occupants.

26) Bicycle parking, facilities and storage must be in convenient locations, visible, secure, and provide weather protection for the bicycle.

3.8 Project Design Response

The project team has assessed the energy use profile of the development and will implement a number of energy efficiency measures that will reduce significantly the greenhouse gas emissions and footprint of the project. Also, as listed below, a series of best practice sustainable initiatives will be incorporated so that potential environmental impacts are mitigated substantially.

There are no perceived threats of serious or irreversible environmental damage as a result of locating the Aspect Industrial Estate development on the desired site. The site is currently zoned RU2 Rural Landscape under the Penrith Local Environmental Plan 2010 and is not listed within the Schedule 5 Environmental Heritage – Part 1 Heritage items of the Penrith Local Environmental Plan 2010. The proposed development will have predominantly the same uses as the current industrial warehouses and developments from the surroundings.

The development will give strong consideration to potential environmental impacts by reducing it through application of best practice design and processes such as the many ESD commitments and initiatives listed in the following Section. The documented initiatives to be implemented – which are the basis for the response to the Sustainable Design Frameworks outlined above - include:

- Buildings to be net positive for carbon emissions where determined by Mirvac to be appropriate;
- On-site Renewable Energy Production: minimum 200kW Solar System for Warehouse 4;
- Environmental outcome benchmarked to a minimum 5 Star Green Star Buildings;
- Smart metering;
- Electric car and truck charging future provisioning;
- Rainwater harvesting and reuse for irrigation;
- Energy Efficient lighting systems (internal and external) and lighting controls;
- Best Practice Façade Thermal Performance/Building Thermal Mass;
- Solar Gain Reduction/Shading;
- Efficient HVAC System Equipment (Office spaces);
- Explore opportunities to reduce embodied energy reduction associated to construction material selection;
- Increased access to natural daylight where possible;
- Water efficient fixtures and fittings (WELS rating);

- Selection of native & low water plants/trees;
- Application of Water Sensitive Urban Design (WSUD) principles;
- Increased Indoor & Outdoor Environmental Quality;
- Waste Management Plan;
- Bike racks and end-of-trip facilities;
- Others as presented in the following Sections.

Any further concerns will be addressed through development of a Construction Environmental Management Plan that incorporates mitigation measures to ensure that environmental impacts to the site are minimised during construction. Contractors will also be requested to provide and abide by an Environmental Management System to be in accordance with NSW Environmental Management Systems Guidelines or a similar standard. This places a value on environmentally responsible building practices to ensure they are held responsible for the environmental management of the building site as they complete their work.

Once the new development is under activity, operational guidelines, best practice procedures and appropriate monitoring and control measures will be defined by the building owner. This will be in accordance with the sustainable strategies adopted by the development, and will be distributed to the tenants to ensure environmental impacts associated with operational processes are minimised wherever possible.

4 ESD Opportunities & Initiatives

The following section addresses the Greenhouse Gas, Energy Efficiency and Ecologically Sustainable Development aspects in response to the Sustainable Design Frameworks (as per Section 3) for the project. It uses best practice sustainable design principals and borrows elements from external sustainability tools to develop a set of metrics for the site.

There are several ESD opportunities and initiatives that will be implemented in the project. The following examples are to be read in conjunction with design documentation prepared by SBA Architects. Stantec note the design is in its very early stages, and the following concepts will be considered going forward.

A robust design philosophy is essential for enhancing the ESD outcomes of the project. Incorporating passive design features can significantly contribute to this success:

- Lower operational energy demand via improved thermal performance;
- Promote greater indoor environmental quality;
- Reduce the buildings' reliance on HVAC systems;
- Improve building occupant comfort; and
- Improve the project's capacity to deliver a responsible development.

The warehouses designs will include several passive design options and provide a robust and environmentally sensitive framework. Furthermore, several energy efficiencies measures and intelligent selection of systems are being proposed in order to improve the environmental outcome of the development while maintaining occupant level comfort and well-being.

4.1 Australian Excellence ESD Framework (Green Star)

The project's as-built environmental performance will be equivalent to a 5 Star Green Star project, based on the Green Star Buildings tool. As proposed by the Green Star framework, a holistic approach will be taken towards the environmental performance of the development, where relevant ESD principles will be applied and voluntarily accessed against the Green Star scheme so that the project can be benchmarked to achieve the equivalent of a 5 Star Green Star Buildings standard – which represents Australian Excellence within the built environment.

Green Star is currently accepted within the building and construction industry as representative of Australian Excellence in design & construction with reference to environmental conservation and performance. Green Star is Australia's foremost holistic built environment assessment tool and outlines a series of environmental performance criteria design to improve environmental sustainability & building performance. There are eight performance categories within Green Star Building, as follows:

- | | |
|---------------|--------------|
| • Responsible | • Places |
| • Healthy | • People |
| • Resilient | • Nature |
| • Positive | • Leadership |

The development may not target a formal Green Star certification, but further investigation is being undertaken by Mirvac on the certification pathway.

4.2 Greenhouse Gas Emission Reduction & Energy Efficiency

A variety of greenhouse gas emission reduction and energy efficiency measures are applicable to the proposed development and form part of the initial design and operation plan for the warehouses. The final strategy will be a combination of sustainability, operational feasibility, architectural intent and site-specific appropriateness.

The energy efficiency strategy follows the hierarchy pyramid below. Best practice energy conservation dictates that in the first instance demand is reduced. This has a much greater benefit to the overall long-term sustainability of the site compared to efficiency measures or renewables/offsets. As such, the focus will be on the elements that provide the greatest impact and return on investment.

All-Electric Buildings

BENEFIT FROM TRANSITIONING TO 100% CLEAN GRID

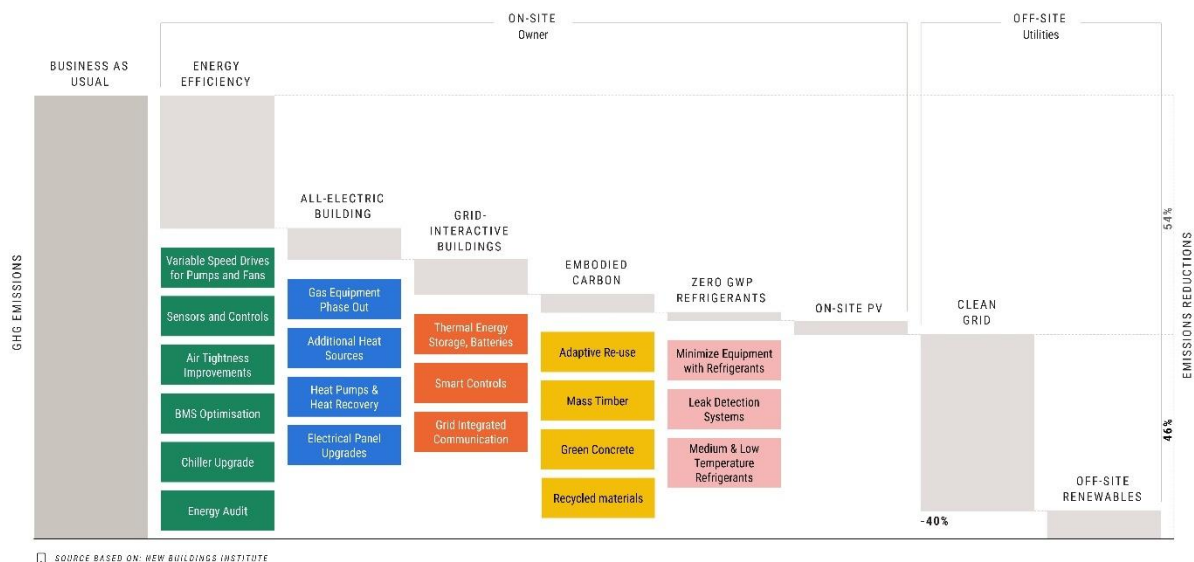


Figure 4. Greenhouse Gas Emission Reduction & Energy Efficiency Strategy Hierarchy

4.2.1 Site-wide Energy Strategies

Methods to achieve the greenhouse gas & energy efficiency goals of the projects will go above and beyond the regulatory requirements and industry benchmarks. The below is proposed to be implemented:

- **Buildings to be net positive for carbon emissions**

The development site is proposed not only to be net carbon zero but to potentially go above and beyond industry benchmarks and deliver a net positive development for embodied carbon emissions. This accounts for scope 1 and 2 greenhouse gas (GHG) emissions from the development site. Reaching net positive carbon by 2030 is part of Mirvac's plan for the future. This is outlined in Mirvac's plan released in 2022 "[Carbon Emissions | Mirvac](#)".

The proposed method of achieving the net positive carbon emissions principle is as follows:

- » Designing electrified, energy efficient buildings with solar PV.
- » Measurement of scope 1 & 2 emissions:

Scope 1 and 2 emissions include Mirvac's own direct emissions and indirect emissions from the services, goods and energy Mirvac consumes. These emissions extend to the development of the building and the building's energy consumption, but not the tenant's emissions. Noting that carbon emissions by tenants of Mirvac's building (scope 3 emissions) are not included within Mirvac's scope 1 & 2 emissions, for example, car exhaust emissions by a building tenant are part of the tenant's carbon emission footprint.

- » Purchase of high quality carbon offsets for the scope 1 & 2 emissions.

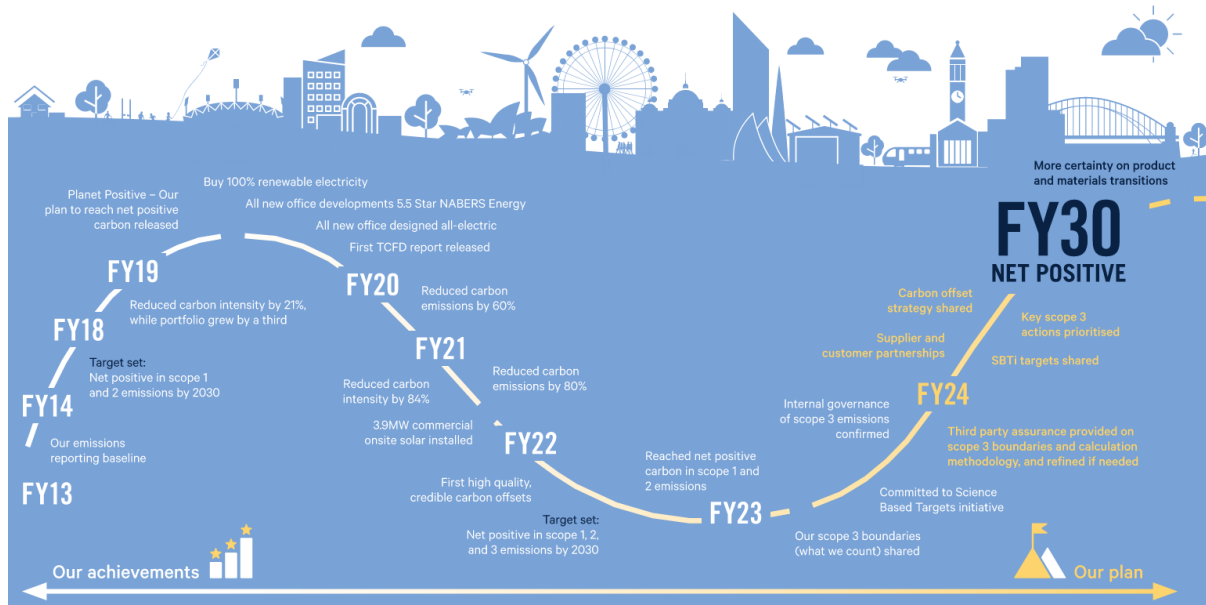


Figure 5. Mirvac's Net positive carbon by 2030 infographic (Source: Mirvac)

"It's important to emphasise that being net positive involves going a step further than reaching net zero. For us, net positive means that our positive actions (energy efficiency, renewable energy, transitioning away from fossil fuels, and either minimising or offsetting other emissions) outweigh the carbon emissions from our buildings." Planet Positive – Mirvac's Plan to reach net positive carbon by 2030.

- **On-site Renewable Energy Production – Min. 100 kW Solar System per building:**
On-site Renewable Energy Production will be implemented in the design to minimise utilisation of energy from the grid system. The system will be designed so that renewable energy is prioritised for use. Consideration can also be given to selling excess energy back into the grid or storage on site for peak reduction.
Further feasibility will be completed regarding the ideal system configuration, sizing, annual energy generation, etc., but it is anticipated that there will be a minimum 100 kW Solar System provided to each building. It is noted the electricity consumption from the site is still to be estimated where the appropriate renewable energy contribution will depend on the final architectural design, industrial arrangement, building services design and tenants operational requirements.
While there is a minimum target of 100 kW Solar System to be provided to each warehouse, Warehouse 4 is proposed to have an 200kW capacity solar system, which represents a fantastic initiative that will have a tremendous impact on the Warehouse 4 operational carbon footprint.



Figure 6. Solar Panels on one of Australia's largest industrial developments by Mirvac. (Google Maps)

- **Electric car and truck charging dedicated bays;**
 The current development includes dedicated bays in the design for electrical vehicle charging, which reduces the harmful air pollution associated to vehicles exhaust emissions. Furthermore, if renewable energy is used to feed the stations (either through the solar systems or Green Power) then this can represent a complete transition away from fossil fuels related to transport.
- **Energy Efficient lighting systems (internal and external):**
 Energy Efficient lighting selection (LED lighting) and system can reduce the electrical load on the grid significantly for the same illuminance output in comparison to traditional incandescent lights. Further, LED globes have a longer life, reducing replacement periods which demands less maintenance, as well as reducing landfill of precious materials. Mirvac will be utilising LED lighting throughout all buildings for the Aspect development.
- **Controls of lighting systems:**
 This can include zoned switching, lighting control systems with time clocks and may include lighting sensors where appropriate. This will reduce base building energy consumption by assuring artificial lighting is turned off when not required.
- **Façade Thermal Performance/Building Thermal Mass:**
 Building envelope thermal performance to comply with NCC 2022 Section J requirements (conditioned spaces). This will reduce reliance on mechanical cooling and heating and therefore bringing down HVAC operational energy consumption.
 The warehouses roof material and colour will be reflective of solar radiation, and consideration will be given to building overall thermal mass and to application of thermal insulation appropriate to the local weather profile.
- **Solar Gain Reduction/Shadings:**
 External shading devices will be implemented in the architectural design adjacent to conditioned spaces in order to reduce solar exposure / solar gains thus reducing the reliance on mechanical systems for internal conditioning. Awnings will be provided at each access point to the warehouses. This will be provided on the warehouse edge where trucks load/unload to provide sun protection for employees.
 The building roof is designed to be light coloured (low solar absorptance), which also reduces solar gains by reflecting light and is beneficial to the local heat island effect.
- **Efficient HVAC System Equipment (Office spaces):**

Efficient and bespoke HVAC systems with high COPs will be appropriately designed and sized for the development. This will include high efficiency centralised plant.

- **Embodied Energy reduction associated to construction material selection.**

Construction materials are a highly carbon intensive component of any development. They often involve energy intensive production processes, large amounts of raw materials including water and energy, and long transport distances to reach the location of the development. However, there are a number of environmentally friendly practices starting to become accepted by the construction industry. Depending on the materials selected for the constructions, and the options available in the area, use of low embodied energy and water materials with preference for sourcing from local or sustainable materials suppliers will be adopted – where possible – during material selection and pre-construction process. This can also include materials with high recycled content.

Lifecycle Impacts of Sustainable Design Outcomes

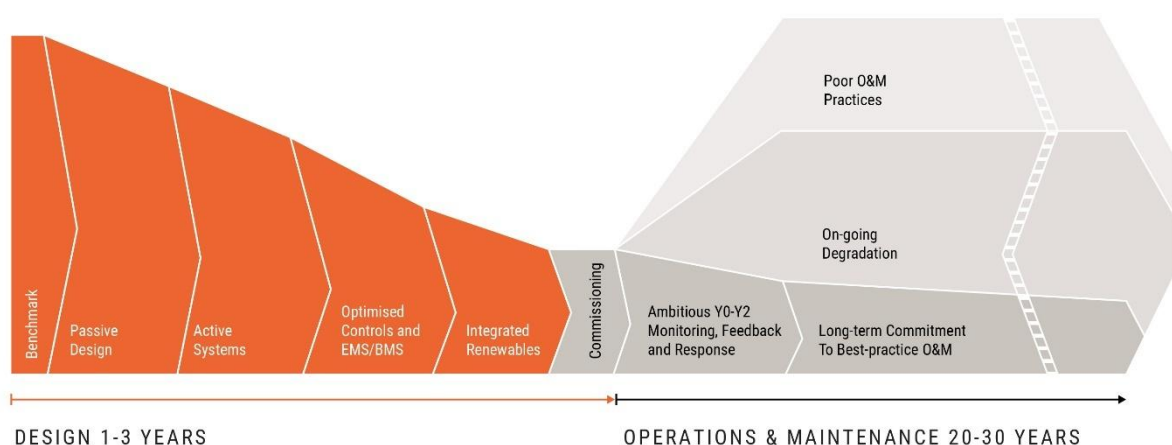


Figure 7. Lifecycle Impacts of Sustainable Design Outcomes

4.2.2 Warehouse Areas

The warehouse floor area represents a large portion of the site area (69,755m²) and as such is responsible for the significant component of energy consumption within the site. A number of initiatives are proposed to reduce the greenhouse gas emissions and environmental impacts associated to the warehouse component on the development. These include:

- Energy Efficient lighting systems (internal and external);
- Controls of lighting systems, including zoned switching, motion sensors and time clocks / lighting sensors as appropriate;
- Large solar PV system to offset the energy consumption of the warehouse machinery and building services.

4.2.3 Office Areas

The office has been proposed and analysed for a number of different design elements and configurations. These include:

- Energy Efficient lighting systems (internal and external);
- Controls of lighting systems, including zoned switching, motion sensors and time clocks / lighting sensors as appropriate;

- High thermally performing glazing and general façade materials – to meet NCC 2022 Section J requirements;
- Increased mechanical equipment performance;
- Zoned mechanical systems (centre/perimeter);
- Wider temperature control band.

By combining all the above elements within the office design, there is a potential for the office energy consumption to be reduced significantly in comparison to a standard office space (considering business as usual systems in line with the BCA and standard operational procedures).

4.3 Water Efficiency

A variety of water efficiency measures can be applied to the proposed development. These best practice water efficiency measures implemented to reduce water consumption include:

- **Water efficient fixtures and fittings (WELS rating):**
By implementing low-flow water fixtures, the consumption associated with amenities can be reduced. This includes taps, wash basins, WCs, Urinals, showers and supplementary water uses.
- **Water efficient appliances (WELS rating):**
Where applicable, priority will be given to efficient water appliances, such as dishwashers for the office spaces.
- **Rainwater harvesting and reuse:**
A rainwater tank will be implemented as required. Further feasibility will be completed regarding the ideal tank sizing, capture area and end-use for any non-potable water collected. Rainwater on this site is particularly advantageous given the significant collection area across the building roofs. The captured water can offset irrigation water consumption and toilet flushing.
- **Water use metering and monitoring:**
Which can identify leaks and amend losses before greater loss occurs.
- **Selection of native & low water plants/trees:**
Native plants are designed to thrive in the Australian environment and are typically more resilient than their exotic counterparts. Low water species will reduce even more irrigation demand.

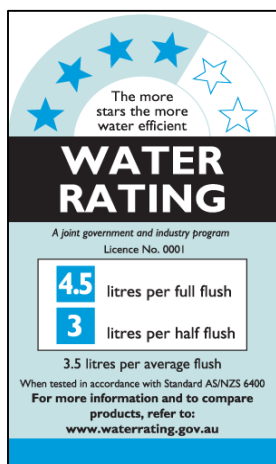


Figure 8. Illustration of WELS rating label (Source: WELS)

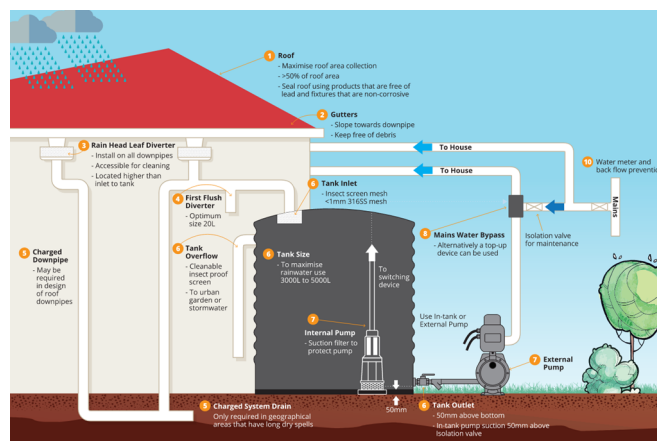


Figure 9. Illustration of a Rainwater Harvesting System (Source: Rainwater Harvesting Australia)

The above initiatives are sufficient to allow the project to meet best practice consumption benchmarks considering the HVAC mechanical design will most likely apply waterless heat rejection systems due to the size and volume of the commercial office spaces within the development.

4.3.1 Water Sensitive Urban Design (WSUD)

The WSUD principles, outlined in Chapter C3 Water Management - Water Sensitive Urban Design - of the Penrith DCP, will be considered for implementation by the project. These include:

- To maintain the natural water balance;
- To make more efficient use of water resources by conserving water, particularly potable (drinking) water;
- To reduce general flood risk;
- To reduce erosion of waterways, slopes and banks;
- To control stormwater and waste water pollution and improve water quality in waterways and groundwater;
- To integrate stormwater management with water supply and waste water treatment; and
- To integrate stormwater treatment into the landscape so as to maximise the visual and recreational amenity of urban development.

4.4 Indoor & Outdoor Environmental Quality

Internal Environmental Quality and occupant comfort will be a key consideration in the warehouses design. A comfortable workplace encourages greater productivity, workplace satisfaction and tangible health benefits. These benefits range from reduction in stress, increased physical and mental health and general quality of life. Therefore, provision of more thermally comfortable spaces for employees and allowance to natural daylight are being envisaged.

Initiatives being contemplated that would improve overall occupants' comfort and internal environmental quality include:

- **Preference for light coloured reflective roof sheeting:**
Solar heat is expected to be passively absorbed by the warehouse's roof sheeting, which shall drive the internal temperatures of the building up. By using a more reflective roofing material, which has a lower solar absorptance (SA), the internal heat gains are reduced, thus reducing the average internal temperature of the building throughout the year.

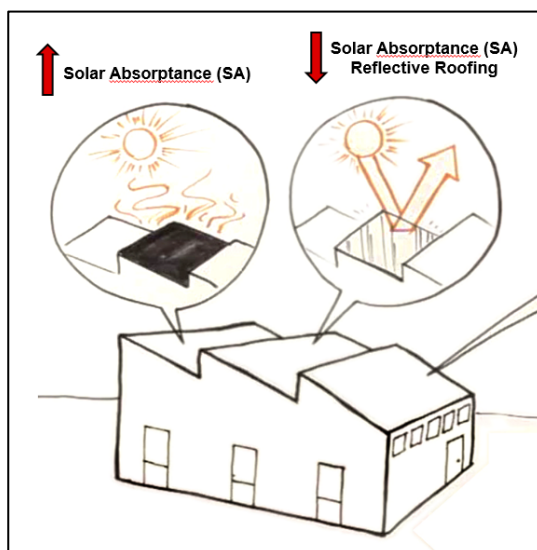


Figure 10. Roofing solar absorption effect
(Source: Autodesk)



Figure 11. A light-coloured roof on a Mirvac development (Google Maps)

- **Application of translucent roof materials:**

Encouraging natural lighting where possible (e.g. where internal thermal comfort is not compromised), through application of translucent roof materials across the warehouse roofing components. This reduces reliance on artificial lighting and supports an energy efficient design.

- **Design of high-quality amenity area**

An amenity area is currently being considered within the office area. This will be developed for occupants' amusement and well-being. A high-quality breakout area with access to daylight and spaces for staff to relax and socialise could be included in such an amenity zone.

- **Provision of end-of-trip facilities**

Showers and changing areas will be developed for the use of regular occupants to encourage active transport to-and-from the site, and active break activities.

4.5 Building Management

Via the implementation of industry recognised best practice frameworks, the project design and built form will seek to respond to the ongoing environmental challenges of urban development and ensure the project implements a range of ESD initiatives aimed at improving ongoing building management.

Through specific contractual commitments and documented design intent the project proposes to address environmental management & building operational performance through the following initiatives.

- **Building Commissioning & Tuning Procedures:**

Prior to practical completion / 12 months post practical completion. By implementing this via project contract documents the project ensures operational efficiency & building operation is optimised in accordance with the intended building design.

- **Smart Metering:**

Smart metering will provide relevant data for the use & management of building staff. This will provide detailed information about the project energy use and profile on a regular basis and through an easily accessible online platform. This information will help in the understanding of the usage profile so that adjustments can be made to guarantee optimal performance. This ensures operational efficiency is maintained and also facilitates detection of systems failures, thus improving maintenance and tuning processes.

- **Waste provisions:**

Appropriate waste provisions are going to be included within the project to ensure recycling rates & reduced waste to landfill is optimised.

4.6 Waste Management

In order to facilitate sustainable waste management within the City of Penrith in accordance with the principles of Ecologically Sustainable Development, waste minimisation and resource recovery, easy access to waste systems, pollution prevention associated with waste management practices will be taken into consideration as part of waste management strategy.

The Industrial Estate development is targeting to increase on-site recycling and resource optimisation through adoption of the Waste Management Hierarchy with the ultimate goal of reducing waste going to landfill, which is in line with *Waste Avoidance and Resource Recovery Act, 2001 and the NSW Waste Avoidance and Resource Recovery Strategy 2014-21*. The waste reduction strategy follows the hierarchy pyramid below:

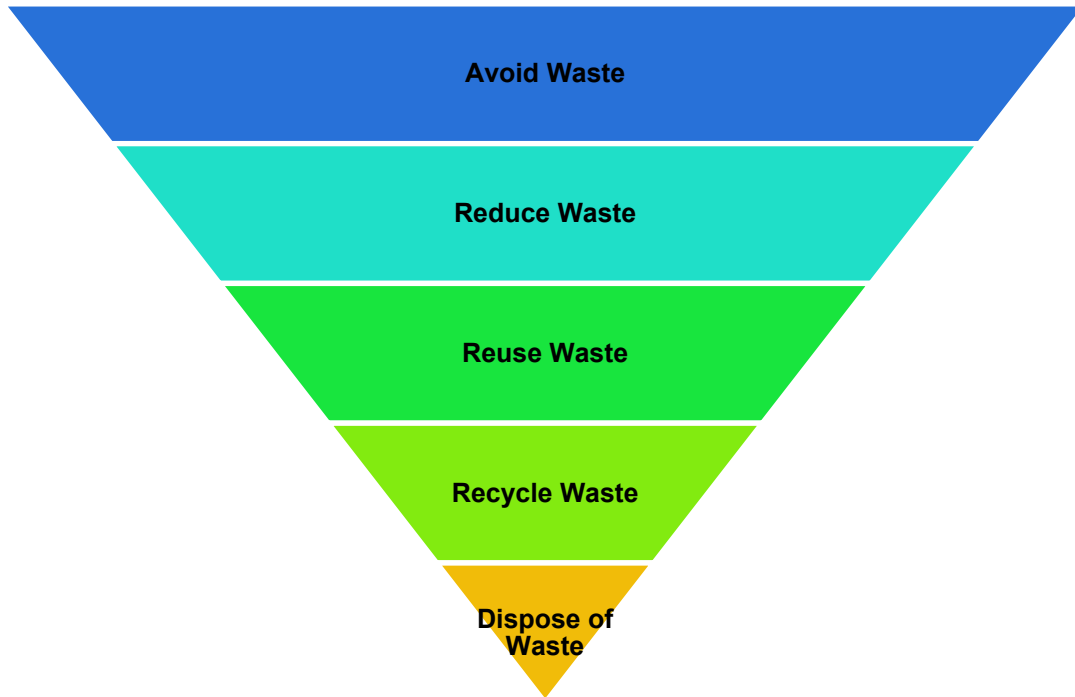


Figure 12. The "Waste Management Hierarchy"

Best practice initiatives will be explored through a development of a Waste Management Plan, which is going to address Demolition, Early Works, Construction and Operation Waste Management Strategies, where appropriate.

The key objectives for the management of waste generated by the demolition, early works and construction will include:

- Minimise waste generation on site;
- Segregate waste on site to maximise recycling;
- Store wastes on site appropriately to prevent cross-contamination and/or mixing of different waste;
- Segregate hazardous waste for appropriate treatment and disposal, where applicable;
- Where appropriate, set targets for demolition and construction waste diversion from landfill;
- Where appropriate, analyse potential operational waste generation profile from the warehouses and propose best practice Waste Management Strategies.

5 Summary of Design Response

Ecologically Sustainable Design continues to be a driving consideration in the ongoing development of the Warehouse 4, Aspect Industrial Estate, Kemps Creek development. Warehouse 4 will incorporate a number of ESD initiatives - which are aligned with the applicable - to complement the initiatives undertaken to reduce the greenhouse gas emissions, potable water consumption and material resources of the site. These constitute the sustainability response from the project to the site applicable sustainable design frameworks, as listed within Section 3. Sustainable Design Framework.

The ESD initiatives outlined in this report are intended to be used as a design guide for the development. The specific initiatives that will be installed across the precinct will be determined throughout the development application stage for each individual building and will be subject to feasibility analysis, including that of the final use and layout. The initiatives are being designed to comply with the guidelines set out by the relevant authorities.

The development's commitment to reducing the overall environmental impact is evident of the holistic approach taken to long-term sustainability. Documented initiatives cover a range of categories including:

- Energy & Greenhouse gas emissions reduction
- Potable Water reduction
- Minimising Waste to landfill
- The Indoor Environment
- Occupant Amenity and Comfort
- Building Management

We trust this report provides sufficient overview of the project commitment to environmentally sustainable design and greenhouse gas and energy efficiency vision for the Warehouse 4 development.

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