

APPENDIX D

Lighting Assessment by WSP OPUS Limited

WAIKATO DISTRICT COUNCIL

**GULL SERVICE STATION CONSENT
APPLICATION, 68 GREAT SOUTH
ROAD, POKENO.**

REVIEW OF LIGHTING ASSESSMENT



Gull Service Station Consent Application, 68 Great South Road, Pokeno

Waikato District Council

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Introduction

WSP has been commissioned by Waikato District Council (WDC) to provide a review of a third-party lighting effects assessment associated with the proposed Gull Service Station in Pokeno at 68 Great South Road. The following documents (and referenced sections) have been provided to WSP and considered in the review:

1. Combined Notification and 104 Decision Report – LUC0329/20 – 08/06/20
2. Kern Consultants External Signage and Lighting Assessment – 2 March 2020.
3. Waikato District Council District Plan – Section 29.6.4 – Lighting Spill and Glare
4. Waikato District Council District Plan Polices – Section 19.3.4
5. Waikato District Council District Plan: Chapter 4: Urban Environment

Purpose

The purpose of our review is to provide WDC with comment on the accuracy of the third-party lighting assessment and confirmation that the appropriate District Plan conditions have been utilised. In addition, WSP is to provide draft specific consent conditions for possible inclusion into any consent granted thereafter.

Lighting Assessment Review

Applicable WDC District Plan Criteria

WSP have assessed that the proposed Gull Petrol station site at 68 Great South Road is subject to the main following criteria:

Light Spill and Glare, Section 29.6.4.3 (i) & (iii)

Where a property is deemed to have "bright" surrounds, all lighting shall be installed and operated such that the direct component of illuminance for the stated hours is less than the stated lux (lumens per square metre) on or at any point inside the closest boundary of every affected site:

- 0600 hours to 2230 hours: 25 lux
- 2230 to 0600 hours: 10 lux (A property has 'bright' surrounds where it has any non-Business land abutting it which fits the following description: The land is within 60 metres of a road or length of road which is illuminated to the minimum standard set out in NZS 6701 for intermediate and main road streetlighting).

(iii) All artificial lighting shall be installed and operated such that the luminous intensity of any light source is less than 1000 candelas in the direction of any affected property or road.

It should be noted that NZS 6701 was superseded by the AS/NZS 1158 series in 1997 and subsequent amendments since then, this historical reference would suggest that the criteria above within the WDC District Plan is outdated and likely requires testing against more contemporary industry guidelines to ensure suitability for future use.

Industry Best Practice

The Auckland Unitary Plan (AUP) Section 24 Lighting is based on the criteria of AS/NZS 4282:1997 (superseded by 2019 edition) and has additional requirements which are not specified by the WDC Plan. Although, zoning isn't defined for Pokeno (it being in a different Local Authority Area), the most liberal category likely for this site would be 'District Brightness 3', and thus the following could apply. The purpose of referencing the AUP guidelines is to offer some confidence to WDC on the suitability of the proposed lighting installation against more recently defined criteria.

Table E24.6.1.2 Horizontal and vertical illuminance at a boundary

Time	Illuminance limit
Pre-curfew	100 lux above the background level
Curfew	10 lux above the background level

Figure 1: AUP maximum requirements at a boundary

Table E24.6.1.3 Vertical illuminance at a window

Time	Vertical illuminance limit for each lighting category			
	Lighting category 1	Lighting category 2	Lighting category 3	Lighting category 4
Pre-curfew	2 lux	10 lux	10 lux	25 lux
Curfew	0 lux (except public road lighting)	1 lux	2 lux	4 lux

Figure 2: AUP maximum requirements at a window

Table E24.6.6 Curfew luminous intensity limits

Curfew luminous intensity limit for each lighting category			
Lighting category 1	Lighting category 2	Lighting category 3	Lighting category 4
0 cd	500 cd	1,000 cd	2,500 cd

Figure 3: AUP Curfew luminous intensity requirements

Kern Consultants Lighting Assessment

As part of the Gull petrol station submission a lighting design and assessment of associated effects has been carried out by Kern Consultants. WSP have reviewed their documentation and agree with the application of WDC District Plan criteria which has been reported on. The conclusion of the assessment is that the proposed lighting is in compliance with the District Plan Rules, based on the figures reported this is mostly agreed by WSP. However, the following is noted:

1. WSP cannot verify Kern Consultants design file (AGI32) and calculations as access to them was declined by Kern Consultants. Thus, there could be an error within the model which leads to inaccurate result reporting.
2. It is not clear to what extent the lighting assessment covers the residential boundaries, for example, it would be expected that the calculation grids on the boundary exceed the heights of the adjacent lighting and are not just carried out at ground level or in a single vertical plane. As the plan provided is in “plan view” only, the results are unreadable (layered on top of each other), consequently they cannot be confirmed.
3. The Threshold Increment Calculations utilise an adaptation luminance of 10cd/m² which is unrealistic for the location (typically associated with City Centres), a more appropriate level would be 1 or 2cd/m². This however is unlikely to bring the calculated values into non-compliance with the WDC’s 20% limit.
4. The internally illuminated signs do not appear to be modelled within the lighting design provided and the levels measured from other sites as quoted in the report are unlikely to generate a non-complying activity.

When the presented values are compared against the criteria of the Auckland Unitary Plan for sensitivity testing, the luminous intensity and boundary illuminance limits would be met. It is unclear whether the vertical illuminance levels outlined in table E24.6.1.3 for the curfew criteria would be complying for #25 Market Street West building line. The

report does suggest that 7.3 lux would be present at #25 but it is not confirmed where this value occurs. Although in accordance with the WDC District Plan limits, and assuming this value occurs at the property windows, this would not be in compliance with the AUP or 2019 version of AS/NZS 4282. In addition, 7.5 lux is the minimum illuminance level associated with a Sub-Category V3 traffic route intersection. This is a reasonable level of illumination and may cause a nuisance to the residents of that dwelling.

Kern Consultants Reponse to RFI – 24/03/21

Following a request for information (RFI) made by WDC to Kern Consultants, some additional information was provided on 24 March 2021. This mainly related to AGI screen prints of the spill lighting boundaries to confirm the lighting levels reported and the technical inputs into the Threshold Increment calculations. The spill lighting levels stated in the report and subsequent RFI response do not match what is shown on the screen prints. It would appear (unless labelled incorrectly) that the boundary of #25 Market Street West has a maximum vertical illuminance of 9.1 lux which is closer to the 10-lux limit stated in the District Plan than originally reported (7.3 Lux in the initial lighting assessment) . The Threshold Increment calculations were confirmed to have utilised an adaptation luminance of 10cd/m², which is not considered appropriate for the location as already outlined. These clarifications do not necessitate any change to either the Conclusions or Recommendations detailed below.

Other Environmental Considerations

There has been a move in the Waikato in exterior road lighting to a light source with a Correlated Colour Temperature (CCT) of 3000 kelvin to reduce the impact of artificial light on the night-time dark sky environment. The presented lighting design utilises 5700 kelvin which will have an increased blue light make-up and is no longer used in Aotearoa for public spaces for that reason. It should be noted that there is no governing criteria which limits CCT and this is raised as a comment on best practice design.

Conclusion

Kern Consultants have followed the appropriate methodology for assessing lighting effects, however, the accuracy of the figures presented cannot be fully confirmed and WSP have some concerns regarding the way that certain criteria has been applied.

However, addressing our concerns is unlikely to have a meaningful influence on the calculated results at the residential boundary of #25 Market Street West where WSP's concern around spill lighting is held. The design philosophy and use of forecourt luminaires with no horizontal tilt will limit spill lighting onto adjacent properties but this is subject to the correct installation and specification of the design. However, the proposal appears to comply with the criteria of the WDC District Plan in relation to lighting but the results could likely be improved upon.

It is recommended that post construction checks are included within consent conditions in order to ensure that the installation meets the expectations of the design. In addition, the equipment can include dynamic dimming control through DALI, which would be of benefit to alleviate any post install issues without major modification or delay.

Proposed Consent Draft Condition Recommendations

1. The applicant must ensure that the constructed exterior lighting installation does not exceed the maximum spill and glare values as defined in the WDC District Plan once operational. This shall be carried out by on site measurement on all relevant site boundaries utilising an appropriately qualified lighting professional with recently (within 5 years) calibrated (from an ILAC accredited test facility) illuminance and luminance meter. This process shall be carried out during the first 2 weeks of operation and repeated after 6 months of use to confirm no change has been made and at each instance a report detailing the results shall be submitted to council for approval. All measurements shall be undertaken in dry conditions and during the hours of darkness, at least 1 hour after sunset.
2. The applicant must ensure that the all the exterior lighting luminaires (including integral illuminated sign fittings) have dimmable controls to enable immediate changes to be made to the lighting levels to ensure compliance with the District Plan limits.

Recommendations for WDC

It is recommended that WDC consider reviewing their District Plan in respect of exterior lighting and its associated obtrusive effects. The current criteria although functional, is dated and silent in certain areas which are becoming more relevant. For example, LED advertising signs with dynamic displays.

Risks, Assumptions & Uncertainties

1. The review is limited to the documentation that has been provided and listed above.
2. The accuracy of the Kern Consultants design and assessment cannot be fully verified due to being denied access to their AGI32 file.
3. The photometric data used in the third-party design is assumed to be correct and any variance will affect as-built results.