Daylight Modelling

Model | 35-45 Lithgow Street, Abbotsford, Victoria

02 February 2026 | Revision B

Overview

Arup has been engaged by Model to provide a daylight strategy including daylight modelling for the proposed build-to-rent development located at 35-45 Lithgow Street in Abbotsford. This has been requested by the Department of Transport and Planning (DTP) to support the project's town planning submission and reassure the state of the project's daylight amenity.

This report provides an overview of the project's estimated daylight levels with consideration of good and best practice daylight levels within the context of the project's 5 Star Green Star Buildings v1 commitment or 6 star target.

The daylight assessment shows that the development meets the Green Star Minimum Expectation for good daylight across the development, with 95% of living rooms featuring daylight access and 95% of bedrooms. Consistent with the Green Star requirements, the project team have met the criteria for remaining apartments by acknowledging the barriers to daylight access that are attributable to the building's adjacent conditions and desire to introduce permeability to the site creating areas of self-shade in the built form.

For the limited areas that have lower levels of daylight access, it is noted that they are ground floor units with access to terraces and units that have relatively good daylight in the living areas, whilst all units have access to daylight through access to the common amenity areas.

	Green Star Minimum Expectation (mandatory) % of apartments with daylight access (160 lux for 80% hours)	
	Living	Bedrooms
Ground Floor	75%	82%
Level 1	100%	93%
Level 2	100%	97%
Level 3*	100%	100%
Level 4*		
Level 5*		
Overall	**95%**	**95%**
	>95%	**>95%**

Introduction and methodology

Project and site context

Site

The development is located at 35-45 Lithgow Street Abbotsford, Victoria. It is a 5-story development positioned adjacent to low-density residential and commercial buildings.

There is an existing building on site that will be retained and refurbished and is ~10m high. This building, as well as all directly adjacent single-story neighbours have been included in the model.

Policy Context

National, State and Local Council

The project is located within the City of Yarra in Victoria and is therefore required to meet the national, state and local council relevant building requirements that pertain to daylight.

The NCC effectively mandates that apartment windows must be at least 10% of the apartment sizes, Victorian Apartment Design Guidelines limit the room depth to less than 9m, whilst the project must also meet the objectives outlined in Yarra Council's ESD Policy, which requires an assessment using BESS or Green Star.

The project is committed to a 5 star Green Star rating, so this pathway will be taken. Within Green Star, the daylight related provisions are as follows:

- **Minimum expectation (mandatory):** Aims to ensure at least 95% of apartments having access to daylight, with mitigation strategies for any loss acceptable. The glazing must have a VLT of >40% with consideration of glare, daylight access, daily activities etc.
- **Credit Achievement (optional 2 points):** 60% of combined living and bedroom area of each unit and minimum 20% of each separate area must have at least 160 lux daylight during 80% of nominated hours.

This report can be used to demonstrate compliance with the Green Star Minimum Expectation. The NCC an ADGV criteria is considered to be met by virtue of the architectural design and is not tested within this document.

Federal

Australia

NCC 2022 Volume One

Architectural dimensions

Window size at least 10% of room size

State

Victoria

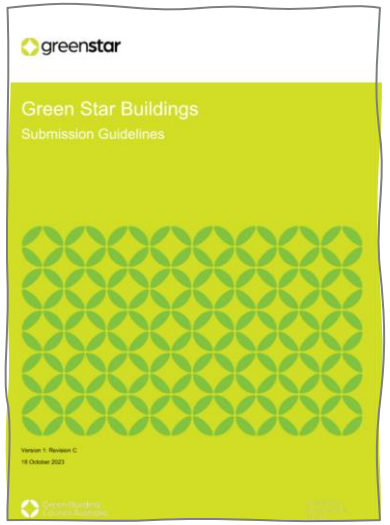
ADGV

Architectural dimensions

Room depth less than 9m

Local

City of Yarra



Green Star Buildings v1

Daylight strategy

>95% of apartments have access to daylight.

Green Star Daylight Credit Criteria

Green Star Credit 11 Light Quality

The project is targeting a 5 star Green Star rating, which includes meeting the Minimum Expectation for Credit 11 Light Quality.

This criteria aims to exceed the Federal and State daylight requirements for daylight and aims to provide enhanced access to a view and daylight for at least 95% of the apartments including the provision for daylight within shared amenity areas.

Daylight autonomy has been used to quantify the daylight levels within the apartments, which reports the extent of the apartment floor area that achieves a moderate level of daylight (160 lux) for 80% of the hours between the occupied hours (nominated as 8am and 6pm) through the year.

For the Minimum Expectation, the daylight autonomy calculation has been used to show whether living rooms and bedrooms have access to moderate levels of daylight, whilst the Credit Achievement level defines specific thresholds that can be attributed to optional points claims.

The more detailed criteria for both the Minimum Expectation and Credit Achievement for Green Star Buildings v1 credit 11 Light Quality are outlined inset.

Minimum Expectation (targeted)

- For 95% of all apartments, the living rooms and all bedrooms have access to a view and daylight.
- Maximise the number of occupants that are in or near daylit areas during their daily activities.
- Control or mitigate external glare in the daylit spaces.
- Provide building occupants with unrestricted access to daylight indoor public common spaces.

Where the requirements cannot be met, it is acceptable to outline the barriers to achieving the requirements, and the measures taken to mitigate the loss of daylight quality for occupants.

This is confirmed in Green Star FAQ 00433.

Credit Achievement (optional and not targeted)

- 60% daylight autonomy per unit. As combined living and bedroom area for each unit. Kitchens are not included.
- 20% daylight autonomy per room. For living and bedrooms separately for each unit.

This is not required to be met by the project to achieve a 5-star Green Star rating.

Methodology

Process

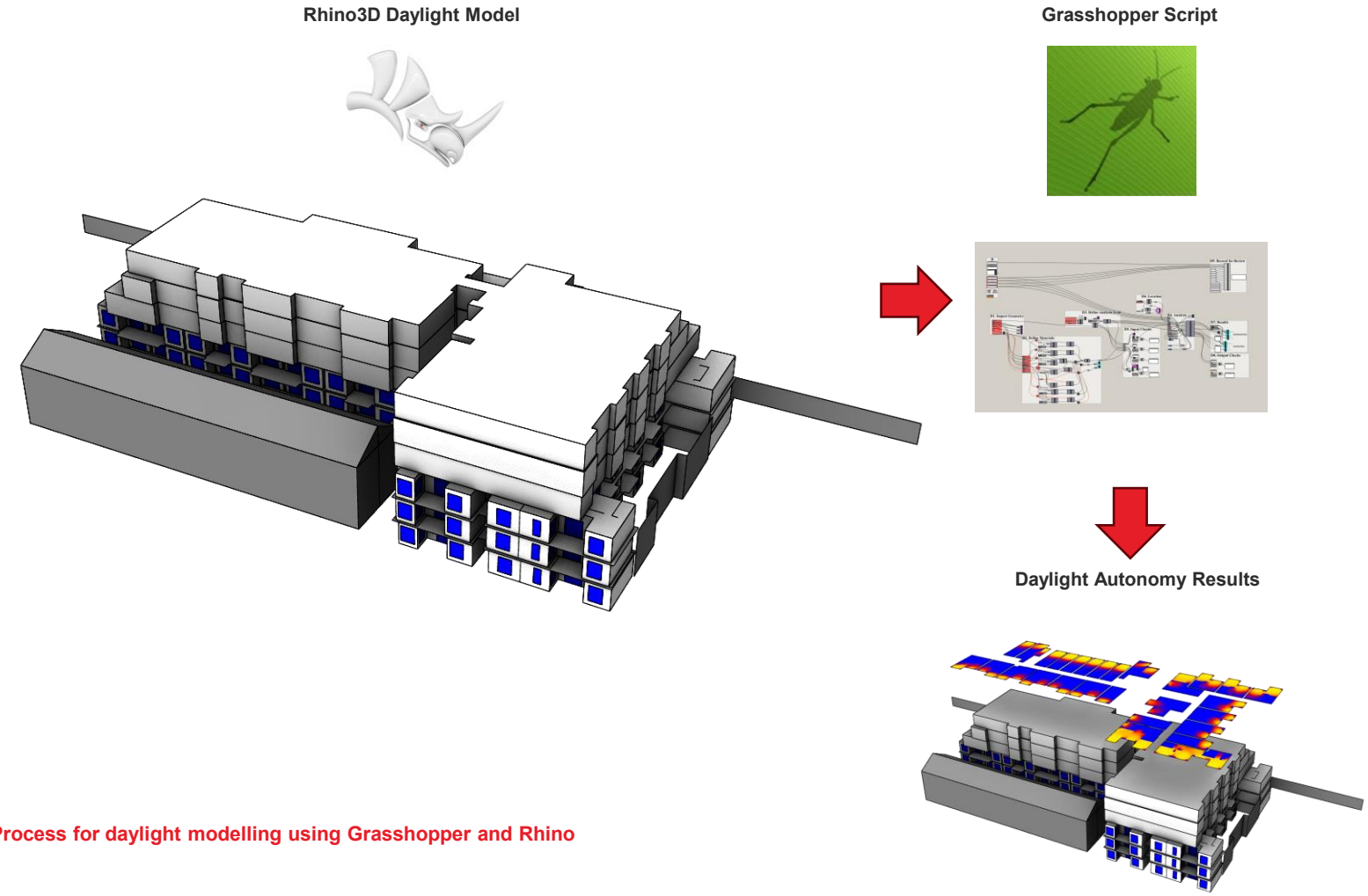
The daylight model is based on the town planning drawing package provided by Warren and Mahoney (dated 29 October 2025). The model includes the geometry for surrounding buildings to account for overshadowing, as well as shading devices.

Daylight Autonomy has been modelled across the nominated area between the assumed nominated hours of 8am to 6pm. The nominated area is comprised of spaces that are regularly occupied for more than two hours – these are highlighted on the following page.

A Radiance simulation was established through a Grasshopper script, incorporating defined values for Light Reflectance and Visible Light Transmittance.

Simulation Settings:

- Calculation engine: Radiance
- Type of analysis: Daylight Autonomy
- Grid size: 0.5m x 0.5m (exceeding 1m x 1m requirement)
- Compliance threshold: 80% of nominated hours (8am-6pm) exceeding 160 lux
- AUS_VIC.Melbourne.948660_IWEC/AUS_VIC.Melbourne.948660_IWEC



Process for daylight modelling using Grasshopper and Rhino

Areas tested

Nominated area as regularly occupied

A representative selection of floors have been modelled, including:

- Ground floor (representing worst case apartments)
- Level 1 (representing worst case apartments)
- Level 2 (representative of levels 2-5)

For each apartment, regularly occupied spaces continually occupied for more than 2 hours have been assessed.

These include:

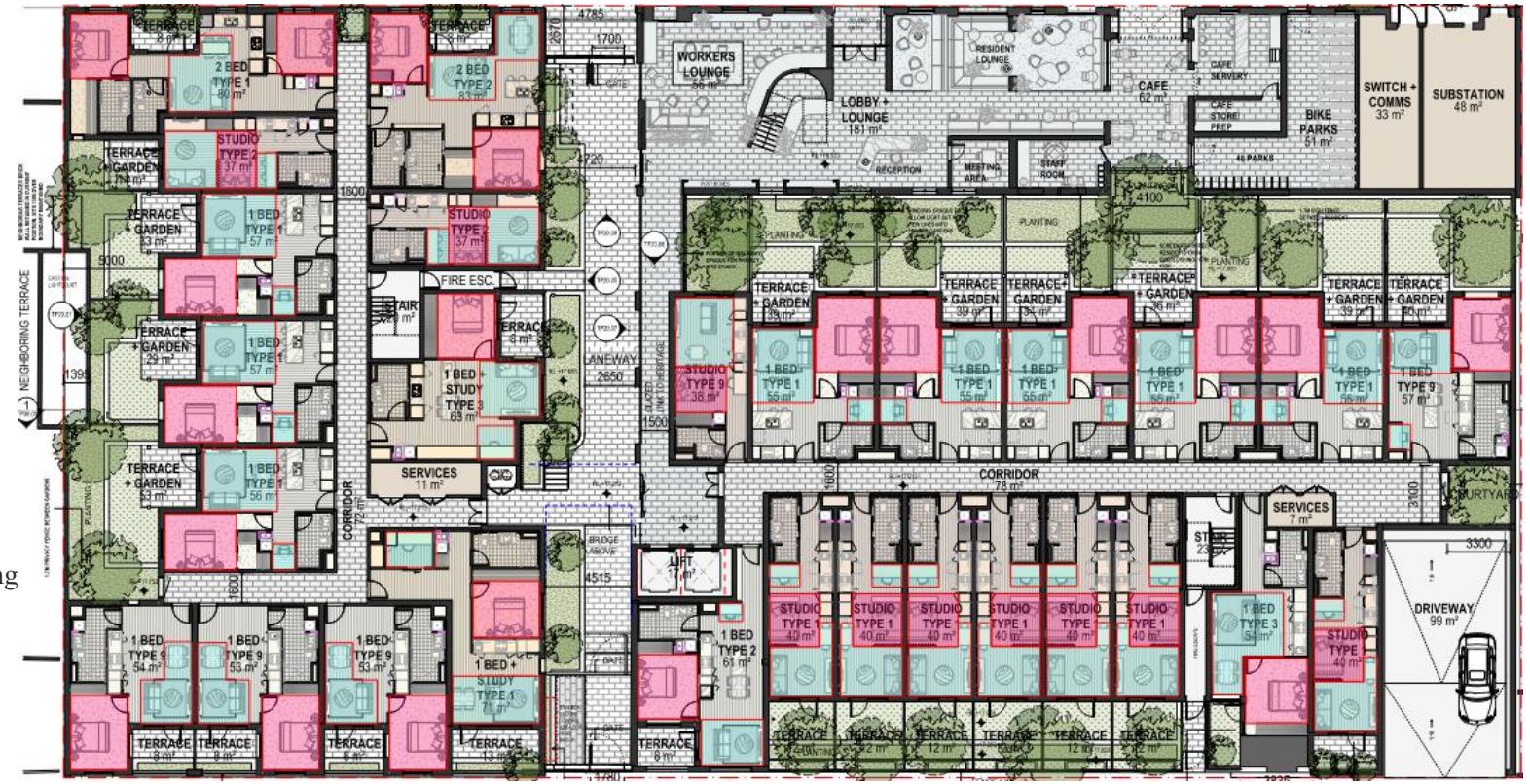
- Bedrooms
- Living Areas
- Dining areas
- Studies – Note limited use intended with dedicated co-working space in the residential amenities building for longer work.

The following have been excluded:

- Kitchens and kitchen islands plus 1m circulation
- Bathrooms
- Wardrobes, including walk-in wardrobes
- Corridors

Bedroom area included

Living area included



Areas to be tested for daylight

Lithgow Street Ground Floor plan example

Visible light transmittance and light reflectance values

Visible light transmittance (VLT)

The visible light transmittance (VLT) of the glass is a key parameter in daylight modelling calculations as it defines the extent of light that is permitted through the glass.

The VLT is required to be greater than 40% to meet the Green Star Minimum Expectation criteria.

At this stage in the project, VLT has been assumed as 60% for all glazing within the development. This is expected to be achievable for the development whilst maintaining appropriate SHGC values to limit cooling loads.

Light Reflectance Values

At this stage in the project, internal finishes have not been finalised. The following values were defined initially to inform this preliminary target setting exercise and represent typical building materials.

- Floor LRV: 30% (e.g. typical of timber or carpet)
- Walls : 70% (e.g. light-coloured painted plasterboard)
- Ceilings : 80% (e.g. white painted plasterboard)
- Context: 30% (e.g. bricks)

These assumptions are reflective of the current design intent, whilst remaining conservative at this stage.

Analysis Results

Results overview

Current status

The daylight analysis results are shown inset.

Minimum Expectation (mandatory)

- 95% of the living rooms feature areas with moderate daylight levels for 80% of the year, with only ground floor units being effectively limited.
- 95% of bedrooms feature areas with moderate daylight levels for 80% of the year.
- Barriers for higher levels of daylight are discussed on the following pages for these areas, particularly the bedrooms, but in terms of mitigation, the residents have access to daylight in other areas of their overall apartment spaces including their terraces as well as the common amenity areas.
- Other aspects of the Minimum Expectation criteria pertaining to glare will be met with blinds or curtains anticipated to be provided for all apartments which will combine with external shading in some locations in coordination with the energy strategy.

	Green Star Minimum Expectation (mandatory) % of apartments with daylight access (160 lux for 80% hours)	
	Living	Bedrooms
Ground Floor	75%	82%
Level 1	100%	93%
Level 2	100%	100%
Level 3*		
Level 4*		
Level 5*		
Overall	**95%**	**95%**
	>95%	**>95%**

* Assumed conservatively based on Level 2 results

Ground floor

Living rooms

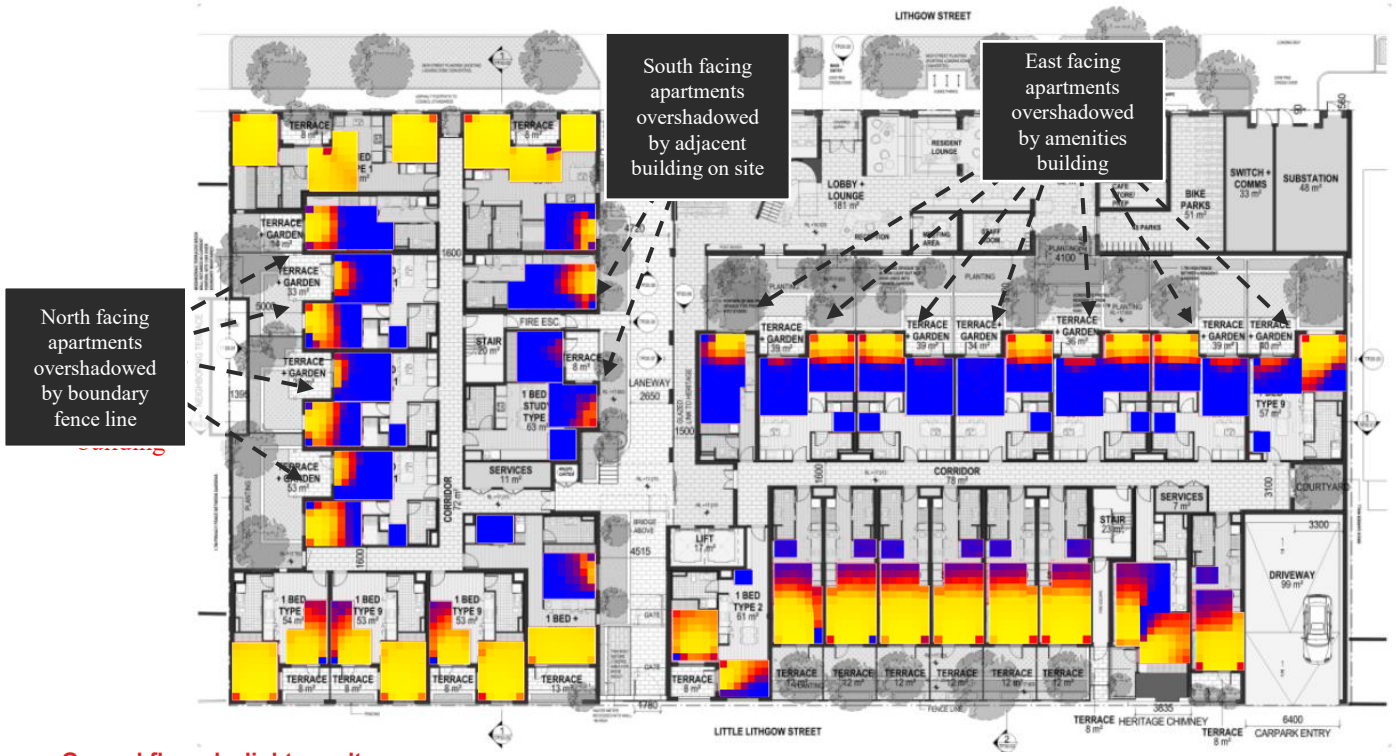
75% of living rooms have daylight access for more than 80% of the year, meeting the Green Star Minimum Expectation for these apartments. Some units also include study areas with limited daylight access, which have been included for a conservative estimate of daylight autonomy.

Bedrooms

Daylight autonomy shows that 82% of apartments have access to daylight in all bedrooms, in accordance with Green Star Minimum Expectation. In many instances, bedrooms within studio apartments do not meet the target, however these are adjacent to well-lit living rooms and as such occupants have direct access to daylight.

Apartments with barriers to daylight access

These are north, east and south-facing apartments, which are overshadowed by other buildings on site. Being on the ground floor, these units have easy access to the amenities building which has a well-lit co-working space and lounge areas. They also have access to outdoor terraces, proving additional daylight access.



Level 1

The 30 apartments modelled on Level 1 show an improvement compared to the ground floor.

Living rooms

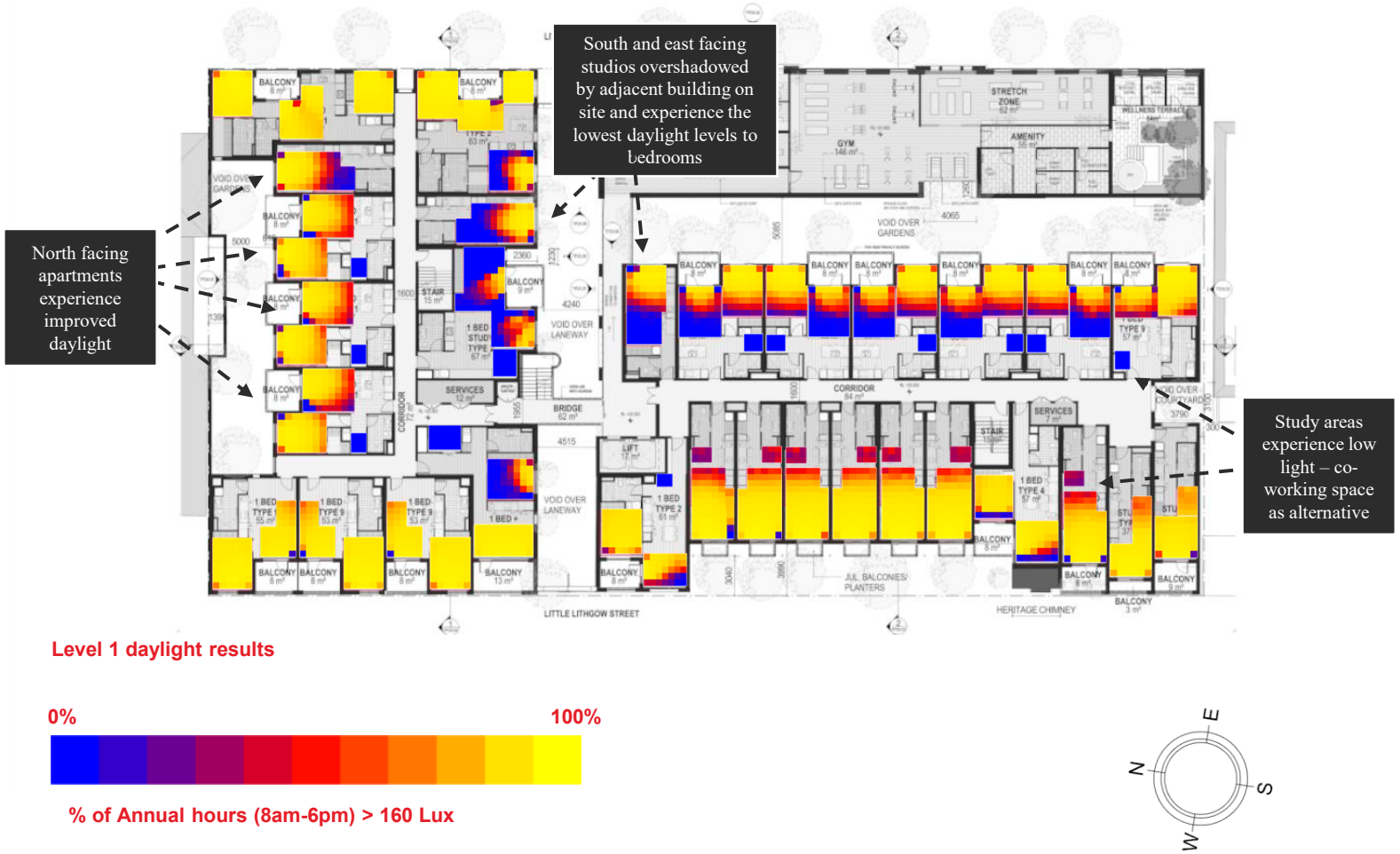
All living rooms achieve daylight access for more than 80% of the year, meeting Green Star Minimum Expectation requirements.

Bedrooms

Daylight autonomy in bedrooms shows that 93% of bedrooms have access to daylight, in line with Green Star Minimum Expectation requirements. Only 2 bedrooms, which are part of studio apartments, do not achieve daylight access for more than 80% of the year.

Apartments with barriers to daylight access

North facing apartments daylight has improved across living and bedrooms spaces. The east and south facing apartments daylight has also improved but still experience moderate overshadowing. These units have access to the amenities building which has a well-lit co-working space and lounge areas. As well, most of these apartments have balconies for additional daylight and views.



Level 2

The 30 apartments modelled on Level 2 show another significant improvement compared to Level 1.

Living rooms

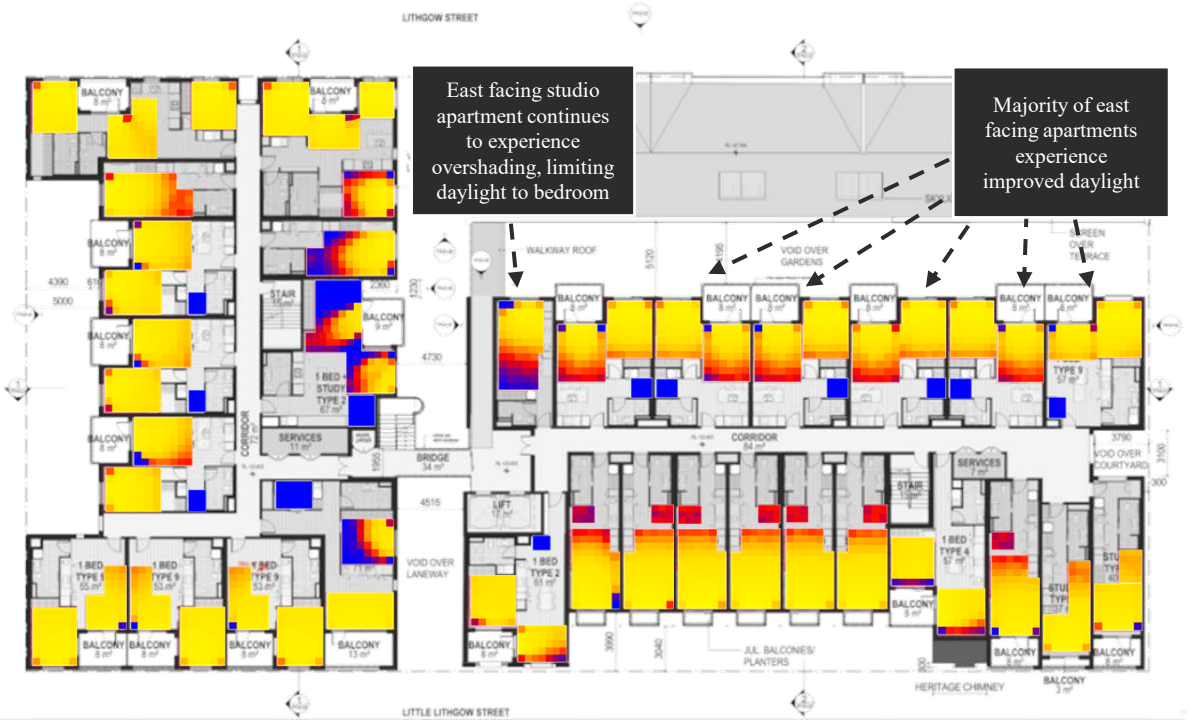
Daylight autonomy improved compared to Level 1, with 100% of the living rooms achieving daylight access for more than 80% of the year, meeting Green Star Minimum Expectation requirements for all apartments.

Bedrooms

Daylight autonomy for bedrooms also improved, with 97% of bedrooms achieving daylight access for more than 80% of the year, meeting Green Star Minimum Expectation. Only one bedroom, which is part of a studio apartment, experiences moderate daylight for less than 80% of the year.

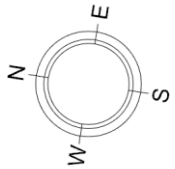
Apartments with barriers to daylight access

One studio apartment in particular facing east maintains overshadowing from the adjacent building, limiting daylight access to the bedroom. These occupants have excellent daylight access in the living room, however, and have access to the communal building and rooftop terrace. The majority of east facing apartments previously experiencing overshadowing from the amenities building, now experience moderate levels of daylight in all rooms.



Level 2 daylight results

% of Annual hours (8am-6pm) > 160 Lux



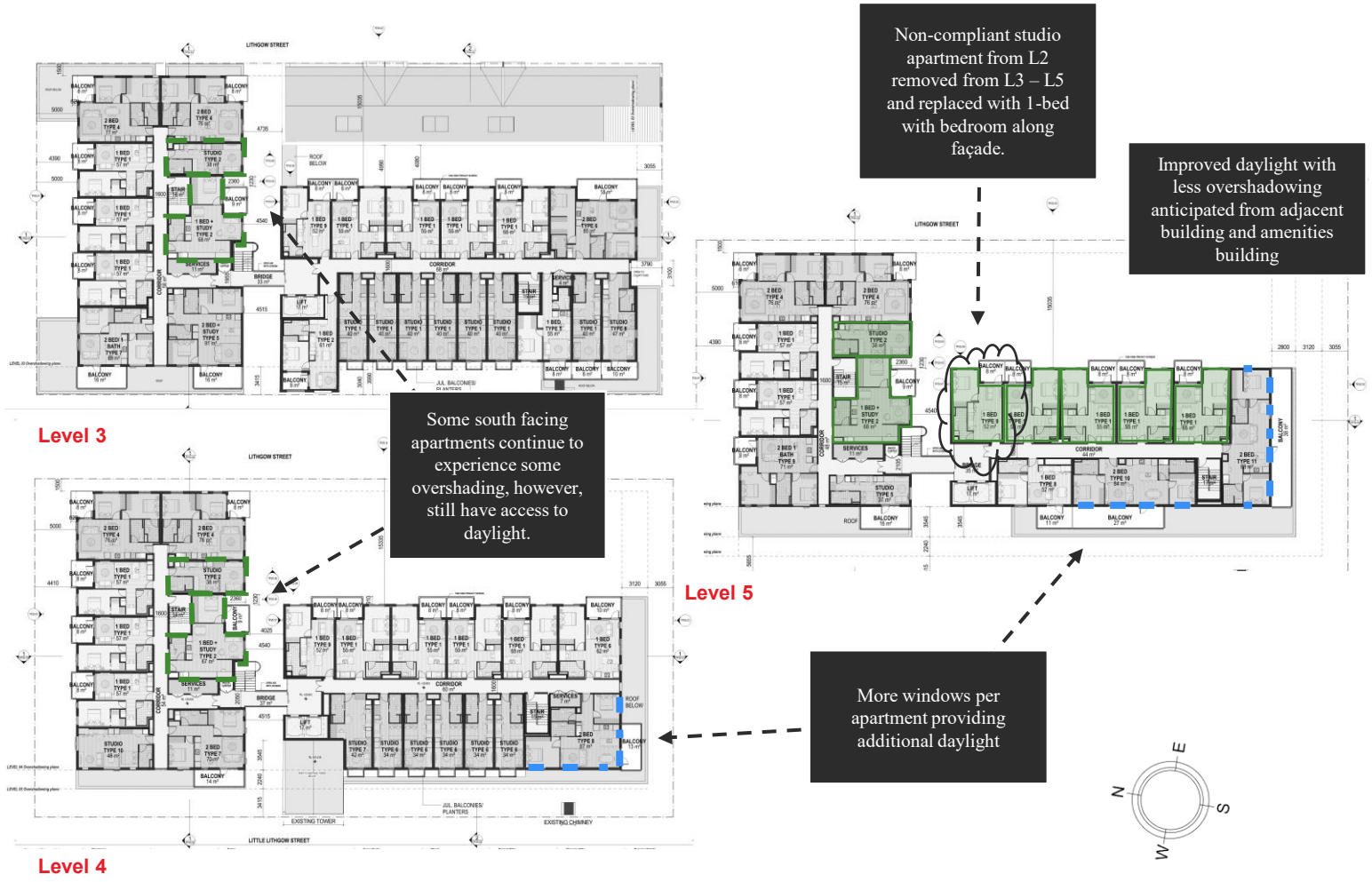
Level 3-5

Extrapolated results

Due to the reduction of overshadowing from level 2 up due to the amenities building and other neighboring buildings, we have assumed that the apartments on these floors experience the same levels of daylight as those on level 2.

This is a conservative estimation, with apartments on level 5 likely experiencing higher levels of daylight with fewer and larger apartments, some with large balconies and more windows.

We also note that the single apartment on level 2 that experiences limited daylight to the bedroom is removed from level 3 up. Therefore, we can assume that 100% of bedrooms and living rooms from level 3 to 5 meet the minimum expectation for access to daylight.



Results - Detailed

Ground floor

One apartment does not have access to daylight

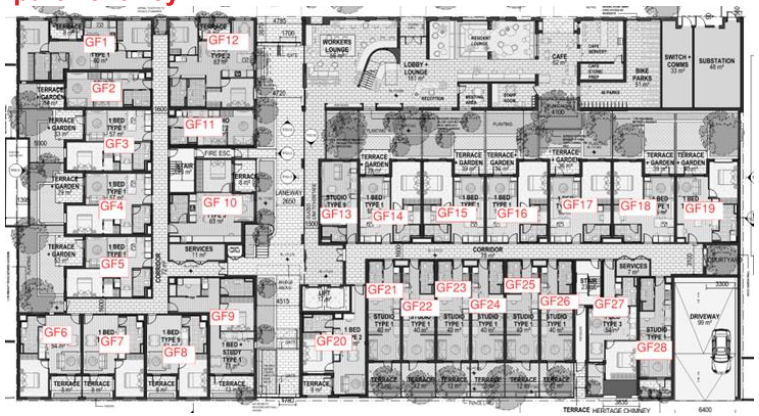
A breakdown of apartments daylight access against both Green Star Minimum Expectation and Credit Achievement are shown inset for the Ground Floor, which represents the worst-case units.

Most apartments comply with the Green Star Minimum Expectation with:

- A window in each habitable room for all units that covers at least 20% of the floor area, exceeding NCC requirements.
- High levels of natural light are achieved in at least the living room or bedroom of most units – where at least 160lux is met for 80% of hours between 8am and 6pm.

Unit GF.10 is south facing and overshadowed, resulting in no floor area meeting the requirement for high levels of daylight.

Apartment key:



Apartment	Green Star Minimum Expectation		Analysis results			
	All bedrooms	Living room	Bedroom 1	Bedroom 2	Living	Combined living + bedroom
	Access to daylight		% of floor area with 160 lux for 80% of the year			
GF.1	✓	✓	98%	97%	98%	98%
GF.2	×	✓	0%	N/A	29%	18%
GF.3	✓	✓	25%	N/A	6%	14%
GF.4	✓	✓	25%	N/A	3%	16%
GF.5	✓	✓	36%	N/A	6%	19%
GF.6	✓	✓	96%	N/A	58%	79%
GF.7	✓	✓	96%	N/A	53%	77%
GF.8	✓	✓	92%	N/A	50%	74%
GF.9	✓	✓	2%	N/A	69%	42%
GF.10	×	×	0%	N/A	0%	0%
GF.11	×	✓	0%	N/A	18%	11%
GF.12	✓	✓	98%	10%	95%	96%
GF.13	×	✓	0%	N/A	19%	12%
GF.14	✓	×	25%	N/A	0%	11%
GF.15	✓	×	27%	N/A	0%	12%
GF.16	✓	×	25%	N/A	0%	11%
GF.17	✓	×	27%	N/A	0%	12%
GF.18	✓	×	31%	N/A	0%	14%
GF.19	✓	×	46%	N/A	0%	25%
GF.20	✓	✓	43%	N/A	25%	34%
GF.21	✓	✓	20%	N/A	63%	46%
GF.22	✓	✓	30%	N/A	76%	58%
GF.23	✓	✓	33%	N/A	75%	59%
GF.24	✓	✓	30%	N/A	75%	57%
GF.25	✓	✓	30%	N/A	78%	60%
GF.26	✓	✓	24%	N/A	74%	55%
GF.27	✓	✓	39%	N/A	28%	32%
GF.28	×	✓	0%	N/A	56%	35%
% apartments meet criteria	82%	75%				

Level 1

All apartments have access to daylight

A breakdown of apartments daylight access against both Green Star Minimum Expectation and Credit Achievement are shown inset for Level 1.

Every apartment complies with the Green Star Minimum Expectation with:

- A window in each habitable room that covers at least 20% of the floor area, exceeding NCC requirements.
- High levels of natural light are achieved in at least the living room or bedroom of each unit – where at least 160lux is met for 80% of hours between 8am and 6pm. Where this isn't met for both bedrooms and living spaces, mitigation measures are in place.

Apartment key:

Apartment	Green Star Minimum Expectation		Analysis results			
	All bedrooms	Living room	Bedroom 1	Bedroom 2	Living	Combined living + bedroom
	Access to daylight		% of floor area with 160 lux for 80% of the year			
L1.1	✓	✓	98%	97%	98%	98%
L1.2	✓	✓	4%	N/A	72%	46%
L1.3	✓	✓	75%	N/A	47%	59%
L1.4	✓	✓	75%	N/A	49%	65%
L1.5	✓	✓	79%	N/A	42%	58%
L1.6	✓	✓	98%	N/A	89%	94%
L1.7	✓	✓	100%	N/A	85%	94%
L1.8	✓	✓	98%	N/A	90%	94%
L1.9	✓	✓	17%	N/A	71%	49%
L1.10	✓	✓	12%	N/A	9%	10%
L1.11	×	✓	0%	N/A	42%	27%
L1.12	✓	✓	98%	26%	97%	76%
L1.13	×	✓	0%	N/A	50%	31%
L1.14	✓	✓	54%	N/A	13%	31%
L1.15	✓	✓	57%	N/A	13%	33%
L1.16	✓	✓	53%	N/A	13%	31%
L1.17	✓	✓	53%	N/A	15%	32%
L1.18	✓	✓	57%	N/A	14%	34%
L1.19	✓	✓	83%	N/A	31%	59%
L1.20	✓	✓	93%	N/A	45%	70%
L1.21	✓	✓	47%	N/A	72%	62%
L1.22	✓	✓	67%	N/A	81%	76%
L1.23	✓	✓	67%	N/A	80%	75%
L1.24	✓	✓	67%	N/A	81%	76%
L1.25	✓	✓	63%	N/A	82%	75%
L1.26	✓	✓	60%	N/A	80%	73%
L1.27	✓	✓	83%	N/A	67%	75%
L1.28	✓	✓	50%	N/A	80%	68%
L1.29	✓	✓	40%	N/A	97%	82%
L1.30	✓	✓	53%	N/A	94%	84%
% apartments meet criteria	93%	100%				

Level 2 (representative of levels 2 to 5)

All apartments have access to daylight

A breakdown of apartments daylight access against both Green Star Minimum Expectation and Credit Achievement are shown inset for Level 2. This is representative of levels 2 to 5, which is considered a conservative approach. We note that apartment L2.13 is removed from L3 and above.

Every apartment complies with the Green Star Minimum Expectation with:

- A window in each habitable room that covers at least 20% of the floor area, exceeding NCC requirements.
- High levels of natural light are achieved in at least the living room or bedroom of each unit – where at least 160lux is met for 80% of hours between 8am and 6pm.

Apartment key:

Apartment	Green Star Minimum Expectation		Analysis results			
	All bedrooms	Living room	Bedroom 1	Bedroom 2	Living	Combined living + bedroom
	Access to daylight		% of floor area with 160 lux for 80% of the year			
L2.1	✓	✓	98%	97%	98%	98%
L2.2	✓	✓	54%	N/A	77%	68%
L2.3	✓	✓	96%	N/A	81%	88%
L2.4	✓	✓	96%	N/A	80%	90%
L2.5	✓	✓	98%	N/A	66%	80%
L2.6	✓	✓	98%	N/A	95%	96%
L2.7	✓	✓	100%	N/A	88%	95%
L2.8	✓	✓	98%	N/A	90%	94%
L2.9	✓	✓	31%	N/A	71%	54%
L2.10	✓	✓	21%	N/A	24%	23%
L2.11	✓	✓	12%	N/A	71%	50%
L2.12	✓	✓	98%	50%	97%	83%
L2.13	×	✓	0%	N/A	76%	47%
L2.14	✓	✓	86%	N/A	42%	61%
L2.15	✓	✓	85%	N/A	42%	62%
L2.16	✓	✓	83%	N/A	42%	61%
L2.17	✓	✓	86%	N/A	48%	65%
L2.18	✓	✓	86%	N/A	48%	65%
L2.19	✓	✓	98%	N/A	74%	87%
L2.20	✓	✓	95%	N/A	57%	77%
L2.21	✓	✓	53%	N/A	72%	65%
L2.22	✓	✓	67%	N/A	81%	76%
L2.23	✓	✓	67%	N/A	80%	75%
L2.24	✓	✓	67%	N/A	84%	77%
L2.25	✓	✓	67%	N/A	85%	78%
L2.26	✓	✓	64%	N/A	83%	76%
L2.27	✓	✓	86%	N/A	78%	82%
L2.28	✓	✓	53%	N/A	80%	70%
L2.29	✓	✓	40%	N/A	100%	84%
L2.30	✓	✓	80%	N/A	94%	91%
% apartments meet criteria	97%	100%				