



New World Supermarket
26 Ganges Road
Khandallah, Wellington

Proposed Carpark Extension
Exterior Lighting Design Report



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Exterior Lighting Design Report

Prepared By

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A handwritten signature in black ink, consisting of several loops and a long horizontal stroke, positioned over a dashed line.

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Executive Summary

3DLD has been engaged to provide an exterior lighting design for a proposed extension to an existing customer carpark at New World Khandallah, in Wellington. The design is required to comply with the Outer Residential standards of the Proposed District Plan and AS4282-2019 "Control of the obtrusive effects of outdoor lighting". We have also assessed the general illuminance across the common area against AS/NZS1158.3.1:2020 "Lighting for roads and public spaces" for this report.

The assessment is to determine compliance with Rule LIGHT S2 "Light Spill" of the Proposed District Plan on spill light within outer residential zones. Our results are shown on the attached drawings EL00 to EL09 inclusive.

We have concluded that the proposed exterior lighting design will comply with Rule LIGHT S3 "Glare" within outer residential zones as defined in the Wellington City Proposed District Plan. The maximum calculated vertical illuminance (light spill) at any residential boundary is 4.5 lux.

Preamble

2.1 Introduction

This report details the Lighting Design and Calculations prepared for the common exterior area of the proposed development, comprising vehicular driveway, pedestrian footpath, and adjacent car parking bays.

2.2 Background

The existing supermarket is located at 26 Ganges Road, Khandallah and includes a carpark on the corner of Ganges Rd and Dekka St. The owners of the supermarket propose to extend the car park onto three neighbouring residential zones properties at 3 Dekka St, and 29 & 31 Nicholson Rd. (Image 1)



Image 1 - Development Site

The drawings provided show the proposed carpark to facilitate parking for up to 67 vehicles with access from Ganges Rd, Dekka St and Nicholson Rd. The carpark design includes pedestrian footpaths, safety fencing, substantial landscaping, and lighting for limited use on hours of darkness. The scope of the lighting design and assessment is limited to the new carpark extension only. (Image 2)

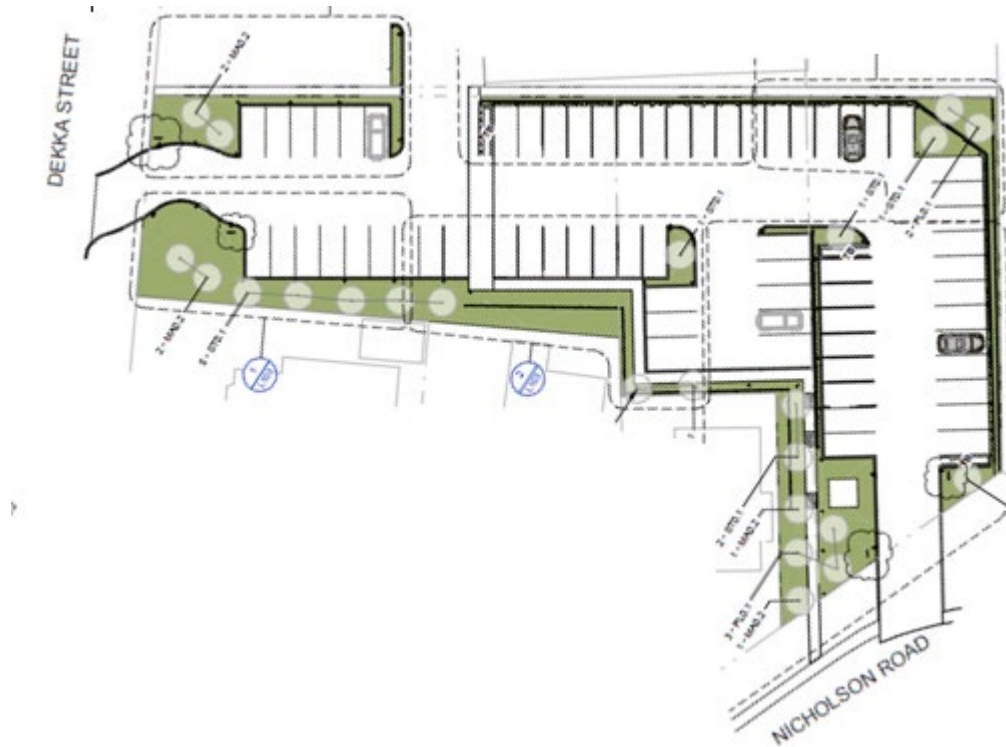


Image 2 - Proposed Carpark

2.3 Design Scope

Our brief was to provide lighting for the new carpark to enhance the surrounding residential amenity of the development, to facilitate the safe movement of pedestrians and vehicles while ensuring minimum adverse lighting effects to surrounding properties. The proposed lighting design is described in the drawings provided with this report.

The design comprises, 10x lighting columns with lights at 4000mm in height above the pavement level to provide general illuminance of the carpark area. In addition, 13x, 875mm high bollard lights are proposed for the pedestrian footpath, and an integrated handrail lighting system for the section of the path where steps have been proposed as part of the landscaping plan. The lighting arrangement is shown on sheet EL01 of our drawings.

These luminaires have been selected due to their inherent optic efficiency and full-cutoff optics that when placed and oriented appropriately will direct light into the car park area and away from neighbouring residential homes. The lighting is proposed to operate 7 nights per week from dusk until approximately 9.30pm. Our calculations consider the limits applied to curfew hours (7.00 am to 10.00 pm)

2.4 Purpose of Report

This report details the modelling, design and calculation methodology undertaken for the proposed development site. It is intended to demonstrate compliance with Wellington City Proposed District Plan for “Outer Residential” zones.

2.4.1 Illuminance

We have guidance from AS/NZS1158.3.1:2020 “Lighting for roads and public spaces” and applying the recommendations of the standard, we determined that the following sub-categories are appropriate targets for the carpark based on the demographics of the surrounding locality, and potential for mixed vehicle/pedestrian activity.

- Pedestrian footpaths: Subcategory PP3 per Table 3.4 of the standard
- Pedestrian steps, connecting elements: Subcategory PE2 per Table 3.6 of the standard.
- Main carparking spaces and vehicle circulation: Subcategory PC2 per Table 3.7 of the standard.

2.4.2 Light S2 – Light Spill

We have applied control limits per Rule “Light S2” which states:

Outdoor artificial lighting must not exceed the following vertical illuminance levels:

- 7.00am – 10.00pm: 10 Lux; and
- 10.00pm – 7.00am: 2 Lux.

The vertical illuminance shall be measured at:

- • Any window of a habitable room of a building used for a sensitive activity on any adjacent site; or
- • The minimum setback distance for buildings and structures used for residential purposes for the relevant zone of an adjacent site if that site does not contain a building used for a sensitive activity. The vertical extent of the calculation points for vertical illuminance shall be between:
 - 1.5m above ground level; and
 - The maximum building height permitted by the relevant zone.

The supermarket operates 7 days per week and is open from 7.00am to 9.00pm each day. The proposed carpark lighting is going to be controlled by a time clock and will be turned off before 10.00pm. Accordingly, the lighting design must demonstrate compliance with the pre-curfew conditions only.

We have assessed the potential for spill light by including vertical calculations planes at the boundaries of the carpark site at 1.5m above ground up to 8.5m above ground. These planes are closer to the proposed lighting than they otherwise would be if they were set back into the neighbouring property. Due to their placement, the calculated results will be higher, and essentially more controlling by ensuring that the illuminance limits are contained with the design site proper.

2.4.3 Light S3 – “Glare”

We have applied control limits per Rule “Light S3” which states:

Outdoor artificial lighting on any site adjacent to a road, or adjacent to a site which contains a building used for a sensitive activity, must be selected, located, aimed, adjusted and/or screened so that the luminous intensity does not exceed the following:

- 7.00am – 10.00pm: 12,500 cd; and
- 10.00pm – 7.00am: 2,500 cd.

As described in section 2.4.1 above, the potential for glare created by the proposed lighting has been assessed using vertical calculation planes calculated at the boundaries of the carpark site at 1.5m above ground up to 10m above ground.

Due to the expected operating hours of the carpark where lighting will be turned off before 10.00pm each night, the design must demonstrate compliance with the pre-curfew, 12,500cd condition only.

Methodology

3.1 Site Plan

To calculate the lighting effects, it was necessary to first construct a simple computer simulation of the site, buildings, car park and immediate surroundings as per the drawings provided. The model was created using AGi32 v20.9, a specialist lighting design and calculation computer program to determine horizontal and vertical illuminance.

3.2 Lighting Calculations

3.2.1 Luminaire Spacing for category PP3

We applied the method prescribed in AS/NZS1158.2:2005 “Computer procedures for the calculation of light technical parameters for Category V and Category P lighting” for our lighting calculations. Compliance is achieved by using the method described in Section 3.3 of the standard to calculate the optimum spacing of luminaires to meet the recommended LTP’s of the relevant Lighting Subcategory of AS/NZS1158.3.1:2020.

- Pedestrian footpaths (PP3)

Footpaths are proposed to be lit by a series of 875mm high, Disano “Faro” bollards with 180deg asymmetric distribution. Our spacing calculations were undertaken using photometric data from the lighting manufacturer.

The data was inserted into AGi32 software. The Roadway Estimator module of the software is fully compliant with AS/NZS1158.2:2005 and sets out horizontal and vertical illuminance grids based on the metrics of the design area input. The required LTP’s for the applicable lighting subcategory are applied and a series of calculations are performed to determine spacing. The results of our spacing calculations for the PP3 area are shown on sheet EL00.

3.2.2 Carpark Illuminance (PC2)

The illumination of the main carpark areas is proposed to comprise a series of 4m lighting columns with 15w Disano “Mini Giovi” area lights with controlled type III optics with zero upward wasted light emission. To confirm the predicted illuminance levels, we divided the carpark into 3 logical areas for assessment purposes. A series of calculation points were placed at ground level within each lighting zone in accordance with the method prescribed in section 3.3.7 of AS/NZS1158.2:2020, including horizontal illuminance at ground level and vertical illuminance at 1.5m above finished ground level. The results of these calculations are summarised on sheets EL02 to EL07.

3.2.3 Connecting Elements (PE2)

The overall lighting scheme is planned without considering the contour of the site in accordance with AS/NZS1158.2, however the method for designing illuminance on the steps requires a three-dimensional approach to properly consider the elevation change of the steps in relation to proposed lighting. Therefore separate modelling and calculations were performed with guidance from section 3.3.8 of the standard. The calculation results can be found on sheet EL08.

3.2.4 Vertical Spill and Glare

As described earlier in this report, we elected to assess adverse lighting effects from the property boundaries as they are closer to the proposed lighting. Vertical calculation points were inserted along the front and rear property lines, adjacent to the proposed lighting. The calculation planes consisted of a grid formation from 1.5m up to a height of 10m to capture any upward spill from the proposed installation. (Image 3)

All calculations performed using direct illuminance only (no reflectance) based on photometric data with no depreciation factors applied. The result of these calculations can be found on sheet EL09.

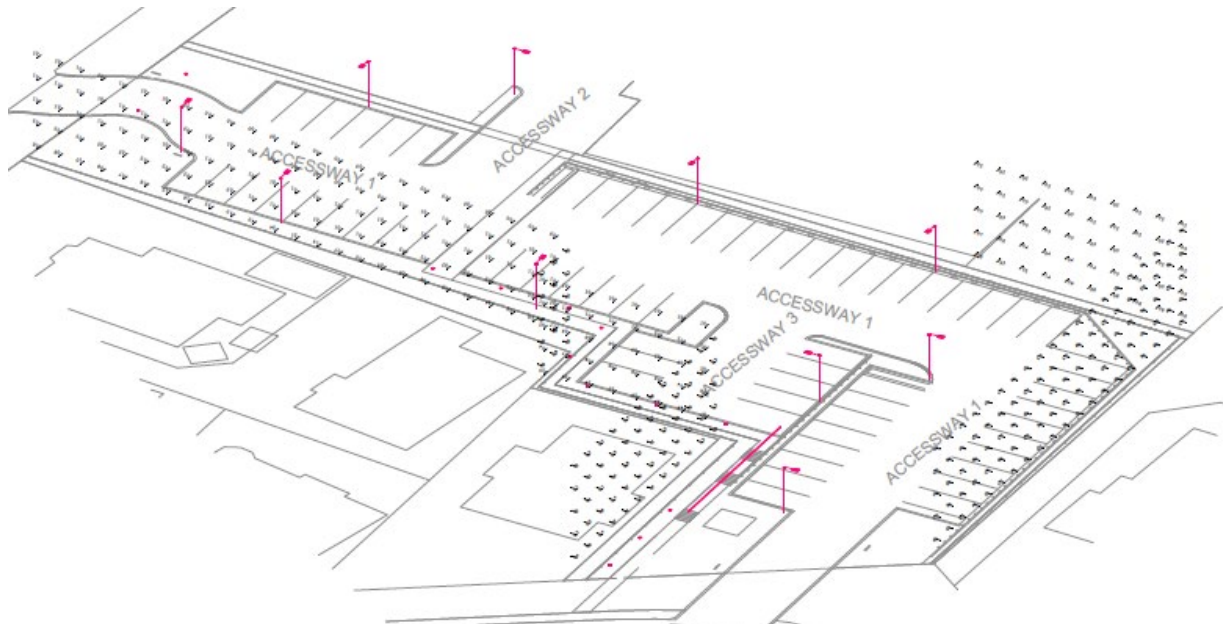


Image 3 – Spill Light & Glare Calculations

Results

4.1 Calculation results

Our computer calculations indicate that the general (horizontal) illuminances levels provide sufficient light for the safe movement of pedestrians and vehicles at night while maintaining a comfortable visual aesthetic for neighbouring residents.

When assessed against AS/NZS1158.3.1:2020, we find that:

- The bollard lighting proposed for the pedestrian footpaths achieves the LTP requirements of lighting category PP3 when spaced at approximately 6m apart. The minimum calculated average is 6.94lx, greater than the 3.5lx recommendation of the standard.
- The steps within the footpath alignment achieve the LTP requirements of lighting category PE2. The average calculated illuminance is 35lx at pavement level.
- The main car park areas achieve the LTP requirements of lighting category PC2. The average calculated illuminance is 16.72lx, and a minimum point illuminance of 1.3lx at pavement level. We note that the minimum illuminance of 1.3lx is slightly less than the 1.5lx recommendation of the standard in an isolated part of Area 3 carpark, adjacent to a residential boundary.

Horizontal illuminance calculation results and isolux plot can be found on the attached sheets EL02-EL05.

Spill light and glare have been assessed against Rules “Light S2: and “Light S3” of the Wellington City Council Proposed District Plan.

With regards to rule “Light S2 – Spill Light”, our computer calculations show a maximum vertical illuminance of 4.5 lux above the rear, northeastern property boundary adjacent to No. 34 Ganges Rd. 4.5 lux is lower than the 10-lux limit of the District Plan for operating hours between 7.00am and 10.00pm. The proposed design complies with this rule as the lighting will be timeclock controlled to switch off before 10.00pm each night.

Regarding rule “Light S3 – Glare”, our computer simulations indicate that the maximum calculated luminous intensity in any direction within the development site will be 80 candelas. This value is considerably lower than the 12, limit of the District Plan for operating hours between 7.00am and 10.00pm. The proposed design complies with this rule as the lighting will be timeclock controlled to switch off before 10.00pm each night.

Vertical lightspill and glare calculation results can be found on the attached sheets EL09.

4.2 Risks, assumptions, and uncertainties

1. We have not considered any mitigation from site topography, landscaping, or tree planting, therefore, the calculation results shown are worst-case.
2. All modelling and subsequent calculation results are based on the drawings and information provided to us.

Conclusions

Our computer simulations indicate that the predicted illuminance levels within the proposed site are compliant with the Wellington City Proposed District Plan in terms of spill light and glare, and AS4282-2019 “Control of the obtrusive effects of outdoor lighting.”

We can also conclude that the pedestrian footpaths, connecting stair elements and the carparking areas exceed the minimum requirements of AS/NZS1158.3.1:2020 sub-categories PR3, PE2 and PC2 respectively, and that the predicted illuminance will be sufficient to enable safe movement at night.

The proposed landscaping will serve to further mitigate any lighting effects of the proposed lighting and so any affects to surrounding residential properties will be less than minor.

End of Report



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