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Sustainability Management Plan

Oakdale West Estate

Stage 2 MOD 3

Report Number: 610.19170 R2

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Goodman Property Services

Level 17

60 Castlereagh Street

Sydney NSW

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Sustainability Management Plan

Oakdale West Estate

Stage 2 MOD 3

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610.19170-R2	V1.0	12 December 2019	Dr. Hamidul Islam Horatio Cai	Dr. Neihad Al-Khalidy	Dr. Neihad Al-Khalidy

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1 INTRODUCTION

SLR Consulting Australia Pty Ltd (SLR Consulting) has been commissioned by Goodman Property Services to prepare a Sustainability Management Plan (SMP) for the site preparation, construction and operational activities of Modification 3 (MOD 3) and the Stage 2 development of Oakdale West industrial Estate (the Project).

The SMP has been undertaken in accordance with the Secretary's Environmental Assessment Requirements (SEARs) for the State Significant Development (SSD 10397 and SSD 7348 MOD 3) application.

2 OBJECTIVES

The principal objective of this Sustainability Management Plan is to identify all potential energy savings that may be realised during the operational phase of the Project, including a description of likely energy consumption levels and options for alternative energy sources such as solar power in accordance with Penrith City Council (Council) requirements.

The specific objectives of this plan are as follows:

- To encourage energy use minimisation through the implementation of energy efficiency measures.
- To promote improved environmental outcomes through energy management.
- To ensure the appropriate management of high energy consumption aspects of the Project.
- To identify energy savings procedures for overall cost reduction, greenhouse gas emission reduction and effective energy management.
- To assist in ensuring that any environmental impacts during the operational life of the development comply with Council's development consent conditions and other relevant regulatory authorities.
- To ensure the long term sustainability of resource use through more efficient and cost effective energy use practices for the life of the development.

3 SUSTAINABILITY MANAGEMENT GUIDELINES AND LEGISLATION

3.1 Building Code of Australia

The Building Code of Australia (BCA) is produced and maintained by the Australian Building Codes Board (ABCB) on behalf of the Australian Government with the aim of achieving nationally consistent, minimum necessary standards of relevant health and safety, amenity and sustainability objectives efficiently. The BCA contains mandatory technical provisions for the design and construction of BCA class buildings.

Volume 1, Section J of the BCA (2016) outlines energy efficiency provisions required for BCA class buildings (including Class 7b Warehouses and Class 5 Offices). There are eight (8) Deemed-to-Satisfy subsections, J1 to J8, that focus on separate aspects of energy efficiency as follows:

- J1 - Building Fabric (i.e. the ability of the roof, walls and floor to resist heat transfer).
- J2 - External Glazing (i.e. the resistance to heat flow and solar radiation of the glazing).
- J3 - Building Sealing (i.e. how well parts of a building are sealed to ensure comfortable indoor environments are efficiently maintained).
- J4 - Air Movement (i.e. the provision of air movement for free cooling, in terms of opening and breeze paths).

  Note: This subsection has been removed from the most current version.
- J5 - Air Conditioning and Ventilation Systems (i.e. the efficiency and energy saving features of heating, ventilation and air-conditioning systems).
- J6 - Artificial Lighting and Power (i.e. power allowances for lighting and electric power saving features)
- J7 - Hot Water Supply (i.e. the efficiency and energy saving features of hot water supply)
- J8 - Access for Maintenance (i.e. access to certain energy efficiency equipment for maintenance purposes)

3.2 Secretary's Environmental Assessment Requirements (SEARs)

The SEARs of the Oakdale Site states:

- ***Greenhouse Gas and Energy Efficiency*** *– including an assessment of the energy use on-site, and demonstrate the measures to be implemented to ensure the proposal is energy efficient.*

4 PROJECT DESCROPTION

Goodman Property Services (Aust) Pty Ltd is developing the Oakdale West site at Lot 11 in DP 1178389 in Erskine Park. This site is primarily a greenfield site and will be comprised of industrial warehouses and office precincts, including internal roads, car parking spaces and hardstand.

The Oakdale West site is a precinct within the wider Oakdale Estate development and forms part of a progressive development designed to make Oakdale a regional distribution park of warehouses, office facilities and distribution centres.

The project is a staged development which includes bulk earthworks, civil works and the construction of infrastructure and stormwater management.

The site has received a Concept and Stage 1 consent for implementation of the masterplan. Modifications 1 and 2 to that consent are currently under assessment by NSW Department of Planning, Infrastructure and Environment (DPIE).

The works for the proposed Stage 2 SSDA requires an alteration to the existing masterplan, identified as MOD 3. Under MOD 3, Stage 2 will relate to the development of building 2B.

4.1 Overview of Proposed Development

The overall Oakdale West Estate is a 154 hectare (ha) site located within the Oakdale Estate, a 421 ha area of land within the Western Sydney Employment Area. Oakdale West Estate is the third of four stages of the broader Oakdale Estate under the management of Goodman Limited.

Oakdale West is essentially a Greenfield site at present which has been used for stock grazing. The surrounding areas are primarily rural in nature, but, the area to the north is becoming more industrial. Land uses in the surrounding area include:

- Rural (grazing, market gardens, etc) and rural residential to the south-east, south and west.
- Sydney Water Pipeline and industrial land to the north (industrial zones at Eastern Creek to the north and Erskine Park to the north-west).
- To the west land uses include a number of sensitive uses such as an aged care facility (Catholic Health Care) and three schools: Mamre Anglican School, Emmanual Catholic College and Trinity Primary School. Other land uses include recreational and sporting facilities.

Oakdale West Estate will be developed in stages with the stage 2B including:

- A four-storey warehouse building;
- An ancillary office;
- A mezzanine;
- The amenities required for site operation including Estate Road 03, fencing, utilities, safety and communications infrastructure, and
- Truck and car parking areas and associated site hardstand.

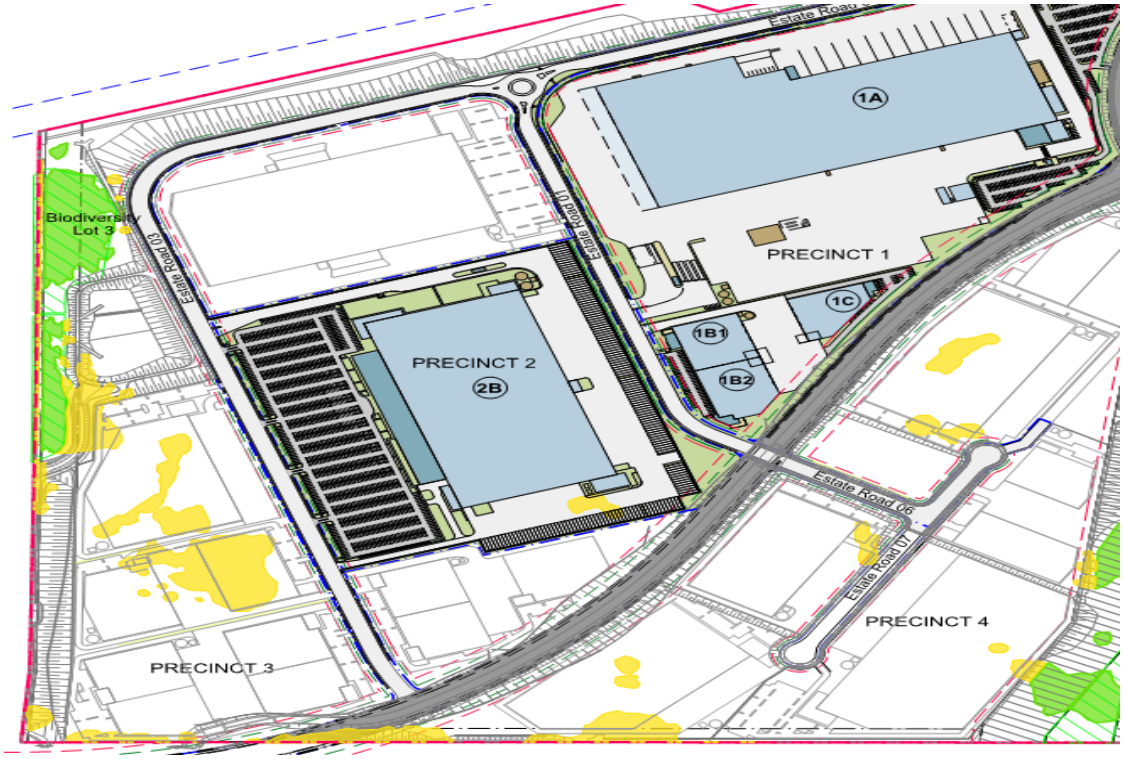
The Stage 2 has a site area of 149,266 m2 and a GLA area of 200,668 m^2. Building areas and development schedule are outlined in Table 1:

Table 1 Outlined Areas

Site	Unit and Area
Site Area	149,266 m^2
Ground Level - Processing	50,873 m^2
Ground Level – Mezzanine	6,300
Level 1 to Level 3	48,101 m^2 per level
Office	5,492 m^2
Hardstand Pavement	40,626 m^2
Light duty pavement	30,197 m^2
Truck parking	135
Double swap spaces	20
Shunter parking	3
Car parking	1127

The stage 2 development is shown in **Figure 2** to **Figure 4**.

Figure 1 Overview of the Oakdale West Estate showing Precinct 2 Development Area



Source: SBA Architects (2019)

Figure 2 Oakdale West Estate, Stage 2 Development

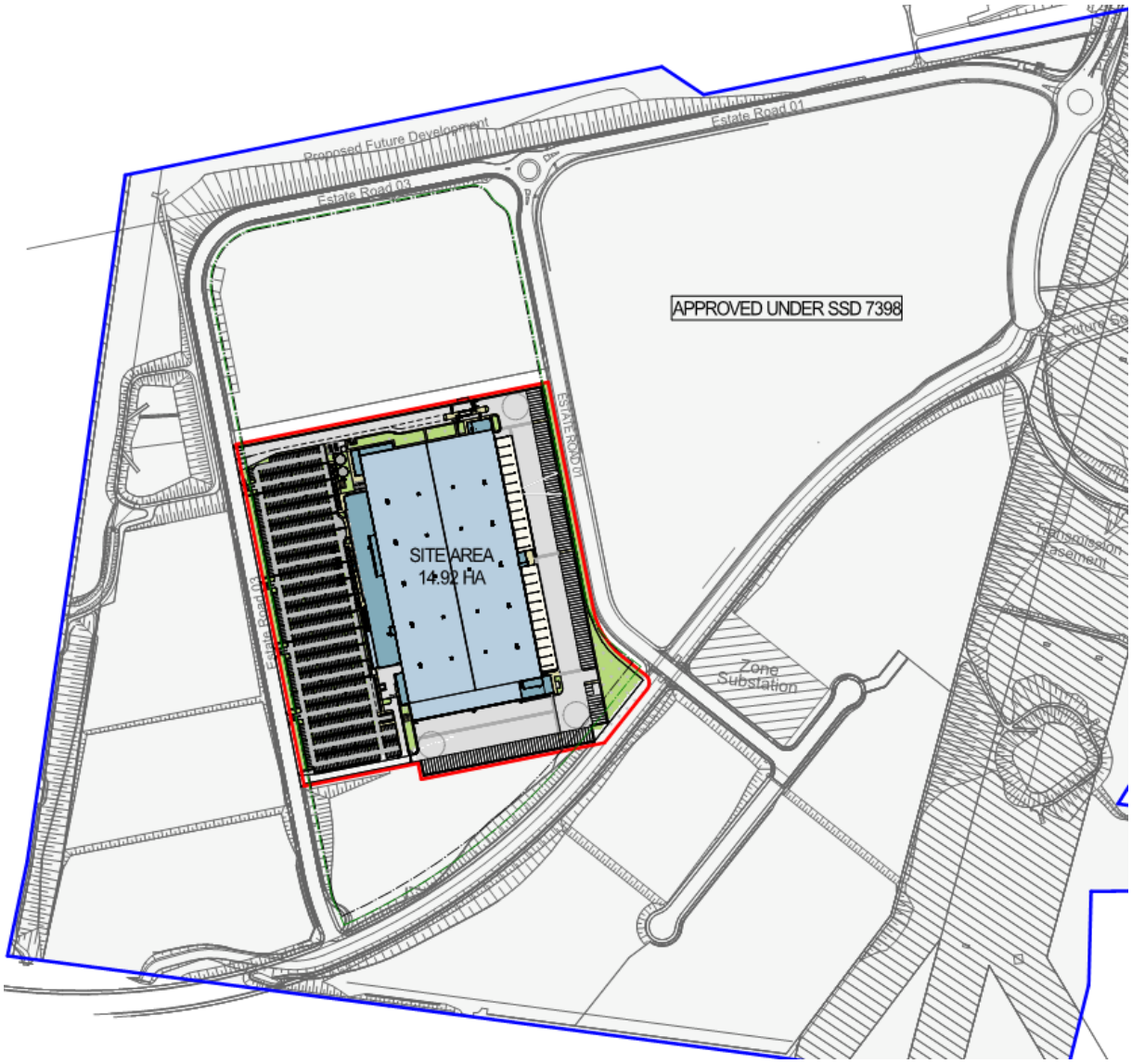


Figure 3 Oakdale West Estate, 3D Image of Stage 2B

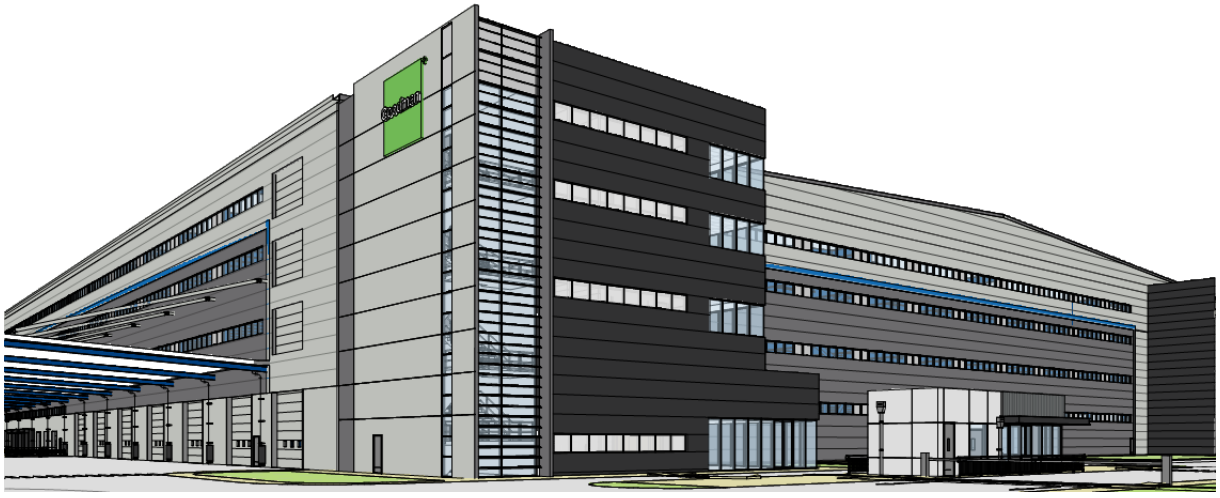
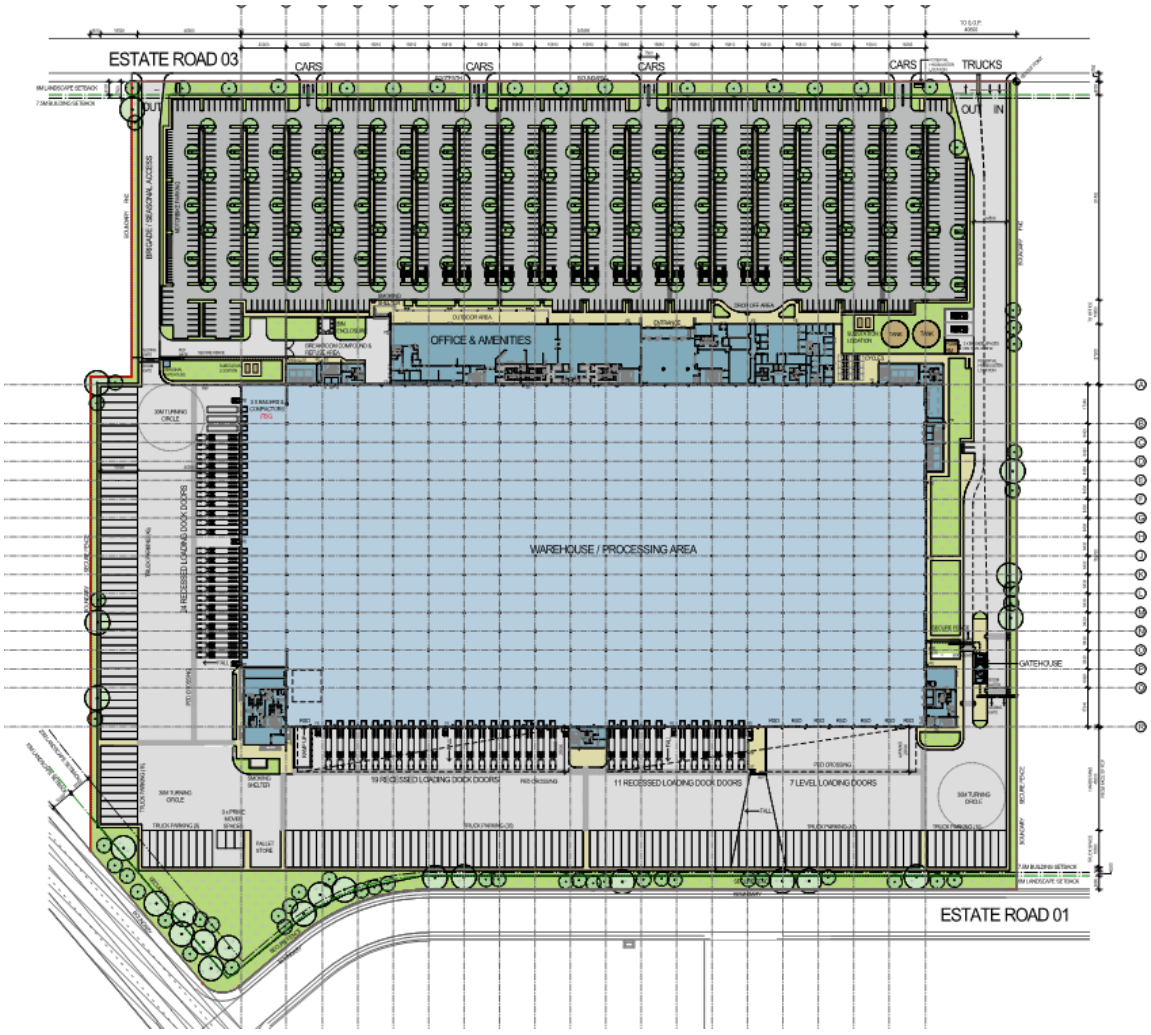


Figure 4 Site Plan - Warehouse and office & Amenities



5 OPERATIONAL ENERGY MANAGEMENT

Ineffective energy management for industrial and commercial premises can lead to unnecessary growth in greenhouse gas emissions and consumption of natural resources. Effective energy management reduces costs through the use of energy efficiency measures and improves environmental outcomes locally, regionally and globally.

Effective energy management is achieved through the implementation of a Sustainability Management Plan (SMP) for the operational life of the Project.

5.1 Identified Major Energy Use Components

Major energy use components of the Project Site have been identified below based on information available within the Project Design Brief.

- Lighting (include natural and artificial lighting and shading).
- Air Conditioning.
- Power.

5.2 Energy Sources

The main source of energy for the proposed site is electricity, but it is also proposed to have gas available at the site as required.

6 PROPOSED SUSTAINABLE MEASURES

The following Sustainability Management Plan (SMP) and Energy Efficiency measures are recommended based on the following project documentation:

Document Type	Document Number	Issue Date
Architectural Drawings	OAK MP 01-14	29/11/2019
Architectural Drawings	DA000 to 002	10/01/2020
Architectural Drawings	DA100 to 102	10/01/2020
Architectural Drawings	DA200 to 204	10/01/2020
Architectural Drawings	DA210 to 214	10/01/2020
Architectural Drawings	DA300, 400 & 410	10/01/2020
Performance Package AR Sortable Design Criteria v20.1.1	V201.1.1	October 2019

Table 2 Summary of Assessment

Objective	Proposed Target	Proposed Strategy	Project Implementation	Comments
Design and Management • Documentation of design intent and expected outcomes. • Appropriate commissioning.	• Communicate sustainability initiatives and operation to building users. • Commissioning and building tuning required by contractors and reviewed for 12 months after completion.	• Provision of Building Users Guide. • Investigate costs and viability of commissioning and building tuning requirements and appointing an independent commissioning agent. • Independent consultant to perform quarterly tuning of fire, mechanical, electrical and hydraulic services.	✓ ✓ ✓	SLR recommends the preparation of a Building User Guide that enables building users to optimise the building's environmental performance. A sub-contractor will be engaged to maintain the facility in accordance with the operations and maintenance manuals during the 12 month defects liability period.
Façade Performance • Optimised façade performance.	• Achieve minimum performance requirements under NCC Section J1 and J2. • Reduce heat gain through the warehouse façade.	• Meet or exceed NCC Section J1 and J2 façade performance for conditioned spaces. • Light coloured roofing with high reflectivity and appropriate insulation to reduce solar heat gain into the warehouse. • Daylight: evenly spaced translucent roof sheeting to warehouses areas. • Performance glazing in office spaces appropriate to the window size and orientation.	✓ ✓ ✓ ✓	• NCC Section J report needs to be prepared by a qualified ESD consultant. • This warehouse will comply with all the requirements specified within the report during construction stage. • Colourbond roof sheeting which has a higher solar reflectivity is proposed; • As per project NCC Section J report.

Objective	Proposed Target	Proposed Strategy	Project Implementation	Comments
Social sustainability • Consider design with due regard to occupant satisfaction in accessibility, usability, Indoor air quality and public space utility.	• High level of occupant satisfaction. • Provide external as well as internal comfort.	• Flexibility of space for potential future configurations.	✓	The design will incorporate open plan workspaces, offices, client rooms, meeting rooms, lunch room and outdoor seating area
		• Use of Low VOC paints, carpets and sealants.	✓	Low VOC paints, carpet and sealant will be used
		• Consider using dense planting to screen the outdoor areas from the docks to increase visual amenity.	✓	Selection of endemic and low maintenance landscaping species
		• Consider occupant user control eg A/C systems, glare reducing strategies, lighting etc.	✓	Both AC and lighting control is provided to offices and warehouses.

Objective	Proposed Target	Proposed Strategy	Project Implementation	Comments
Minimising Transport Impact • Consider location with links to public transport and employee services. • Consider location to reduce operational transport. • Consider the impact of industrial trucks on local traffic.	• Reward drivers of fuel efficient vehicles by providing spaces for small cars and or motorbikes. • Provide alternatives to single-occupancy vehicles. • Reduce operational fuel consumption through close proximity to major arterial roads. • Reduce the impact of operational traffic on local communities.	• Consider providing 10% of total parking spaces for small cars and 5% for motorbikes situated near the office entrance. • The site is located within close proximity (<5km) to both the M7 and M4 motorways. • The roads linking the site to the motorways are predominantly used for industrial traffic, as such the traffic is unlikely to impact on local areas.	✓ ✓ ✓	54 Motorcycle Parking Spaces are provided. Refer Architectural Drawings Due to the location of the site, it is considered that staff bicycle riding will be unlikely, although if staff surveys indicate a preference for cycling, consider appropriate amenities. Car park numbers and provision for disabled parking are provided be in accordance with Consent Authority requirements.

Objective	Proposed Target	Proposed Strategy	Project Implementation	Comments
Optimising IEQ • Optimise natural light to work environment. • Optimise fresh air ventilation. • Consider Thermal Comfort of occupants. • Consideration of noise transference in space planning. • Minimise use of materials that emit volatile organic compounds. • Create a pleasant working environment.	• Daylight: Daylight Factor (DF) of at least 2% at finished floor level under a uniform sky for at least 60% of the GLA. • Thermal comfort: 95% of office areas have PMV levels between -1 and +1 for 98% of the year; Warehouse spaces include passive thermal comfort strategies. • Finishes: 95% of all paints, adhesives & sealants and all carpet and flooring to be low-VOC finishes; use low-formaldehyde wood products. • Electric lighting levels: 95% of GLA has a lighting system that is flicker free and has a maintained illuminance of no more than 25% above those recommended in AS1680.2.4, 2.1 and 0.1. • Reduce visual glare.	• Daylight: rationalised glazing to offices; high performance glass. • Thermal comfort: Office envelope and HVAC system designed to meet thermal comfort requirements; • Provide sufficient roof and wall insulation to the air conditioned spaces; • Finishes: Specify and track correct finishes and wood products. • Provide pleasant indoor and outdoor breakout spaces with sufficient daylight and plants. • Lighting: Good light fixtures and well-designed layout. • Ventilation: Consider increased fan and duct sizing. • Provide sufficient shading and blinds with rationalised glazing for visual and thermal comfort.	✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓	High performance glazing to all air-conditioned areas will be considered to satisfy NCC Section J requirements Refer Section 6.3.1 of this report for proposed set up temperatures Roof and External Wall insulation as per the NCC requirements LED lighting and lighting controls to warehouse and offices. Adequate ventilation will be supplied in accordance with AS1668. Shown on the Architectural Drawings

Objective	Proposed Target	Proposed Strategy	Project Implementation	Comments
Minimising Energy Use • Consider passive design to minimise energy use such as orientation, ventilation, shading and floor plate design. • Appropriate sizing of plant and equipment in heating and cooling, lighting, control systems, • Building management systems and renewable energy sources. • Reduce reliance on connection to grid electricity and gas.	• Target a 20% reduction in Greenhouse gas emissions. • Energy sub-metering for all major uses greater than 100kVa; linked to monitoring system. • High efficiency warehouse lighting and controls. • Reduce energy for water heating. • Integrated building management. • Consider renewable energy generation for a portion of energy consumption and/or consider future-proofing the building for future installation. • Reduce urban heat island effect and heat load through the roof by providing a highly reflective roof. • Reduce office equipment load from 20W/m² to 15W/m². • Optimise insulation for energy and thermal comfort.	• Roof Insulation, External Wall Insulations, Reduced Glazing area and associated heat loss in winter. • Air conditioned to warehouse spaces. • Consider office air conditioning temperature set-points for an increased comfort band. • Provide energy efficient T5 lighting, with zoning and automatic controls where reasonable. • Consider LED lighting strategies and advanced controls. • Consider a solar hot water system with gas boost • Sub-metering: install appropriate metering; develop metering and tracking strategy to allow for self-assessment, problem solving and ongoing improvements during operations • Use roofing material that has a high Solar Reflective Index • Investigate current insulation design and determine proposed options.	✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓	Shown on the Architectural Drawing Design brief sets the temperature - Refer Section **6.3.1** of this report. LED lighting and lighting controls to warehouse and offices. Sub meters for major energy/water uses in the offices and warehouses. Colourbond roof sheeting which has a higher solar reflectivity is proposed. As per project NCC Section J report.

Objective	Proposed Target	Proposed Strategy	Project Implementation	Comments
Choosing Materials • With consideration to energy inputs in manufacture. • Toxicity. • Consequential impacts – rain forest timbers. • Regional or local manufacturer employment support.	• Reduce steel and cement in internal slab (10% reduction in embodied energy). • Reduce embodied energy in concrete and plasterboard elements. • Consider 95% of timber to be AFS or FSC certified. • Reduce emissions associated with insulation and refrigerant. • Reduce environmental impact of materials for tiling, awning.	• Jointless fibre reinforced slab. • Use pre-cast concrete panels with recycled content.	✓ ✓	To minimise the environmental impacts of materials used by encouraging the use of materials with a favorable lifecycle assessment based on the following factors: - Fate of material - Recycling / re-use - Embodied energy - Biodiversity - Human health - Environmental toxicity - Environmental responsibility.

Objective	Proposed Target	Proposed Strategy	Project Implementation	Comments
Minimising Waste • By clever design. • Contracted to builder as a requirement on site for construction waste. • During the life of the building. • And in dealing with building end of life options.	• Reduce construction waste going to landfill by 90%. • Reduce operational waste going to landfill. • Consider a design that can be disassembled at the end of the building's life.	• Contractor is to develop and implement a Waste Management Plan and track all waste going offsite to show that 90% of all construction waste is re-used or recycled. • Waste storage and recycling facilities to be provided for different operational recycling streams such as paper, glass, plastics, metals, food waste etc. Consider operational waste plans and training for staff to provide incentive to reduce waste.	✓ ✓	SLR recommends more than 70% of the predicted construction waste arising from development can be re-used (on-site or at another development) or recycled off-site. Refer project Waste Management Plan. The following waste avoidance measures are recommended in the Waste Management Plan for the Project: - Provision of take back services to clients to reduce waste further along the supply chain;
Water Conservation and Reuse • Monitoring of meters to track use. • Timely maintenance of fixtures and fittings. • Water sensitive landscape design. • Source potable water alternatives such as rain water harvesting, grey and black water treatment.	• Reduce potable water in internal fixtures. • Reduce potable water for irrigation. • Water efficient operation of appliances. • Utilise rainwater and/or recycled water.	• Water efficient sanitary taps and toilets. • Water efficient and drought tolerant landscaping. • Water and energy efficient dishwasher. • Rainwater collection for toilets, irrigation and truck wash down.	✓ ✓ ✓ ✓	Low flow fixtures and fitting including taps and shower heads Selection of endemic and low maintenance landscaping species SLR recommends water efficient dishwashers 25 kL Rainwater tanks have been proposed for rainwater harvesting and re-use for landscape irrigation and flushing of toilets.

Objective	Proposed Target	Proposed Strategy	Project Implementation	Comments
Land Use and Ecology Impact • Consider local biodiversity impacts of flora and fauna. • Look to specialist advice on land in development.	• Encourage biodiversity. • Reduce light pollution from the site. • Consider reducing impact of stormwater flows off the site into the natural watercourses including Ropes Creek adjacent to the site.	• Install indigenous plating appropriate to the area and the adjacent biodiversity lots. • Design external lighting to avoid emitting light into the night sky or beyond the site boundary. • Consider integrated stormwater management to minimise the impact on receiving waters of flow volumes and pollution content, eg bioswales, bio retention, OSD tanks and treatment. • Consider permeable concrete/paving for staff parking areas and footpaths, etc.	✓ ✓ ✓ ✓	Selection of endemic and low maintenance landscaping species LED lights have been proposed for all external lights to avoid emitting light The warehouse sustainability objectives include: - Reduce the impact of stormwater runoff and improve quality of stormwater runoff - Achieve best practice stormwater quality outcomes - Incorporate water sensitive urban design principles.

6.1 Baseline and Proposed Energy Consumption

A NCC Sections J Deem-to-Satisfy compliant building is used as the baseline building for energy consumption savings. NCC Section J provides the minimum requirement for energy efficiency and it is predicted that the proposed development will have more than 42.3% energy reduction (Refer **Section 6.7** for energy simulation results) via:

- All luminaire shall be low energy LED type.
- Warehouse lighting is generally to be zonally controlled via motion sensor.
- Office lighting shall be controlled via dual technology infrared/ultrasonic sensor.
- Daylight harvesting function to office with external windows.
- Efficient air conditioning system.

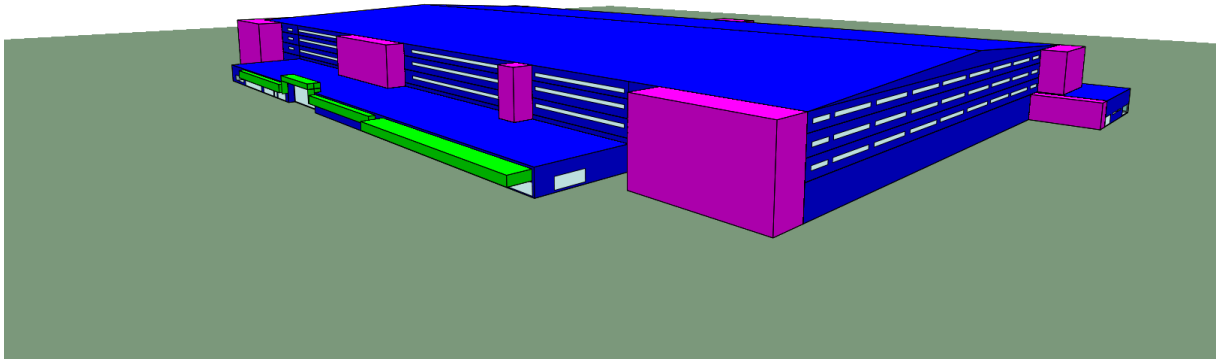
All building information and associated parameters are listed in the following sections of this report.

6.2 Energy Calculation of the Proposed and Reference Buildings

The Energy Simulation Program used in this study is the IES computer program Virtual Environment 2019(VE). The program is based on the ASHRAE response factor and the modifications included utilising Australian weather data and including building materials more appropriate to those used in Australia and enabling the input of metric data.

- SLR Consulting Pty Ltd (SLR) supports a perpetual license of the Energy Simulation Software package IES <VE>.
- IES <VE> has passed the BESTEST (ASHRAE Standard 140) external validation process.
- The weather data from ACADS-BSG NSW Richmond Test Reference Year (TRY) is used for the modelling.
- IES<VE> assesses U-Value, SHGC, and shade coefficient when evaluating the effect of glazing.
- Detailed warehouse operating schedules are not available at this stage. Therefore, NCC standard building operating profiles such as occupancy, lighting, air conditioning and equipment were adopted for warehouse and office area.
- At least 100 kW of PV system has been proposed for the warehouse.

Figure 5 Proposed Warehouse in IES Model



6.3 Artificial Lighting

In Section J6 of the NCC, the requirement for the total lighting power load within the proposed spaces of a building is to be no greater than a maximum illumination power load, measured in Watts (W). The maximum allowable building illumination power load is based on the total illumination power load calculated for each space.

For artificial lighting, the aggregate design illumination power load must not exceed the sum of the allowances. This may be obtained by multiplying the area of each space by the maximum illumination power density (as found in Table J6.2a of the NCC 2016 Volume One). The maximum illumination density for a storage warehouse is 10 W/m² as per Table J6.2a of the NCC 2016 Volume One.

The proposed warehouses will adopt the following energy efficiency measures to reduce the lighting energy consumptions:

Office lighting

- LED fitting for offices.
- Occupancy sensors to low occupancy areas e.g. office, toilets and lunch room.
- Lighting will be dimmable up to 10% when daylight allows, or area is vacated.

Warehouse lighting

- LED fitting for warehouse.
- Occupancy sensors to low occupancy areas.

Outside lighting

- LED external lighting for all outside areas.
- External lighting will be controlled via daylight sensor (photocell).

Electrical lighting is the major energy reduction component for warehouse with a large footprint.

The lighting calculation for NCC reference building is based on the maximum illumination power density specified within NCC Table J6.2A as below:

- Warehouse = 10 W/m^2
- Offices = 9 W/m^2

The electrical lighting layout of the proposed building is not provided at the time of preparing this report. It is assumed the maximum design lighting power density will be achieved as below:

- Warehouse = 6 W/m^2
- Offices = 5 W/m^2

Therefore, the proposed building is likely to achieve a 40.2% lighting energy reduction when compared with reference building. Detailed calculation is shown in **Appendix A**.

6.4 Mechanical Air-Conditioning

The mechanical service design is not available at this stage. Performance Package AR sortable Design Criteria has specified the following system types for the proposed building:

- Offices - Dedicated VRF/VRV system with heat recovery units
- Warehouses – Single zone packaged rooftop units with economiser

6.4.1 Air-conditioning temperature control and set point

Air-conditioning temperature control is summarised in Table 3.

Table 3 AC Unit Temperature Control Range

Space Type	Temperature Control Range (°C)
Offices	21 to 24°C BD
Warehouse	16 to 27°C BD

6.4.2 Air-conditioning energy efficiency requirements

2016 NCC Section J5.2e has specified the minimum energy efficiency ratios requirements for package air conditioning equipment.

Table 4 BCA Unitary Plant Requirement

Office Equipment	Minimum energy efficiency ratio	
	NCC Requirement	Proposed System[1]
Cooling	2.7	3.5
Heating	2.7	3.5

Note 1: Detailed Mechanical design is not available at this stage. It is assumed that the proposed VRF/VAV system will achieve the performance requirements above.

Warehouse Equipment	Energy Efficiency Ratio (EER)	
	NCC Requirement	Proposed System[1]
Cooling Efficiency	2.7	12.0 -Units below (70Kw)
Heating Efficiency	2.7	11.6 -Units above (70Kw)

Note 1: The AR Sortable Design Criteria has specified the above system performance to the warehouse.

Details or NCC Section J5 certification demonstrating compliance will need to be submitted with the application for a Construction Certificate.

6.5 Building Fabric Requirements

Part J1 to J3 of the BCA Section J contains the requirements of the Deemed-to-Satisfy compliance of the building fabric. The purpose of this subsection is to ensure that the building fabric will provide sufficient thermal insulation to minimise heating and cooling loads placed on the building and the commensurate energy consumption HVAC systems servicing internal building spaces.

All fabrics of the proposed building shall comply with 2016 NCC Section J. Project Section J report will need to be submitted with the application for a Construction Certificate.

6.6 Domestic Hot Water (DHW)

The BCA specifies the thermal efficiency for hot water systems to be at least 80%. The solar hot water reticulation system shall be provided to all faucets' fittings, equipment and apparatus within the development. Hot water will be generated from the roof mounted solar water packaged plant.

With the installation of water efficient fixture, the hot water consumption will be decreased and thus the domestic hot water usage will also decrease. If the domestic hot water usage is less than the energy required to heat to the water also decreases. Moreover, the supplement natural gas consumption will be reduced by using the proposed solar hot water system.

The energy simulation in this analysis is assumed both reference and proposed building are using same gas fired boiler for DHW. The actual energy consumption will be reduced once solar hot water is adopted for the proposed building.

6.7 Simulation Results

The predicted Total Energy Consumed annually by the reference building and the proposed building with the reference services is summarised in **Table 5**.

The reference and proposed building with reference services temperature is within the range 16°CDB to 27°CDB for 100% of the plant operation time.

Table 5 Comparison of Annual Energy Consumption between the reference and proposed building

Electricity Usage	**Reference building (MWh)**	**Proposed building (MWh)**
Heating	679.7	204.2
Cooling	1432.9	442.0
Auxiliary	150.1	150.1
Lighting	29760.9	17804.6
Equipment	Same	Same
DHW	Same	Same
PV System	-	-123.8
Total	**32023.6**	**18477.1**

The energy consumptions of equipment, warehouse ventilation fans and domestic hot water (DHW) are specific to the tenant's application. Therefore, it is assumed they will be the same as the NCC reference building energy consumption.

By implementing all energy efficiency measures described in **Section 6**, the project is predicted to achieve a 42.3% GHG emission reduction when compared with NCC reference building.

7 POTABLE WATER CONSUMPTION

The project will have several sustainable water saving measures, including:

- 25 kL rainwater reuse and reticulation system – Rainwater will be harvested from the roof and reuse for irrigation and toilet flushing. The reticulation will be a separate system to the domestic cold water with domestic water top up in the event of insufficient rainfall.
- Use of water saving plumbing devices.
- Water sensitive landscape design.

Further to above sustainable water measures, the following items are considered during the detailed design stage:

- Water efficient sanitary taps and toilets – install higher WELS Rating sanitary fixtures such as 4 stars for water taps, urinals and toilet.
- Water and energy efficient dishwashers with minimum 4 star WELS water rating.

By installing 4-star water efficient sanitary taps, urinals and toilets combined with the proposed rainwater harvesting facility the proposed development will reduce its potable water demand by approximately 37%. The quantities of each water fittings are assumed from the drawing and listed in **Appendix B**.

8 MONITORING AND REPORTING

All sustainable measures will be implemented into the project need to be commissioned and tuned once the project is completed, to ensure all services operate to their full potential and as designed.

As specified within the Tenant Base Building Specification, the building tuning will be provided by service contractors and overseen by an independent assessor, at least once a month within the Defects Liability Period (DLP) period to ensure that services are operating effectively and efficiently. Monthly reports to be provided to the tenant for DLP.

8.1.1 Energy Review and Audit

An energy usage review should be undertaken within the first few months of operation to ensure the Energy Management Plan is sufficient for the development's needs. A breakdown of energy usage per month at the Project Site will help to measure the development's baseline energy use and assess what appliances, equipment and processes are consuming energy.

An energy review is also necessary for the assessment of energy utilisation to further identify opportunities for improvement. Energy usage data obtained during the review process may be used to establish key performance indicators and annual energy targets for the Project.

Energy usage to be included in the review should include all purchased electricity and energy which is consumed by stationary equipment on site. Energy consumed by mobile equipment (e.g. forklifts) should also be examined as this will identify variations in warehouse operation efficiency. (Refer to 'Guidelines for Energy Savings Action Plans' (2005) (as developed by the former Department of Energy, Utilities and Sustainability) for reporting templates and further information.)

An energy audit and management review should also be undertaken on a half-yearly basis to ensure employees are following energy savings procedures correctly. Where audits show that energy savings procedures are not carried out effectively, additional employee training should be undertaken and signage and procedures re-examined.

The Energy Management Plan should be progressively improved and updated on an annual basis, or as required, to reflect changes to the Energy Management System and to promote continual improvement of energy management at the Project Site.

8.1.2 Energy Metering and Monitoring

To enable effective review of energy usage by the project, sub-metering should be implemented for all major energy consuming processes or items of equipment including sub-metering for all loads greater than 100 kVA.

Electrical equipment should be maintained to Australian Standards to ensure unnecessary energy wastage is minimised. Roof access system is proposed for third party access to roof for carry out necessary maintenance as required.

In accordance with the Goodman's Industrial Building Specification, a Building Users' Guide is to be prepared for the Project. The Building Users' Guide provides details regarding the everyday operation of a building and should include energy minimisation initiatives such as natural ventilation strategies, user comfort control, maintenance of air conditioning units and other electrical devices to ensure maximum operating efficiency, and lighting zoning strategies.

An effective Building Users' Guide will ensure that:

- Facility managers understand in detail their responsibilities for the efficient operation of the facility and any additional building tuning necessary to continuously improve energy management.

- Maintenance contractors understand how to service the particular systems to maintain reliable operations and maximum energy efficiency.
- Employees understand energy minimisation procedures and working limitations required to maintain design performance for energy efficiency.
- Future fit-out / refurbishment designers understand the design basis for the building and the systems so that these are not compromised in any changes.

8.2 Roles and Responsibilities

It is the responsibility of the facility manager to routinely check energy savings procedures are undertaken correctly (i.e. lighting turned off while areas of the development are not in use). The facility manager should also ensure all monitoring and audit results are well documented and carried out as specified in the Energy Management Plan.

Senior management should also be involved in energy management planning as an indication of the organisation's commitment to the Energy Management Plan.

9 CONCLUSION

SLR Consulting Australia Pty Ltd (SLR Consulting) has been engaged by Goodman Property Limited (Goodman) to provide a Sustainability Management Plan (SMP) for Stage 2 MOD 3 establishing warehouse and office facility within a portion of Precinct 2 at Oakdale West Estate development.

The SMP has been undertaken in accordance with the Secretary's Environmental Assessment Requirements (SEARs) for the State Significant Development (SSD 10397 and SSD 7348 MOD 3) application.

- ***Greenhouse Gas and Energy Efficiency*** *– including an assessment of the energy use on site, and demonstrate what measures would be implemented to ensure the proposal is energy efficient.*

The principal objective of this Sustainability Management Plan is to identify all potential energy savings that may be realised during the operational phase of the project, including a description of likely energy consumption levels and options for alternative energy sources such as PV solar power.

A BCA Sections J Deem-to-Satisfy compliant building is used as the baseline building for energy consumption savings. BCA Section J provides the minimum requirement for energy efficiency and it is expected that the proposed development will operate energy efficiently via:

- At least 100 kW PV Solar Installation;
- Daylight controlled fluorescent/LED lighting for the warehouse instead of metal halide, resulting in a considerable energy reduction and reduced maintenance;
- Motion sensors to all LED lights within the warehouse, and offices;
- Roof and external wall insulation as per the NCC requirements;
- High performance glazing to all air-conditioned areas or minimum NCC requirements;
- Passive solar design for external outdoor areas;
- High efficient air conditioning system;
- Power sub-metering to enable continued review of power consumption for the offices, and warehouse;
- Selection of endemic and low maintenance landscaping species;
- 25 kL rainwater tank for rainwater harvesting and re-use for landscape irrigation and toilet flushing;
- Low water flow fixtures and fittings including taps and shower heads;
- Low VOC paints, carpet and sealant and
- Other measures are detailed in report.

By implementing all energy efficiency measures described in Section 6 of this report, the project is predicted to achieve a 42.3% GHG emission reduction when compared with NCC reference building.

By installing 4-star water efficient sanitary taps, urinals and toilets combined with the proposed rainwater harvesting facility the proposed development will reduce its potable water demand by approximately 37%.

In conclusion, the relevant ESD initiatives and Energy Efficiency measures outlined in this report are incorporated into the proposed building and development details. The proposed ESD initiatives will help to achieve significant reductions in the energy required by the development both in building and operation.

Building tuning will be conducted by builder and SLR Consulting recommends that a quarter reviews of actual building energy and water consumption be carried out once the warehouses are operational to check the actual energy usage and energy savings and verify that all systems are performing at their optimum efficiency. This will provide an opportunity for the systems to be tuned to optimise time schedules to best match occupant needs and system performance while satisfying the sustainability target for the project.

10 CLOSURE

This report has been prepared by SLR Consulting Australia Pty Ltd with all reasonable skill, care and diligence, and taking account of the manpower and resources devoted to it by agreement with the client. Information reported herein is based on the interpretation of data collected and has been accepted in good faith as being accurate and valid.

This report is for the exclusive use of Goodman Property Services. No warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from SLR Consulting.

SLR Consulting disclaims any responsibility to the client and others in respect of any matters outside the agreed scope of the work.

APPENDIX A: LIGHTING CALCUATION

BCA Lighting Requirements Oakdale West Stage 2 MOD 3								
BCA Comply Building	**BCA Requirements**		**Area**	**Operating Hrs**	**Lighting Control**			**Total Annual Energy Consumption (kWh)**
	Warehouse Ground Level (W/m2)	10	50873	Monday to saturday 24 hours	Motion Detector, Daylight Sensor	0.9	0.6	2406496
	Warehouse* (Level 1 - Level 3) (W/m2)	10	144303	Monday to saturday 24 hours	Motion Detector, Daylight Sensor	0.9	0.6	6826109
	Offices W/m2	9	5492	Monday to saturday 24 hours	Motion Detector	0.9	1	389690
	Mezzanines	10	6300	Monday to saturday 24 hours	Motion Detector, Daylight Sensor	0.9	0.6	298015
			206968				**Total**	**9920311**
							kWh/m2	**47.93**

* Area per Level = 48,101 m2

Proosed Lighting - Oakdale West Stage 2 MOD 3								
BCA Comply Building	**BCA Requirements**		**Area**	**Operating Hrs**	**Lighting Control**			**Total Annual Energy Consumption (kWh)**
	Warehouse Ground Level (W/m2)	6	50873	Monday to saturday 24 hours	Motion Detector, Daylight Sensor	0.9	0.6	1443898
	Warehouse (Level 1 - Level 3) (W/m2)	6	144303	Monday to saturday 24 hours	Motion Detector, Daylight Sensor	0.9	0.6	4095665
	Offices W/m2	5	5492	Monday to saturday 24 hours	Motion Detector	0.9	1	216495
	Mezzanines	6	6300	Monday to saturday 24 hours	Motion Detector, Daylight Sensor	0.9	0.6	178809
			206968				**Total**	**5934867**
							kWh/m2	**28.68**

APPENDIX B: WATER CALCUATION

WATER SAVINGS CALCULATION

Table C1 - Number of fixtures

Area	Toilets	Urinal	Basins	Showers
Amenities	256	46	221	8
Total	256	46	221	8
Assume 70% of toilet water usage is supplied by rainwater				
Fraction not supplied by RWH	0.3			

Table C2 - Results

No water saving measures		**Max water usage rate** [1]	
Toilet	Adopt 3* Average Flush Usage in Table C3	1024	L/s
Tap	Adopt 3* Tap Usage in Table C3	1989	L/s
Urinal	Adopt 3* Urinal Usage in Table C3	92	L/s
Water reuse measures (4*) with RWH		**Max water usage rate** [1]	
Toilet	Adopt 4* Average Flush Usage in Table C3	896	L/s
Tap	Adopt 4* Tap Usage in Table C3	1657.5	L/s
Urinal	Adopt 4* Urinal Usage in Table C3	69	L/s
Water reuse measures (5*) with RWH		**Max water usage rate** [1]	
Toilet	Adopt 5* Average Flush Usage in Table C3	768	L/s
Tap	Adopt 5* Tap Usage in Table C3	1326	L/s
Urinal	Adopt 5* Urinal Usage in Table C3	46	L/s
	3* with RWH	**4* with RWH**	**5* with RWH**
Improvement Percentage (%) [3]	**25**	**37**	**49**