

1 LAWSON SQUARE REDFERN (TOWER 1)

NABERS Energy Assessment

Prepared for:

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BASIS OF REPORT

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

This report is for the exclusive use of the Client. 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

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

DOCUMENT CONTROL

Reference	Date	Prepared	Checked	Authorised
610.11623-R01-v1.0	19 September 2019	Horatio Cai	Neihad Al-Khalidy	Neihad Al-Khalidy

EXECUTIVE SUMMARY

SLR Consulting Australia Pty Ltd (SLR) has been engaged by Lawson Square Pty Ltd to undertake a Base Building NABERS Assessment for the commercial component (Level 1 to Level 5, Office area, Tower 1) of the proposed mixed-use building at 1 Lawson Square, Redfern in accordance with the NABERS Energy Guide to Building Energy Estimation.

The following approach has been proposed with respect to the NABERS rating:

- The 'rated area' according to the NABERS Energy and Water for Offices Rules is defined as the Net Lettable Area (NLA) for the office area in Level 1 to Level 5 being rated based on the Property Council of Australia (PCA) March 1997 Method of Measurement, excluding non-office spaces, and spaces not reasonably compared to an office (eg plant rooms, stairwells and lift cores).
- NABERS Energy Guide to Building Energy Estimation occupancy schedule was used for all offices.
- After hours of use for level 01 office area is assumed to be 4 hours per week.
- The estimated rated hour for the proposed building is 50 hours/week.
- The total energy use of lighting and ventilation for carpark is included in the NABERS rating.

The "NABERS Rating Calculator" with input data based on 50.0 hours/week occupancy indicates:

- Energy intensity of 315 MJ/m² p.a,
- Greenhouse gas intensity (Scope 1 2 without Green Power)) of 64 kgCO₂-e/m² p.a.

These results indicate that the commercial component can theoretically achieve a 5-star Energy performance.

As more mechanical and electrical specifications and design drawings are produced during the detailed design stage, SLR can refine the NABERS energy model and confirm the energy performance for the proposed re-development.

While every endeavour has been made to provide a realistic energy rating for the proposed development, we note that the energy efficiency of any building is determined not only by the design but also by the energy consumption requirements and practices of the occupants. Actual energy consumption cannot be determined until a building is 75% occupied and operational.

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1 Introduction

SLR Consulting Australia Pty Ltd (SLR) has been engaged by Lawson Square Pty Ltd to undertake a Base Building NABERS Assessment for the commercial component of the proposed mixed-use building at 1 Lawson Square, Redfern in accordance with the NABERS Energy Guide to Building Energy Estimation.

The proposed development includes:

- One level of basement car parking.
- Ground floor with retail, shopfront premises and residential lobby.
- Commercial office floors from level 01 to 05.
- Residential apartments from level 06 to 17.

This report is prepared based upon the following documentations:

- Architectural drawings – S96 Modification 7 drawings received on 16 August 2019 from Candalepas Associates.
- Mechanical drawings prepared by SEMF Pty Ltd for Tower 02 within the site.

1.1 Development Site

The site is currently under reconstruction of a mixed use development. The site is located to the south of Lawson square and north to the Redfern Street. It is mainly surrounded by commercial and residential buildings. An aerial view of the development site is shown in **Figure 1**.

Figure 1 Aerial View of Development Site Location



2 Thermal Calculations

The Energy Simulation Program used in this study is the IES computer program Virtual Environment (VE) version 2019, to confirm to Australian conditions. 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/CSIRO Nominated Test Reference Year NSW Nowra is used for the modelling.
- The building's proposed air-conditioning system is air-cooled reverses cycle ducted VRF system with heat recovery and as such can be readily modelled using the proposed energy software.
- IES<VE> assesses U-Value, SHGC, and shade coefficient when evaluating the effect of glazing. This will tend towards a more conservative outcome.

Figure 2 SLR 3D Model in in IES VE Energy Simulation Software

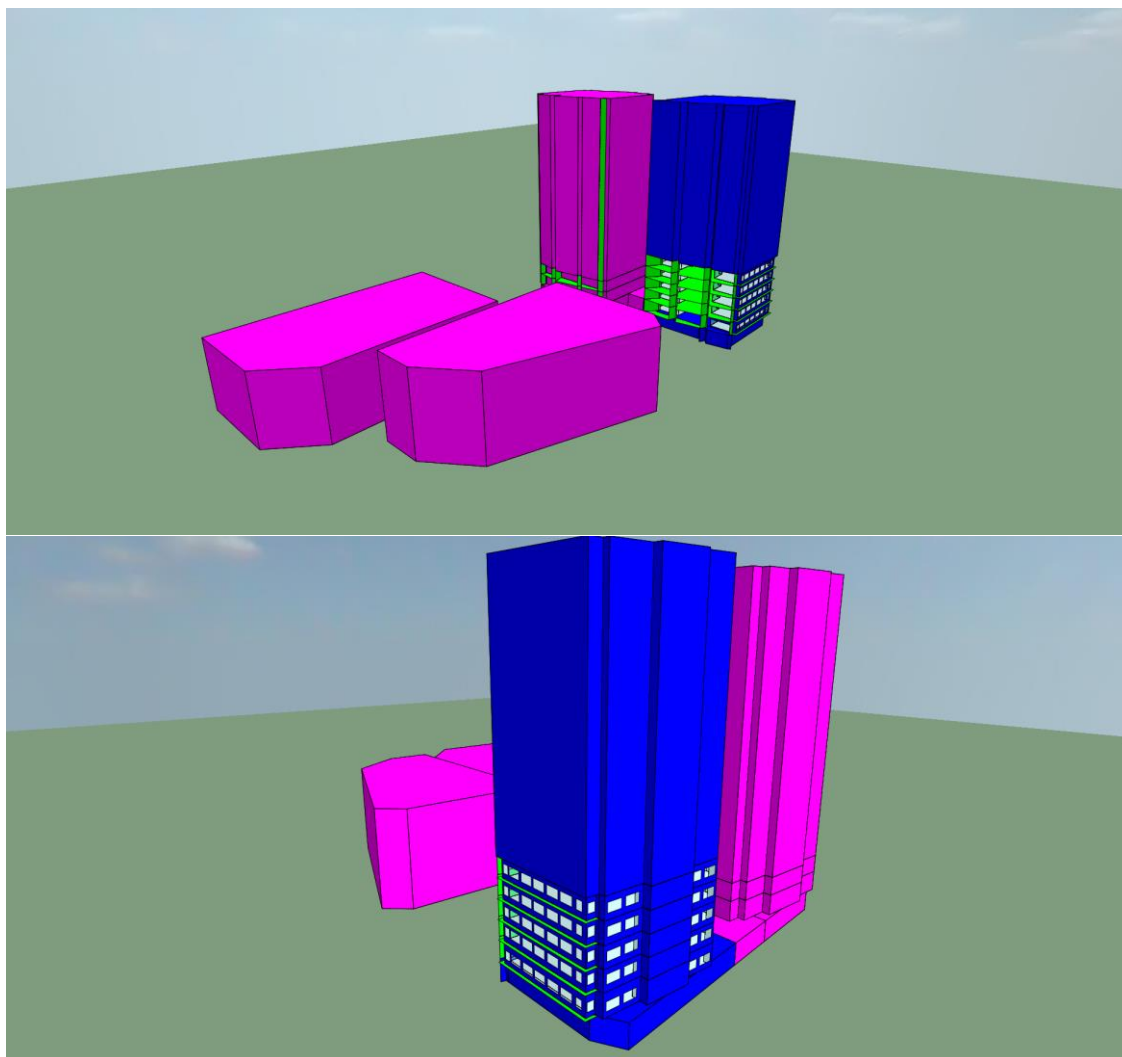
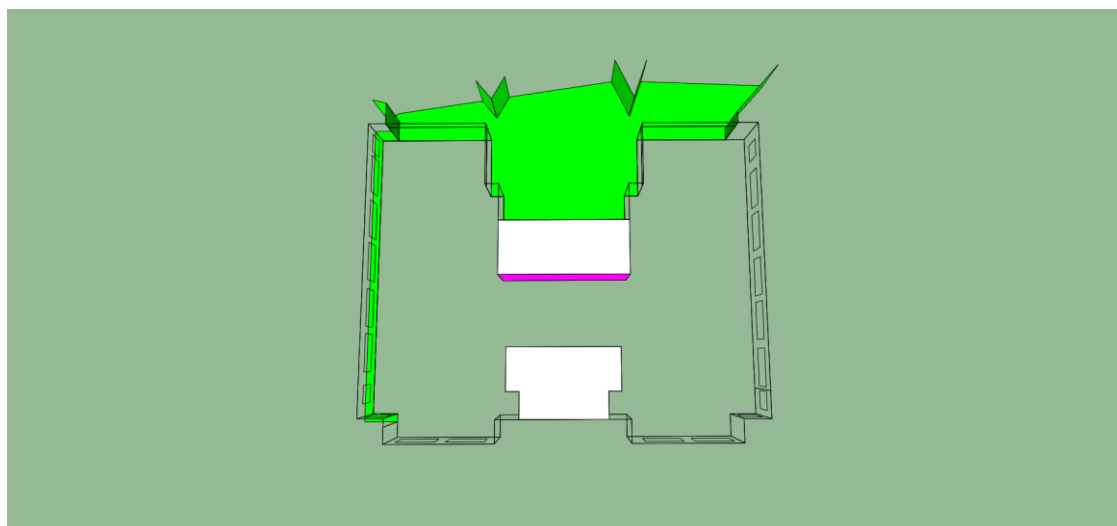


Figure 3 Proposed Typical Office Level in IES VE



3 Modelling Description

3.1 Input Data Validation Form

Climate Data	Weather data from ACADS-BSG, Sydney NSW Test Reference Year (TRY)			
Building Form	- One level of basement car parking. - Commercial offices from level 01 to 05. - Stairwells are located on the south side of the building. - Glazing facades are facing all directions. - All external walls are medium concrete wall with insulation totalling to R2.8 for the whole wall system.			
External Shade	- North façade is shaded by terraces from level above. - The glazed facade is shaded by vertical fins and overhangs. - Provision has been made in the modelling for the adjacent external buildings where applicable.			
Glazing	Glazing system (glass and frame) with U value & Solar Heat Gain Coefficient presumed in the modelling are as shown below.			
	Area	Orientation	U-value	Solar Heat Gain Coefficient (SHGC)
	Throughout	All	5.7	0.61
	E.g. G. James GJA-043-04 10.38mm laminate			
Insulation	Building envelop thermal performance as per project section J requirements below : - All external walls have a total R-value of 2.8. - Internal walls to unconditioned space have a total R-value of 1.8. - External floors above unconditioned spaces and outside air have a total R-value of 1.0.			
Car parks	The basements carparks have supply and exhaust air fans with VSD/CO monitoring controls.			
Floor Area	- Detailed NLA schedule is not provided at this stage of the project. The total estimated net lettable floor area of the building is 1,680m². - The NABERS rated area for this study is 1,680m². Rated area includes level 01 to 05 open plan offices. - The rated floor area is based on the air conditioned floor area on Levels 01 to 05 excluding plant rooms, stairwells and lift cores.			
Lighting Density	- Lighting layout is not available at this stage. The following assumption has been made. - Office floors: In general average lighting intensity in the office floor is approximately 9 W/m² - Carpark lighting density is approximately 6 W/m².			
Lighting hours	- Schedules used in study are as detailed for Lighting (automated control) in "NABERS Validation Protocol" for weekdays. - One after-hours zone selected for level 01 office. - Schedule shown in Appendix A.			
Equipment density	The area weighted average equipment load in the model is 11 Watts/m ² . The equipment loads are randomly distributed into zones of the following loads figures: 3.3 W/m ² , 4.4 W/m ² , 8.25 W/m ² , 11 W/m ² , and 13.75 W/m ² .			
Equipment Hours	Schedules used in study are as in Appendix A .			
Occupant density	Occupancy has been based Nabers Default values below: 1 person /10 m². - Internal heat gains from occupants at an average rate of 75W per person sensible heat gain and 55W per person latent heat gain.			
Occupancy hours	Schedules used in study are shown in Appendix A .			

HVAC System type	It was advised that the proposed system will be VRF with heat recovery system to serve the level 01 to 05 offices. No economy cycle and no CO2 monitoring.
HVAC Hours	The base building HVAC has been modelled to operate for 11-hours on Monday to Friday from 7.00am to 6.00pm for level 01 to 05 offices. Saturday after hours from 9:00am to 12:00pm and 5:00pm to 6:00pm for level 01. Schedules used in study are as detailed in Appendix A . Note: The energy consumption of tower 01 was estimated based upon the building services design for tower 02 within the same site. The two towers have similar layout, building fabrics and building services design expectations.
HVAC After hours	After-hours modelled for level 01 office as described above.
HVAC Plant	The building main plant consists of number sets of the VRF system. The equipment selection from DAIKIN for commercial tenancies has been utilised for this analysis.
HVAC Control	Mechanical specification is not available. A space temperature indoor condition is assumed to be 22.5±1.5°CBD.
Energy Coverage	The energy sources considered in the study were gas and electrical energy.
Domestic hot water demand	Default value at 4L/person/day.
Lifts	Default value 8 kWh/m ² based on building NLA.

4 Metering Requirements Description

Metering Requirements	Energy Coverage	
The program used separates the total energy usage into the main categories required for this study, on an annualised basis. All of these loads are allocated to the Master meter. The loads, in this study, are all electrical energy	Office lighting	This load is a Tenant of Building Load.
	Equipment	This load is a Tenant of Building Load.
	Cooling	This is the energy required to cool the air in the system.
	Heating	This is the energy required to heat the air in the system.
	Fans, pumps and controls	Those loads are included as part of the base or whole building load.
	Domestic Hot Water	This load was input as default value at 4L/person/day based on NLA.
	Lifts	This load was input as default value at 8 kWh/m ² based on building NLA.
Sub metering of car park	Covering of the entire energy use associated to the car park	Separate meter for commercial, retail and residential.
Sub metering the supplementary HVAC	Cooling, heating, fans and pump and any associated equipment	This load needs to be excluded/included in the NABERS rating depending on the areas they are

serving.

5 Base Building simulation results

5.1 Energy End-Use Summary

Energy End Use	Total Electricity Use (MWh)/GJ	Electricity included in Rating (MWh)/GJ
Tenancy Lighting	59.49	-
Common Area Lighting	8.23	8.23
Carpark Lighting	29.15	29.15
Tenancy Equipment	60.30	-
Lifts	13.44	13.44
Domestic Hot water (gas) in (GJ)	83.50	83.50
Space Heating	6.89	6.89
Space Cooling	18.34	18.34
HVAC Aux	3.90	3.90
Ventilation Fans	22.34	22.34
Carpark Fans	5.70	5.70
Hydraulic Pumps	12.32	12.32
Equipment Testing	1.41	1.41
BMS & Security System	2.10	2.10
Total Electricity Use (kWh)		123820
Total gas Use (MJ)		83500

5.2 Floor Area

NLA Schedule is not provided at this stage and the following NLA area was measured/calculated from the architectural drawings.

Area	Internal NLA (m ²)
L1 OFFICE	336
L2 OFFICE	336
L3 OFFICE	336
L4 OFFICE	336
L5 OFFICE	336
Total NLA	1,680

The total rated area excluding plant rooms, storage areas, toilet areas and lift cores as per architectural drawings is 1,680 m².

6 NABERS Energy Ratings

6.1 Energy Rating

Table 1 Data inputs and Results

Item	Figure for use in Rating	Notes
Postcode	2016	
Rated Floor Area	1680	NLA of levels 01 to 05 office area
Hours of Use	50.0 hours/week	Occupancy hours as per default
Electricity Use	123,820 kWh	This is the base building annual electricity consumption as per Section 5.1
Fuel Use (Gas)	83,500MJ	This is the base building annual gas consumption as per Section 5.1
Raw Emissions (scope 1, 2 without Green Power)	108,309 kg CO ₂ per annum	
Greenhouse gas intensity (Scope 1 2 without Green Power)	64 kgCO ₂ /m ²	
Energy/Greenhouse rating	5-Stars	

The final energy performance will be confirmed during the detailed design stage once the building service design is progressed.

6.2 Estimated NABERS Energy Performance based on the Simulations

The NABERS web-site "NABERS Rating Calculator" with input data based on 50.0 hours/week occupancy indicates:

- Energy intensity of 315 MJ/m² p.a.,
- Greenhouse gas intensity (Scope 1 2 without Green Power)) of 64 kgCO₂-e/m² p.a.
- These results indicate 5-star Energy performance.

NABERS online results page attached in **Appendix B** of this report.

7 Conclusion

SLR Consulting Australia Pty Ltd (SLR) has been engaged by Lawson Square Pty Ltd to undertake a preliminary Base Building NABERS Assessment for the proposed mixed-use building at 1 Lawson Square, Redfern in accordance with the NABERS Energy Guide to Building Energy Estimation.

The “NABERS Rating Calculator” with input data based on 50.0 hours/week occupancy indicates:

- Energy intensity of 315 MJ/m² p.a.
- Greenhouse gas intensity (Scope 1 & 2 without Green Power) of 64 kgCO₂-e/m² p.a.
- These results indicate that the commercial component can theoretically achieve a 5-star Energy performance.

The final energy performance will be confirmed during the detailed design stage once the building service design is progressed.

While every endeavour has been made to provide a realistic energy rating for the proposed development, we note that the energy efficiency of any building is determined not only by the design but also by the energy consumption requirements and practices of the occupants. Actual energy consumption cannot be determined until a building is occupied and operational.

8 Disclaimer

Computer building simulation provides an estimate of building performance. This estimate is based on a necessarily simplified and idealised version of the building that does not and cannot fully represent all of the intricacies of the building once built. As a result, simulation results only represent an interpretation of the potential performance of the building. No guarantee or warranty of building performance in practice can be based on building simulation results alone.

APPENDIX A

Nabers Default Office Profiles

Weekdays (All Zones)

Time period	Occupancy	Lighting (Automated time of use control)	Lighting (limited control)	Equipment	HVAC Operation
0000-0100	0%	5%	15%	25%	Off
0100-0200	0%	5%	15%	25%	Off
0200-0300	0%	5%	15%	25%	Off
0300-0400	0%	5%	15%	25%	Off
0400-0500	0%	5%	15%	25%	Off
0500-0600	0%	5%	15%	25%	Off
0600-0700	0%	5%	15%	25%	Off
0700-0800	10%	30%	40%	65%	On
0800-0900	20%	75%	90%	80%	On
0900-1000	70%	100%	100%	100%	On
1000-1100	70%	100%	100%	100%	On
1100-1200	70%	100%	100%	100%	On
1200-1300	70%	100%	100%	100%	On
1300-1400	70%	100%	100%	100%	On
1400-1500	70%	100%	100%	100%	On
1500-1600	70%	100%	100%	100%	On
1600-1700	70%	100%	100%	100%	On
1700-1800	35%	75%	80%	80%	On
1800-1900	10%	25%	60%	65%	Off
1900-2000	5%	15%	60%	55%	Off
2000-2100	5%	15%	50%	25%	Off
2100-2200	0%	5%	15%	25%	Off
2200-2300	0%	5%	15%	25%	Off
2300-2400	0%	5%	15%	25%	Off

Saturdays (after-hours zones)

The below schedule (which operates the HVAC from 9.00am – midday on Saturday) can be applied to a single after-hours zone of the building (for example, the smaller of 10% of the building, one storey, or an individual and distinct tenancy with area greater than 5% of the total building).

Time period	Occupancy	Lighting (Automated time of use control)	Lighting (limited control)	Equipment	HVAC Operation
0000-0100	0%	5%	15%	25%	Off
0100-0200	0%	5%	15%	25%	Off
0200-0300	0%	5%	15%	25%	Off
0300-0400	0%	5%	15%	25%	Off
0400-0500	0%	5%	15%	25%	Off
0500-0600	0%	5%	15%	25%	Off
0600-0700	0%	5%	15%	25%	Off
0700-0800	0%	5%	15%	25%	Off
0800-0900	5%	40%	25%	25%	Off
0900-1000	15%	40%	40%	25%	On
1000-1100	15%	40%	40%	25%	On
1100-1200	15%	40%	40%	25%	On
1200-1300	5%	15%	25%	25%	Off
1300-1400	5%	15%	25%	25%	Off
1400-1500	5%	15%	25%	25%	Off
1500-1600	5%	15%	25%	25%	Off
1600-1700	5%	15%	25%	25%	Off
1700-1800	0%	5%	15%	25%	On
1800-1900	0%	5%	15%	25%	Off
1900-2000	0%	5%	15%	25%	Off
2000-2100	0%	5%	15%	25%	Off
2100-2200	0%	5%	15%	25%	Off
2200-2300	0%	5%	15%	25%	Off
2300-2400	0%	5%	15%	25%	Off

APPENDIX B

Estimated Base Building Energy Rating



Your estimated Energy rating is 5 star.

The energy intensity of the building is 315 MJ/m².

0 %	GreenPower
108309 kg CO ₂ -e p.a.	Total greenhouse gas emissions, scope 1 and 2 without GreenPower
124236 kg CO ₂ -e p.a.	Total greenhouse gas emissions, scope 1, 2 and 3 without GreenPower ⓘ
64 kg CO ₂ -e/m ² p.a.	Greenhouse gas intensity, scope 1 and 2 without GreenPower
74 kg CO ₂ -e/m ² p.a.	Greenhouse gas intensity, scope 1, 2 and 3 without GreenPower ⓘ
67	Benchmarking factor without GreenPower

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