IN THE MATTER of the Resource Management Act 1991 ("RMA" or "the Act")

AND

IN THE MATTER of an application to **TASMAN DISTRICT COUNCIL** by **BEKON MEDIA LIMITED** under section 88 of the Act for resource consent to authorise the establishment and display of a digital billboard at 332 Queen Street, Richmond

STATEMENT OF EVIDENCE OF RUSS KERN

1. INTRODUCTION

1.1 My name is Russ Kern. I am a lighting engineer at Kern Consultants.

Qualifications and experience

1.2 I hold the following academic and professional qualifications:

(a) NZ Certificate in Engineering (Electrical) from AUT (43/1982);

(b) An Engineering Associates Registration Certificate EARB 4320 (1986); and

(c) A Certificate in Illumination Engineering from Auckland Institute of Technology (1996).

1.3 I have over 40 years' experience in the electrical and lighting industry, including 13 years' experience in assessing the environmental lighting effects of digital billboards and completing verification testing after installation. I specialise in lighting design and assessment including outdoor lighting for commercial, industrial and residential projects.

1.4 I have been a member of the Illuminating Engineering Society of Australia and New Zealand Limited (MIES 455) since 1993 and I am currently serving on the New Zealand Lighting Society Chapter Management Membership Committee.

Involvement in the Bekon Media project

1.5 I was engaged by Bekon Media Limited in August 2024 to undertake an assessment of the lighting effects of the proposed single-sided digital billboard at 332 Queen Street, Richmond, Nelson (the site).

1.6 I have visited the site at night and in daylight. My most recent site visit was on 15th September 2024. I have familiarised myself with the site and the surrounding environment, including the Wai-iti Dark Sky Park.

Relevant experience

1.7 Examples of my experience relevant to this project are:

(a) I have prepared lighting assessments for numerous resource consent applications for developments which include signs and, in particular, LED billboard lighting in various regions throughout New Zealand including Whangarei, Auckland, Tauranga, Hamilton, Napier, Gisborne, New Plymouth, Masterton, Porirua, Wellington, Lower Hutt, Blenheim, Timaru, Rangiora and Christchurch dating back to 2011.

(b) I have experience testing luminance levels at over 85 digital billboards throughout New Zealand and have prepared lighting assessments for over 120 digital billboard applications.

Purpose and scope of evidence

1.8 The purpose of my evidence is to address the effects of light from the proposed single-sided billboard.

1.9 Specifically, my evidence:

(a) Sets the scene for my specific analysis by making some general comments about issues relevant to luminance (or brightness) and illumination (Section 3);

(b) Provides an overview of the proposal, including the location and orientation of the billboard (Section 4);

(c) Addresses digital billboard lighting considerations relevant to this application (Section 5);

(d) Outlines the relevant planning context, including the relevant provisions of the Tasman Resource Management Plan (Section 6);

(e) Addresses the luminance of the proposed digital billboard screens and the appropriateness of proposed luminance levels (Section 7);

(f) Addresses the effects of variable images on a working digital visual display billboard (Section 8);

(g) Addresses submissions that raise issues in relation to lighting and visual amenity (Section 9);

(h) Comments on the Council's section 42A report (issued on 10 October 2024) (Section 10);

(i) Discusses the proposed lighting parameters relevant to my area of expertise (Section 11); and

(j) Provides a brief conclusion (Section 12).

1.10 A summary of my evidence is contained in Section 2.

Expert Witness Code of Conduct

1.11 While this is not a hearing before the Environment Court, I confirm that I have read the Code of Conduct for Expert Witnesses contained in the Environment Court of New Zealand Practice Note 2023 and that I have complied with it when preparing my evidence. Other than when I state I am relying on the advice of another person, this evidence is within my area of expertise and that in preparing my evidence I have not omitted to consider material facts known to me that might alter or detract from the opinions expressed.

2. SUMMARY OF EVIDENCE

2.1 The proposal is for the installation of a single-sided digital billboard measuring 7m wide and 3.5m high in landscape format, to be located adjacent to the road boundary on the parapet of a single-storey commercial building at 332 Queen Street, Richmond. The proposed billboard will be approximately 180m away from the nearest residential properties at 334 and 337 Lower Queen Street, to the northwest of the site.

2.2 It was originally proposed that the billboard would face the intersection of Queen Street, Richmond Deviation (SH6), and Lower Queen Street, which is controlled by traffic lights and has pedestrian crossings and is utilised by vehicle traffic, cyclists and pedestrians.

2.3 As a result of traffic safety concerns related to the left-turn slip lane on Lower Queen Street, the proposal has been amended by re-orienting the billboard so it will not be visible form the slip-lane and most of Lower Queen Street. This amendment does not alter my evidence in relation to the lighting effects of the proposal.

2.4 The billboard will have:

(a) An image duration of 30 seconds and transition time of 0.5 seconds;

(b) An unlit border; and

(c) A 1.0m wide x 0.5m high illuminated operator name panel located on the lower edge of the billboard.

2.5 The billboard will be equipped with an automated brightness control system to vary luminance as ambient light conditions change during day and night operation, and at dawn and dusk. The lighting controls will provide a dimming effect to ensure luminance and glare are controlled to an acceptable value for motorists, pedestrians, cyclists, residents, and nearby workers on overcast days and when day changes to night and night to day.

2.6 Billboard luminance will be limited to 5,000cd/m^2 during the day and 125cd/m^2 at night by the conditions of consent.

Lighting issues

2.7 The activity standards in the Tasman Resource Management Plan (TRMP) for signage in all Commercial Activity zones:[1]

(a) The billboard is not located adjacent to a residential zone.

(b) The billboard does not utilise a spotlight or floodlight to illuminate the images.

(c) Requires signs to be lit by constant illumination and not flash, use no retro-reflective materials and images are not to be animated or have moving displays.

2.8 The proposed billboard comfortably meets these requirements.

2.9 There are no luminance limits (candela per square metre) in the TRMP for day or night operation of a digital billboard. It is important that image

1 Tasman Resource Management Plan, Chapter Rule 16 1.4.1(d) and 16.1.3.1 (e) and (g)

luminance varies automatically in response to changing ambient light to ensure the billboard is not obtrusive.

2.10 A limit of 250 cd/m^2 was originally proposed for the billboard's operation at night. This is considered by many councils to be an appropriate luminance limit for the images displayed on the digital billboard at night. While the Applicant has agreed to restricting luminance to this value, I have recommended that the nighttime limit be set at the lower limit of 125cd/m^2 to address 'dark sky' issues that have been raised by submitters as further addressed in paragraph 7.4. The Applicant has accepted that recommendation.

2.11 A 5,000 cd/m^2 luminance limit is proposed for the daytime operation of the proposed digital billboard. This level of luminance is necessary to ensure that the image is legible (and therefore not a source of distraction) on sunny days. I consider this to be an appropriate luminance limit during the day. The Applicant has agreed to restricting daytime luminance to this level.

2.12 Image luminance will be automatically controlled to eliminate glare in response to changing light. The ambient light sensor will dim images during overcast daytime periods and as day turns to night and as night changes to day at dusk and dawn respectively to ensure the billboards are not obtrusive.

Image changes

2.13 The images on the proposed digital billboards will be static and will change at a 30 second (minimum) interval with a soft dissolve of 0.5 seconds. The effect of the dissolve is that the billboard image will not appear as a flashing image - rather it is a variable image that does not compete to draw your attention away from your normal field of view and is designed not to be a distraction for cyclists, pedestrians, motorists and residents.

2.14 In my opinion, imposing a conservative dwell time of 30 seconds and a 0.5 second soft transition ('fade') between images will result in images that are similar to a static image and, in terms of lighting effects, will have an acceptable level of (less than minor) effects on pedestrians, cyclists, motorists, nearby commercial workers and the occupants of dwellings in the area during daytime and nighttime operation – the difference will be imperceptible. The proposed 30 second dwell time will have no change on lighting effects.

Potential amenity effects

2.15 In my opinion, coloured images changing on a billboard in this manner will not reduce the amenity of the surrounding environment, particularly for residential and commercial building occupants, due to the already high ambient light at night from commercial lighting, signage lighting, parking area lighting and street lighting in the vicinity of 332 Queen Street and low luminance values emitted from the proposed billboard. Ambient light near the intersection ranged from 8.2 lux to 15 lux as measured during my site visit.

2.16 The material used in the billboard screen and structure will not reflect sunlight or vehicle headlights. The billboard will not include any visible mechanical movement of any kind.

2.17 The billboard will be designed to avoid any nuisance back spill lighting when operating.

2.18 Even though a digital billboard is potentially visible from a residential zone, it does not necessarily follow that the effects will be obtrusive. The context of existing buildings in the area, environmental lighting, distance and direction of view toward the billboard from the dwelling will ensure that effects will not be obtrusive.

Potential effects on the Wai-iti Dark Sky Park

2.19 I have specifically considered the potential effects of the proposed billboard on the Wai-iti Dark Sky Park. With a luminance level of 125cd/m^2 that will be required by the conditions of consent, I am satisfied that the proposed billboard will have no adverse effects on the Wai-iti Dark Sky Park.

Conclusion

2.20 Overall, I consider that lighting effects of the proposed billboard will be acceptable (less than minor) for motorists, cyclists, pedestrians, residents and nearby commercial workers, and visitors to the Wai-iti Dark Sky Park, on the basis that:

(a) Billboard luminance will be controlled to eliminate glare.

(b) Billboard luminance will be limited to a lower value than originally proposed so it will not adversely affect any dwelling within a residential, recreation or rural activity area at night.

(c) An automated ambient light sensor and control system will reduce luminance on overcast and cloudy days.

(d) Nighttime billboard luminance will 'blend in' with existing Richmond commercial, street and flood lighting so it will not be dominant when viewed from the nearest residential properties or surrounding hills.

(e) Nighttime effects from the billboard will not be noticeable from the Dark Sky Park due to the geographical shielding effect of hills, valleys, separation distance and the low luminance settings.

3. LIGHTING 101

3.1 In order to fully understand my evidence, this section provides some introductory remarks in relation to the key issues that need to be considered in assessing lighting effects in these circumstances.

Luminance

3.2 Luminance refers to a photometric measure of the luminous intensity per unit area of light travelling in a given direction. It describes the amount of light that passes through, is emitted from or reflected from a particular area, and falls within a given solid angle.

3.3 The rationale for measuring digital billboard luminance is to provide an empirical value that can be reliably compared between different colours and hues because brightness effects would otherwise differ depending on who is viewing the image. It also provides a comparison of brightness based on empirical luminance values measured from different surfaces.

3.4 In accordance with the International System of Units (SI), the appropriate unit of measurement[2] for a digital visual display billboard and other signage that is internally lit, e.g., fast food signs with fluorescent tubes or LED strips inside, is by luminance values in candela per square metre (cd/m^2).

3.5 Luminance is measured using a specialist luminance meter that has a very narrow, one degree, viewing beam.

3.6 I have undertaken nighttime tests of digital billboards, similar to the billboard proposed by this application, to monitor compliance with consent conditions

[2] Section 4.8 and 12.18 of the IESNA Lighting Handbook.

and the results of this monitoring have been presented to various council officers in the past. For example:

(a) The maximum nighttime luminance of a white image on the digital billboard at 636 Lineside Road in Rangiora was 142cd/m^2, and daytime luminance was up to 3,250cd/m^2.

(b) The digital billboard at 94 Evans Street in Timaru had a nighttime luminance of 154cd/m^2 and was up to 4,640cd/m^2 during the day.

3.7 When used for visual displays, 1 cd/m^2 is also known by the non-SI unit[3] as 1 Nit when referring to manufacturer's data. Digital billboards are capable of up to 10,000 cd/m^2.

Illuminance

3.8 Illuminance is not the same as luminance. 'Illuminance' is the term used to refer to the amount of luminous flux, i.e., brightness, falling on a surface, per unit area; for example, to describe a surface lit by a floodlight. It is measured in lux which is equal to one lumen per square metre. A lumen is the SI measurement for luminous flux. Illuminance was formerly often referred to as 'brightness', but this leads to confusion with luminance and glare.

3.9 It is possible to measure both luminance and illuminance on a traditional floodlit billboard surface; however, it is only possible to measure luminance from a digital billboard and internally lit billboards due to the direction of light emanating from within the billboard. Illuminance is measured to determine any spill light from these panels.

3.10 The TRMP refers to an illuminance limit of 8 lux spill light measured 1.5m above ground level at the site boundary. Spill light is discussed further in paragraph 6.2 below.

4. THE PROPOSAL

4.1 The site is located at 332 Queen Street, at a busy traffic light controlled intersection. The site is occupied by a single-storey commercial building with the building constructed up to the boundary and a verandah extending over the footpath.

[3] Units that are not defined as part of the International System of Units (SI) but are otherwise mentioned in the SI Brochure.

4.2 The proposal is for the installation of a single-sided digital billboard to be installed on the parapet of the building, with the uppermost portion being 8.8m above the footpath. The billboard will be oriented so it faces the intersection where it can be viewed while travelling in a north-easterly direction along SH6 and to a lesser degree while travelling south-east on Lower Queen Street.

4.3 Since the application was lodged, the Applicant has re-oriented the proposed billboard to face down Gladstone Road (SH6) rather than being visible from Lower Queen Street. I can confirm that the re-orientation of the billboard makes no difference to my assessment of the application from a lighting perspective.

4.4 The billboard will be viewed with the sky as the dominant background based on daytime natural light and the single storey buildings in the vicinity of the billboard.

4.5 The proposed billboard will be 3.5m x 7m oriented in landscape format with an overall screen area of 24.5m^2.

4.6 The billboard will have:

(a) An automated ambient light sensor and control system;

(b) An unlit border; and

(c) An illuminated operator name panel 1.0m wide x 0.5m high located on the lower edge of the billboard.

4.7 The billboard screen will be lit for 24 hours a day, 7 days a week. It will display a series of illuminated panels that, when viewed alongside a similar sized front-lit traditional skin billboard, will be more evenly lit and will appear no brighter during daylight hours.

4.8 At night and on overcast days, the billboard will automatically dim down to an acceptable luminance value dependant on ambient light to ensure it is not glary but is still readable.

Existing light environment

4.9 The site is located adjacent to a busy State Highway and the surrounding environment is populated with a mix of commercial and residential activities. There are existing streetlights on both sides of the road along Queen Street, Lower Queen Street and SH6.

4.10 General nighttime lighting in the area comprises existing streetlights, illuminated signage, vehicle headlights and area floodlighting from commercial properties. The result is that there is a reasonably high ambient light and bright outlook from 332 Queen Street. Nighttime illuminance for this commercial area was measured with a range of 8.2 to 15 lux.

Receivers in the vicinity

4.11 The nearest residential properties are located approximately 150m away at 334 and 337 Lower Queen Street to the northwest of the site. Based on my observations using the existing McDonalds sign as a reference at the same intersection locality during my site visit and the surrounding environment including fencing and large trees, I consider that the orientation and location of the proposed billboard means that billboard images are unlikely to be visible from these residential properties. I note there are substantial trees and buildings that will block direct views of the proposed billboard from the dwellings. Motorists and cyclists heading southeast on Lower Queen Street, northwest on Queen Street and northeast on Gladstone Road will be able to view the billboard.

Potential distant receivers

4.12 A number of submitters have raised concerns about the effect of the proposed billboard on the Wai-iti Dark Sky Park and, by inference, visitors to that park.

5. DIGITAL ILLUMINATED DISPLAYS – RELEVANT CONSIDERATIONS

5.1 The luminance from LEDs used in digital visual display billboards such as that proposed is automatically controlled by an in-built sensor to ensure that images are not:

(a) Overly bright to the observers' eye when viewed at night because it can cause flaring (blurring) of the digital image making it difficult to read comfortably; or

(b) Too dark to become unreadable in bright daylight conditions.

5.2 Excessive brightness or darkness can be a source of distraction. Avoiding distraction is the key rationale for luminance control. I played a significant role in settling the Auckland Unitary Plan (AUP) luminance provisions on behalf of the (then) Outdoor Media Association of New Zealand Inc. which now tend to be referred to as the industry standard nationwide.

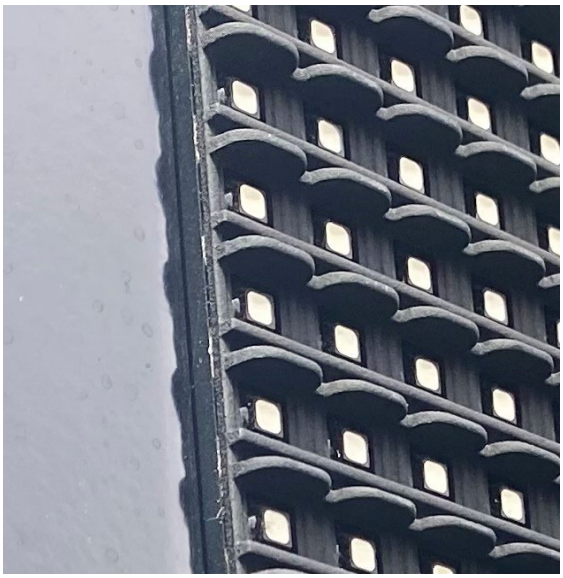
5.3 The automated control limits are programmed into the billboard data control system. Digital visual display billboard owners / operators tend to actively ensure each image does not become unreadable due to excessive brightness.

5.4 On modern digital visual displays, billboard luminance is automatically controlled based on ambient light conditions to remove human error that can occur when a manual system is used. Automated luminance dimming control is the best way to safeguard observers from excessive digital LED brightness and have maximum controls built into such a mechanism. This has been clearly evident during my luminance tests undertaken at 88 digital visual display billboard sites installed across sites in the North and South Islands.

5.5 Daytime luminance is limited by the specification of the digital panel manufacturer. The digital panel is typically capable of displaying a white image of 10,000 cd/m^2.

5.6 It is common practice throughout New Zealand for consent conditions to allow luminance of up to 5,000 cd/m^2 during the day, to ensure the image will not be too bright. Surfaces lit by the sun can have a luminance value much higher than this, for example, a light-coloured painted surface can be more than 10,000 cd/m^2 in direct sunlight.

5.7 Outdoor billboard manufacturers incorporate sun shields, or "eyebrows" positioned above individual LEDs during the manufacturing process to mitigate direct sunlight from washing out images and reducing image clarity, as illustrated in the image below.



5.8 Nighttime luminance must be set at a much lower value to ensure it is not glary or distracting. Typical conditions on similar billboards have set the maximum luminance value at 250 cd/m^2.

6. PLANNING CONTEXT

6.1 Chapter 17 "Zone Rules" of the TRMP includes permitted minimum illumination standards for lighting and glare in Mixed Business Activity Areas as follows:

> ***17.3.2.1(h) – Lighting and Glare:***
>
> *(h) External lighting is shaded or directed away from adjoining sites, roads, and any adjoining site within the Residential Zone, and is less than 8 lux spill of light (horizontally or vertically) measured at a height of 1.5 metres above the ground level at the boundary of the site.*

6.2 The purpose of the above rule is to manage illumination from external lighting such as signs to ensure spill light and glare is adequately controlled beyond the boundaries of the site concerned.

6.3 It is my opinion that, where Signs Planning Rule 16.1.3.1 (g) is referring to digital signs that are lit from within, the intent of the rule is to ensure that images do not flash and create a distraction. In a digital billboard, this concern is managed by having a preset dwell time and a soft transition of 0.5 seconds between images. To that extent, this planning rule does not take into account that a digital light source is different from a traditional billboard floodlight that only operates at night and does not need to be dimmed.

6.4 On the other hand, a digital light source must dim between daytime and nighttime conditions, and on overcast days to avoid glare. Each digital advertising image will use their own colour and hue, and it is for this reason that consecutive images may appear to have different luminous intensity providing the effect of varying brightness. Each RGBW LED is individually controlled to emit the colour required to form an image.

6.5 Notwithstanding that, Rule 16.1.3.1 (g), does not imply that a digital billboard does not comply simply because the light source does not appear to be constant. The reality is that the overall light source has the same intensity for each image regardless of image colour (including black) and the

dwell and transition times ensure the change between images does not present as a flash, and the maximum intensity of white is based on ambient light.

6.6 From my experience throughout New Zealand, the criteria for assessing digital billboards, in terms of lighting requirements, typically include factors relating to:

(a) Whether the lighting associated with the digital billboard will be controlled to minimise adverse effects on the surrounding environment during both day and night (and transition times) having regard to:

(i) The location of the billboard;

(ii) The orientation of the billboard to the sun; and

(iii) The variance of ambient light levels in the area.

(b) Whether the billboard complies with activity standards relating to maximum spill light (illuminance) and glare (luminance) levels.

(c) Whether there will be adverse effects on the amenity values of the surrounding area and traffic safety from billboards that are capable of displaying varying images more than once every eight seconds, taking into account:

(i) Image transition time;

(ii) Image dwell time;

(iii) Number of image changes per hour; and

(iv) Number of consecutive related images.

6.7 The following sections of my evidence address the anticipated lighting effects of the proposal having regard to the location and orientation of the billboard, ambient light levels, the luminance level of the billboard, and the effects of changing images.

6.8 The effects of transition time, dwell time, image changes per hour and number of consecutive related images on transport safety are addressed in the evidence of Messrs Carr and Harries.

7. BILLBOARD LUMINANCE

7.1 There are no standards in the TRMP relating to maximum limits for signage daytime or nighttime luminance.

7.2 A generally accepted nighttime luminance level is 250 cd/m^2. This would be the maximum luminance value permitted at night. In practice, luminance at night will be less than that to provide a glare free image. Luminance is tuned during commissioning to ensure levels are appropriate for the location. High nighttime luminance would cause flaring and glare and both situations are not desirable in terms of the visibility of the image displayed.

7.3 The billboard will be viewed with the sky as the dominant background. At night, the sky will appear black. I have recommended that the nighttime luminance be reduced to 125cd/m^2 to reduce the visual difference in brightness between a lit surface and the darker sky that can create glare as recommended in AS/NZS 4282 Control of the obtrusive effects of outdoor lighting. That recommendation has been accepted.

7.4 A generally accepted daytime luminance level is 5,000 cd/m^2. This would be the maximum luminance value during the day and would automatically dim down to a lower value during overcast periods.

7.5 I consider that the luminance limits proposed above are appropriate and will provide suitable limits to enable digital images to be adequately displayed while avoiding adverse effects on the surrounding environment. Importantly, the maximum luminance levels are maxima and, in practice, the actual values are generally substantially less, particularly at night because the brightness of the billboard will be automatically controlled to respond to ambient light conditions.

7.6 Experience with similar billboards shows the nighttime luminance of a white image will be more likely between 100 and 135 cd/m^2. Coloured images could be as low as 40 cd/m^2. Daytime luminance will vary with ambient light and will be set to a maximum of 5,000cd/m^2 but will be less depending on cloud cover and time of day.

Ambient light sensor

7.7 An ambient light sensor will be incorporated into the billboard. The billboard will be located at a similar height to ambient light from streetlighting and nearby commercial lighting; the sensor will control billboard luminance to a suitable value that will enable images to be read at street level.

7.8 When the billboard is commissioned, adjustments will be made to the ambient light automated sensing system to provide appropriate luminance values for reading the billboard at night.

7.9 Once that has occurred, the actual nighttime luminance could be as low as 40 cd/m^2 to 135 cd/m^2 depending on the image colour (white being the higher value and dark green the lowest value).

Daytime luminance

7.10 Daytime luminance will in practice be lower than the surrounding sky and light-coloured painted building surfaces. Bright daylight, particularly in the early morning when looking east, will provide sky luminance values as high as 13,000 cd/m^2 from white cloud behind the billboard and more than 10,000 cd/m^2 from an otherwise unlit light-coloured wall on a nearby building.

7.11 The conclusion to be drawn from the above analysis is that the brightness of the proposed billboard will be similar to or less than surrounding unlit surfaces during the day.

Nighttime illuminance

7.12 At night, spill light illuminance emitted from a digital billboard is very low by comparison to ambient light from street lighting, commercial floodlighting, traditional floodlit billboards and vehicle headlights. For example, measurements taken at a similar digital billboard site show a maximum spill light of 0.9 lux variance between images when viewed directly in front at a distance of 29m. This means that the surrounding environment will have very low light levels of spill light derived from the billboard and the ambient light at night will not increase by a discernible amount.

7.13 Spill light from the proposed billboard on residential properties will be completely avoided given the separation distances noted in paragraphs 2.2 and 4.12 above.

7.14 Spill light will be localised and will not be discernible on adjacent properties or the road.

8. EFFECTS OF VARIABLE IMAGES

8.1 Digital billboards provide the opportunity for multiple images to be displayed on a rotation system. Image dwell time, i.e., the amount of time that an image is displayed, can vary.

8.2 The typical minimum dwell time established in the context of most applications is 8 seconds and this dwell time is increased where the driving task is more complex to, for example, 15, 20 or even 30 seconds to minimise the likelihood that drivers will view more than one image.

8.3 The proposed single-sided billboard in this case will be viewed by motorists approaching the intersection and viewing distance is not limited by trees or tall buildings.

8.4 Image dwell time is set to ensure that digital billboard images do not provide a flashing effect, cause distraction or provide confusion for motorists with traffic signals. A dwell time of 8 seconds has been established as the minimum time in practice based on experience with other applications. In the context of this application, Bekon has proposed a conservative dwell time of 30 seconds in order to address traffic concerns.

8.5 NZTA provides guidance on digital billboard dwell times in Traffic Control Devices Manual 3 - Advertising Signs (TCDM3), Section 6.3. For variable message signs, NZTA recommends controls on dwell time to avoid distraction, with a minimum of 5 seconds being deemed an acceptable minimum time.

8.6 Section 3.3.5.4 of the New Zealand Lighting Standard AS/NZS 4282:2019 'Control of the obtrusive effects of outdoor lighting' recommends the minimum dwell time of 10 seconds; however, this standard was superseded in 2023, and now no minimum dwell time is stipulated in the new standard.

8.7 I consider that the proposed image dwell time of 30 seconds is acceptable with a high degree of confidence given the recommendations in TCDM3 and installed digital billboards installed in similar controlled intersection locations throughout New Zealand.

8.8 The proposed 0.5 second soft transition time is an accepted value for changing advertising images so as not to distract drivers' attention and is commonly imposed by Council's in conditions of consent. It provides a subtle transition that can easily be missed by the casual observer, rather than a distracting flash or a long change that could cause distraction.

8.9 The effects of digital billboards on traffic safety are addressed in detail in the evidence of Messrs Carr and Harries.

9. COMMENTS ON ISSUES RAISED IN SUBMISSIONS

9.1 Twenty-seven submissions were lodged in opposition to the proposed billboard. Of those submissions, ten mention lighting or illuminance and several others refer to adverse visual effects which I assume could include concerns about the lighting element of the billboard[4].

Submission #18 made by NZTA / Waka Kotahi

9.2 Submission #18 made by NZTA / Waka Kotahi does not specifically mention lighting as a concern but does raise TRMP objective 11.1.2 as a relevant concern for traffic safety where signs could detract from traffic safety causing confusion or obstructing views of motorists or pedestrians.

9.3 I disagree, noting that traffic light signals are deliberately designed to be bright and be clearly visible to road users. Recent tests I have undertaken on site indicate that the traffic lights have a luminance of 6,390cd/m^2 for red, 9,750cd/m^2 for amber and 5,910cd/m^2 for green. These values are significantly brighter than the proposed daytime and nighttime billboard luminance of 5,000cd/m^2 and 125cd/m^2 respectively as proposed for this site. In my opinion, it is highly unlikely (to the point of inconceivable) that any cyclist, motorist or pedestrian will confuse a traffic signal with the larger billboard that may be viewed behind a traffic light. The billboard location and mounting height will not obstruct views of traffic signals for motorists or pedestrians.

Submissions #10, #22, #24 and #25 – brightness and light pollution

9.4 Submissions #10 (Tim Leyland), #22 (Brent Nicholls), #24 (Gordan and Gaye Waide) and #25 Elizabeth Dooley) make general statements that the billboard will be bright and add to light pollution.

9.5 I disagree with the statements in these submissions, noting that the proposed billboard will have an automated luminance (brightness) control system and spill light will be minimal as outlined in paragraphs 2.17, 7.13 and 7.15 above. The proposed billboard will not appear bright either during the day or at night if commissioned and controlled correctly.

Submissions #8, #12, #16 and #20 - dark sky issues

[4] These submissions are identified as #18 (NZTA), #24 (Gordan & Gaye Waide), #8 (Bruce Struthers), #10 (Tim Leyland), #12 (Ralph Bradley), #16 (Thomas Wilson), #20 (Jenny Pollock), #22 (Brent Nicholls), #17 (Sean Walker) and #25 (Elizabeth Dooley).

9.6 Submission #8 (Bruce Struthers) raises concern that the billboard will operate all night and threaten Tasman's dark sky while acknowledging the ambient light in the immediate area is already high at night. It also asks for additional information on how the billboard would be monitored.

9.7 Submission #12 (Ralph Bradley on behalf of the Top of the South Dark Sky Committee) and submissions #16 (Thomas Wilson) and #20 (Jenny Pollock for the Nelson Science Society) outline potential effects when viewing the night sky at a distance from a high ambient light centre such as Richmond.

9.8 I agree that lighting, including billboard luminance, should be controlled at night to reduce dark sky effects and potential hazards for biological life. The proffered International Dark Sky Association (IDA) Guidance for electronic message centres (EMCs), referred to by submitters, refers to an LZ3 lighting zone as a moderately high ambient lighting area and LZ4 as high ambient lighting.

9.9 Both zones are equivalent to the CIE Environment Zone of E3 and E4 as noted in AS/NZS 4282 Control of the obtrusive effects of outdoor lighting, where zone E3 refers to suburban areas and E4 is for town and city centres and other commercial areas. The IDA recommends a maximum nighttime luminance of 160cd/m^2 for LZ4 areas and this generally aligns with my recommendations in paragraphs 2.7, 2.11 and 7.4 to reduce the billboard nighttime luminance from 250cd/m^2 to 125cd/m^2.

9.10 Legal counsel requested that I prepare a technical paper that could be shared with the 'dark sky' submitters, referred to in paragraphs 9.7 and 9.8 above. A copy of my letter to Mr. Berry dated 18th September 2024 is **attached**.

9.11 On the basis of the analysis contained in that letter, given that the nighttime luminance level of the proposed billboard will be set at the lower limit of 125cd/m^2 (roughly half of the original luminance proposed in the application), I am satisfied that there is no sound technical basis for concerns about adverse lighting effects arising as a result of the brightness of the proposed billboard, particularly in relation to Richmon's Wai-Iti Dark Sky Park.

9.12 Responses to my letter were received from Mr. Struthers and Mr. Wilson. I subsequently addressed the further concerns raised in their responses (to the extent that they fell within my area of expertise). A copy of my letter to Mr Berry dated 14th October 2024 is also **attached**.

9.13 I have visited the Wai-iti Dark Sky Park on a cloudy overcast night and noted that there was evidence of sky glow reflecting off the clouds to the west and north of the park. The sky glow appeared to be coming from floodlighting at the nearby Carter Holt Harvey sawmill located on Eaves Valley Road. The lighting effect would be significantly different if there had been a clear sky with no cloud to reflect light off. The park is surrounded by tall trees and is located behind hills providing a natural screen between the Richmond commercial area and the dark sky viewing park reserve.

9.14 I consider that an observer in the dark sky park reserve would not be affected by sky glow from the proposed billboard on a clear night given the 20km distance from Richmond. The nearest streetlights of any quantity are in Wakefield, being approximately 5km to the north of the reserve.

9.15 A condition of consent is proposed that will require the consent holder to submit, within 30 days of the display becoming operational, a certification report from an appropriately qualified lighting designer/engineer confirming compliance with luminance requirements. This report would confirm or otherwise that the billboard lighting aspects are appropriate and meet consent condition requirements.

Submission #17 – intensity and colour issues

9.16 Submission #17 (Sean Walker) states that there should be stricter regulations on the intensity and colour of nighttime signage while limiting the image colour to 2,500 Kelvin. The submission also suggests angling the billboard downwards to minimise light pollution.

9.17 Angling the billboard downwards would not improve night sky effects. Limiting image colour to warmer tones as suggested will not reduce spill light or mitigate light pollution and intensity. The most effective method to reduce these effects is to control luminance to acceptable low limits as recommended in my evidence. While the TRMP does not provide maximum luminance limits for signage, the proposed consent conditions contain strict parameters to control lighting effects. In addition, these proposed conditions reflect my recommendation that nighttime luminance be reduced to a maximum of 125cd/m^2 to mitigate light pollution.

Submissions - summary

9.18 In summary, I generally disagree with these submissions relating to lighting, noting that:

(a) The proposed billboard will comply with TRMP lighting related requirements for lighting activities as noted in paragraphs 2.6, 2.7, 2.8, 6.2 and 7.2 and will not appear bright.

(b) There are no luminance limit standards in the TRMP, however the proposed parameters outline limits that apply to many digital billboards in New Zealand.

(c) Many digital billboards have been tested and have been proven to meet Council imposed lighting parameters throughout New Zealand.

(d) Luminance limits will be set to limit environmental lighting effects so they will be less than minor.

9.19 I also disagree that the billboard will create light pollution. Spill light will be negligible as noted in paragraphs 7.13 and 7.14. The existing bright lighting environment at 332 Queen Street means it would be difficult to quickly pick out the proposed billboard from a distance such as the surrounding hill areas noting there are many existing streetlights, area lights and illuminated signs in the Richmond commercial area. Just because you can see a digital billboard from a distance does not make it obtrusive.

9.20 Submitter comments relating to spill light, sky glow and high intensity bright LED lighting may be based on an existing Go Media digital billboard at Nelson Airport. I agree the luminance was set too high at night measuring 592cd/m^2 during my recent site visit. This billboard is not a good example of how a digital billboard system should be set up and it should be reprogrammed. I sent an email to Go Media requesting a technician adjust the luminance settings following my observations and tests during my site visit.

10. COMMENTS ON ISSUES RAISED IN THE COUNCIL OFFICER'S REPORT

10.1 I have read the Council s42A report and make the following observations.

10.2 I agree with the conclusions arrived at in relation to lighting in paragraphs 7.89 to 7.92 and that any adverse effects are likely to be less than minor given luminance levels from the billboard can be adequately controlled via conditions of consent.

10.3 Attachment 2 to the s42A report contains Recommended Conditions. Luminance related conditions are presented in Conditions 2 to 8. I have no issues with Recommended Conditions 2, 3, 4, 5 and 8.

10.4 However, I do not agree with Recommended Condition 6 which would impose defined times when the maximum luminance limits would apply for autumn/winter and spring/summer, as follows:

> *6. Notwithstanding condition 5, the display shall not exceed the following luminance values:*
>
> *a. 5,000 cd/m2 between the hours of 7.30am - 5.30pm during autumn and winter, and between the hours of 6.30 am – 9.00pm during spring and summer.*
>
> *b. 125 cd/m2 during hours outside the above times.*

10.5 I consider that setting times such as these is not appropriate, and that the wording contained should be changed to refer to "daytime" and "nighttime" as proposed in the applicant's draft conditions. This will ensure that the automated light sensor can limit luminance as ambient light changes across the seasons and is not defined by a set time. Allowing a luminance of up to 5,000cd/m^2 at 7.30am in autumn may be too high for example.

10.6 Recommended Condition 7 introduces reference to spill light "at a road boundary". I prefer the wording in the applicant's draft conditions where the spill light is measured 2m within the boundary of any adjacent site. That requirement is inclusive of a road boundary. I also note that proposed condition 7 refers to 10 lux spill light. I suggest this value be reduced to 8 lux for the reasons noted in paragraph 11.2 (d) below.

11. PROPOSED LIGHTING PARAMATERS

11.1 I generally agree with key lighting related parameters outlined in the application document, subject to the following amendments that the Applicant has agreed to:

(a) The nighttime luminance parameter should read should not exceed 125cd/m^2 at night rather than 250cd/m^2 and remove the reference to a maximum average luminance value.

(b) The spill light limit should be reduced from 10 lux to 8 lux measured 1.5m above ground level to align with TRMP Section 17.3.2.1 (h) for lighting and glare limits.

11.2 The proposed daytime luminance limit of 5,000cd/m^2 is acceptable and is generally used in consent conditions by Councils for digital billboards.

11.3 An ambient light sensor as noted in recommended condition 5 is critical to ensuring the digital billboard automatically adjusts luminance in changing light conditions to ensure the image is readable and is not glary.

11.4 The proposed monitoring requirement described in recommended condition 8 will ensure the installed billboard is operating correctly in differing ambient light conditions and that maximum luminance limits are not being exceeded.

12. CONCLUSIONS

12.1 Based on my experience with similar digital billboards adjacent to roadways and the proposed use of an ambient light sensor to control luminance to be less than typical consented limits under cloudy daytime conditions, I consider the lighting effects will be acceptable (less than minor) with no appreciable glare for aircraft pilots, pedestrians, cyclists, motorists, or occupants of nearby commercial and residential premises and the luminance will be controlled to acceptable values in keeping with ambient light conditions.

12.2 Spill light will not affect any residential dwellings due to the orientation and distance of the nearest dwellings from the billboard. It is unlikely that residential building occupants will be able to see the proposed billboard; however, the luminance will be controlled to acceptable values in keeping with ambient light conditions and accepted obtrusive light standards.

12.3 While the proposed billboard may be able to be seen from a distance, such as the surrounding hills to the east and west, there will be no obtrusive lighting effects noting the immediate area to the site is well lit and the proposed luminance will be set to a low limit at night and the billboard will not be prominent from these viewpoints.

Russ Kern

17 October 2024

kern Consultants
ELECTRICAL & BUILDING SERVICES

PO Box 97
Red Beach
Auckland, New Zealand

Phone 09 426 4007
Fax 09 426 0443
Email russkern@kernconsultant.co.nz

18th September 2024

Berry Simons
P.O. Box 3144,
Shortland Street,
Auckland 1140

Email: simon@berrysimons.co.nz

Attn: Simon Berry

Re: Bekon Media application to authorise a proposed digital billboard at 332 Queen Street, Richmond
Night light / 'Dark sky' effects

1. You have sought my opinion in relation to concerns raised by submitters on the above application in relation to potential adverse lighting effects, including effects on Wai-iti Dark Sky Park, located south of Richmond. In that regard, it is hoped that, if these lighting effects are found to be acceptable, it may be possible to address these submitters' issues ahead of the hearing of the application.

Lighting-related submissions

2. Other than the submission by Waka Kotahi, nine of the submissions lodged on the application mention lighting or illuminance. Several others refer to adverse visual effects, which I have assumed may include concerns about the lighting element of the proposed billboard. The relevant submissions comprise the following:

(a) #8 - Bruce Struthers;

(b) #10 - Tim Leyland;

(c) #12 - Ralph Bradley;

(d) #16 - Thomas Wilson;

(e) #17 - Sean Walker;

(f) #20 - Jenny Pollock;

(g) #22 - Brent Nicholls;

(h) #24 - Gordan & Gaye Waide; and

(i) #25 - Elizabeth Dooley.

My analysis / comments – dark sky issues

3. I have analysed all of the submissions in light of all relevant standards and my expertise in lighting. As requested, this opinion focusses Submissions 8, 12, 16 and 20 which refer to dark sky issues. I make the following comments in that regard.

Submission #8 – Mr. Struthers

4. Bruce Struthers' submission (#8) suggests that shielding be installed above the billboard to shelter the night sky.

5. I understand what Mr. Struthers is seeking to achieve; however, that objective will be met by an "eyebrow" (see picture below) that will be built into each individual LED above the light source. Their primary purpose is to address direct sunlight "washing out" images but their effect will also be to provide a shield to reduce upward light spill. In light of this feature, a larger shield located above the billboard would not in my opinion improve the upward light screening.

Zoomed in image of LED's and eyebrows
LED's are at 10mm centres

6. In response to Mr. Struthers comments, I note that the proposed billboard will incorporate an ambient light sensor to automatically adjust the LED by dimming the output on dull and overcast days and at night. Spill light will be negligible from the very low wattage LEDs. It is acknowledged that the digital images could be seen from a distance but, in my opinion, if they are controlled as I have recommended, they will not appear bright.

7. On the assumption that Mr. Struthers may have adopted as his point of reference the Go Media digital billboard near Nelson Airport, I note that it appears that the luminance controls on that billboard have not been set correctly with the result that the nighttime limit is operating at 592cd/m^2 and daytime is 5,210cd/m^2, both of which are significantly above the luminance that would be expected. Consequently, this billboard is not a good example to base comments regarding sky glow, bright billboards and light pollution on.

8. This example is also relevant in considering Mr. Struthers' submission to the extent that it states that LEDs continue to increase in their intensity so are capable of providing very bright impressions.

9. Lastly, I note that images will be programmed to change with a "soft" transition of 0.5 second to eliminate flicker effect and are therefore not considered to change quickly as Mr. Struthers has assumed.

Submission #12 – Mr. Bradley

10. Ralph Bradley is the Chair of the Top of the South Dark Sky Committee. His submission refers to a document issued by the International Dark-Sky Association ("IDSA") titled "Guidance for Electronic Message Centres (EMCs)" (May 10, 2019). The IDSA is a private environmental organisation based in Tucson, Arizona which has the objective of "empowering a global movement to protect the night sky."

11. EMCs are defined to include "LED signs," LED displays and "digital billboards". That document identifies five "overlay lighting zones" (LZs), ranging from LZ0 (no ambient lighting) through to LZ4 (high ambient lighting), and sets nighttime maximum luminance levels based on the level of ambient lighting in an area in accordance with the following table:[1]

Lighting Zone	Nighttime Maximum Luminance (cd/m2)
LZ0	0
LZ1	20
LZ2	40
LZ3	80
LZ4	160

12. Mr. Bradley considers that the area in the vicinity of the application site has moderately high ambient lighting so that, based on the above table, billboard luminance should be limited to 80cd/m^2 at night.

13. The IDSA's guidelines, etc., have no legal standing in New Zealand. In assessing appropriate levels, lighting experts in New Zealand apply the Standard "AS/NZS 4282 Control of the obtrusive effects of outdoor lighting" and it has similar lighting categories contained in Table 3.1 where A3 refers to medium district brightness in suburban areas in towns and A4 is described as high district brightness in town and city centres and other commercial areas. Table 3.4 then recommends a maximum average luminance limit of 250cd/m^2 for A3 and 350cd/m^2 for A4 zones.

14. Lighting Category A2 in the same Standard is tabulated as 150cd/m^2 maximum average and it is used in low district brightness areas; however, the Standard also contains a recommendation that Lighting Category A2 be applied where the lit surface is viewed against a dark background such as would be the case in Richmond. I have recommended a maximum nighttime luminance limit of 125cd/m^2 which I consider will adequately address any concerns in that regard[2]. This recommendation has been accepted by Bekon Media and will be included in the proposed conditions of consent promoted by Bekon.

15. In my opinion, adopting the maximum average limits as set out in AS/NZS 4282 in the context of this application would not provide a good outcome in terms of luminance / glare. In that regard, I have consistently interpreted the tabulated luminance values in the Standard as representing maxima when an image could have all sorts of colours on it. In my opinion, best practice dictates that white should be adopted as the brightest image to be displayed and that that value should be within those limits for nighttime operation, as a worst-case scenario.

16. Glare arises where there is a discomfort or a reduction in the ability to see, caused by an unsuitable contrast of luminance such as a viewing bright billboard against the dark night sky. The key is to reduce the billboard luminance to ensure one's eye does not have to cope with a high contrast. Typical digital billboards I have tested in New Zealand range from 40cd/m^2 to 135cd/m^2 depending on the advertising image and colours used. Some images do not use white and instead have darker tones as an example.

---

1 International Dark-Sky Association "Guidance for Electronic Message Centres (EMCs)" (May 10, 2019), page 8.

2 For clarity, I note that luminance is measured either in Nits or cd/m2, both of which have the same value.

17. Even though the limit might be set at 125cd/m^2, the luminance of the images will be lower than that, based on tested billboards throughout New Zealand.

18. If I were to apply the IDSA's guidance, I would place downtown Richmond as an area with moderately high ambient lighting in respect of which the guideline would require a maximum nighttime luminance of 80cd/m^2. The 125cd/m^2 that Bekon Media proposes based on AS/NZS 4282 is close to that maximum and is more appropriate for the area noting existing static signage in the area has a luminance reading ranging from 152cd/m^2 on the Black Bull Liquor sign up to 960cd/m^2 on the Z service station fuel pricing display.

19. I visited the Dark Sky Park at 437 Wakefield-Kohatau Highway on Saturday, 16 September between 1.30pm and 2.30pm and again between 7.00pm and 7.45pm. I noted that the reserve area is surrounded by tall trees and the rest of the park is used as a working forest.

20. On the night of my visit, the weather was very cloudy which provides a body for artificial uplighting to reflect off. There was evidence of reflected light in the sky at that time. I note that the outcome would be significantly different if it had been a clear night with no cloud to reflect uplighting.

21. I consider that an observer in the Dark Sky Park would not be affected by sky glow on a clear night given the 20km distance from Richmond, the valley that the park is situated in and the surrounding hills between Richmond and the dark sky park. The nearest streetlights of any quantity are located in Wakefield, being approximately 5km away from the reserve.

Submission #16 – Mr. Wilson

22. Mr. Wilson's submission suggests that the proposal will damage Dark Sky conservation efforts in the Wai-iti Dark Sky Park.

My comments in relation to Mr. Bradley's submission equally apply to Mr. Wilson's submission.

23. In my view, the luminance limits proposed, automated controls and "eyebrows" described above will all assist to mitigate potentially obtrusive lighting effects, particularly at night. I have recommended that a monitoring condition is included to ensure the maximum luminance limits are not exceeded and this has been included in Bekon's proposed conditions. It is my expectation based on my previous history with Bekon Media that nighttime luminance will be even lower than the proposed limits.

Submission #20 – Ms. Pollock, Nelson Science Society

24. Ms. Pollock is the President of the Nelson Science Society. Her submission indicates that she is concerned about the increasing light pollution that is reducing darkness in the Tasman District.

Again, my comments in relation to the above submissions apply here.

25. As noted above, I consider that the controls and features that will be included in the proposed billboard will ensure that the proposed billboard will not add to light pollution in Richmond. In that regard, it is important to note that there is a 20km separation between the proposed billboard and the Dark Sky Park at 437 Wakefield – Kohatu Highway. The effects of the billboard will be negligible over that distance, particularly given the topography in the area that separates the two sites.

26. Light pollution is typically caused by poorly oriented and aimed floodlights that have a high upward light component. An example of this is the Carter Holt Harvey Mill site between Richmond and the Dark Sky Park.

Key conclusion

27. I have recommended that nighttime luminance should be set at 125cd/m^2, which is lower than that specified in the application documents but is accepted by Bekon Media. My recommendation will result in roughly half of the luminance of the original proposal per the application as lodged, with lower day and nighttime maximum limits. (Submitters should not be confused by maximum average limits, the limits noted should be read as maximum limits.)

28. In my opinion, there is no sound technical basis for concerns about adverse lighting effects arising as a result of the brightness of the proposed billboard, particularly in relation to Richmond's dark sky.

29. I am happy for you to present these findings to the relevant submitters and to engage with them as necessary, with a view to allaying their fears and addressing their concerns.

30. Please get in touch if you require further clarification.

On behalf of
Kern Consultants Ltd

Russ Kern MIES

kern Consultants
ELECTRICAL & BUILDING SERVICES

PO Box 97
Red Beach
Auckland, New Zealand

Phone 09 426 4007
Fax 09 426 0443
Email russkern@kernconsultant.co.nz

14th October 2024

Berry Simons
P.O. Box 3144,
Shortland Street,
Auckland 1140

Email: simon@berrysimons.co.nz

Attn: Simon Berry,

Re: Bekon Media application to authorise a proposed digital billboard at 332 Queen Street Richmond Night light / 'dark sky' effects

1. Further to our recent telephone conversation, the purpose of this letter is, as requested, to respond to comments from two submitters received in relation to my earlier letter to you dated 18 September addressing concerns on potential adverse lighting effects on Wai-iti Dark Sky Park. The two submitters who lodged submissions were from #8 (Bruce Struthers) and #16 (Thomas Wilson).

Lighting related comments raised

2. The following items were raised specifically relating to the lighting of a digital billboard and my comments follow:

a) LED "eyebrow" technical and construction details.

b) Digital billboard specifications, operation and installation manuals for review.

c) Luminance measurement methods.

d) Access to data provided by light sensor.

e) External sensors for corroboration purposes.

f) Burdensome compliance requirements.

g) Health hazard from digital billboards.

h) Wai-iti Park intrusion to nighttime darkness.

My analysis / comments

3. I have read the responses from Bruce Struthers and Thomas Wilson in light my expertise in lighting and make the following comments.

Submission #8 – Mr Struthers

4. Bruce Struthers' response raises concerns about the complexity of installing "eyebrows" above each LED and the potential for defects during construction.

5. I understand what Mr Struthers' concern relates to; however, each "eyebrow" is moulded into place as part the panel backboard segment prior to the LED's being placed in purpose-made recesses within the backboard. A closer view of this is presented below to help understand that any misalignment of the moulding is not possible and any damage during manufacture would be picked up during QA and testing. Each eyebrow is not placed individually and separately from each other. If an LED was rotated for any reason during manufacture, there would be no noticeable effect to the overall billboard display. A billboard is made up of individual segmented panels sized approximately 350mm x 350mm that are replaceable if there is a faulty LED.

Zoomed in image of LED's and eyebrows
Example LED's are at 10mm centres

6. The manufacturer's proprietary specifications and installation manuals are not available for distribution at this point for commercial reasons.

7. Mr Struthers' query relating to measuring luminance across a changing set of creative images is unfounded. To explain, a luminance measurement process is undertaken after the commissioning of the billboard to ensure that luminance levels are appropriate and comply with consent conditions. The measurement process uses white as having the highest luminance level and therefore the worst-case scenario. All other colours and hues produce a lower (better) luminance reading than white.

8. The purpose of completing these independent tests after commissioning is to verify that maximum luminance limits have not been exceeded under varying light conditions. A continuous programme to keep monitoring luminance is not necessary. Once these maximum values are set, the only way to alter them again is for a technician to reprogramme the control processor settings. The only variance is that, as LED's age, luminance will decrease marginally, not increase.

9. Mr Struthers' has also asked about access to the light sensors. In response, I note that the proposed billboard will incorporate an ambient light sensor to automatically adjust the LED by dimming the output on dull and overcast days and at night. This reduces luminance below the maximum limit. As ambient light increases during the day, luminance will also increase but not exceed the preset limit. The ambient light sensor does not adjust luminance at night; once it is dark, the maximum nighttime limit becomes 125cd/m^2.

10. Access to the sensors is not required since the outcome of sensor control is to adjust how bright the billboard appears, and this is measured in luminance. Maximum luminance of an operating billboard is verified independently as a requirement of the consent conditions and the report would be made available to Tasman District Council as part of that condition.

11. External measurement devices installed separately from the billboard site to corroborate observations and ambient light is not required and has not been included in any billboard resource consent requirements in New Zealand. Once the billboard has been tested and luminance limits have been measured independently, any ambient light fluctuations will take care of themselves, and a casual observer can witness the luminance effects. Note that changes in luminance can take several minutes to take effect. This is to prevent rapid changes in billboard appearance that could be distracting if for example cloud covered the sun for a few seconds and then it became clear again.

12. Lastly, a manual visual inspection routine is not envisaged to be undertaken by Tasman District Council except as required to ensure maintenance and appearance of the billboard is being kept up to standard. This requirement is normally included in a written maintenance programme. Typical conditions also include a review condition so that Council can complete an annual review.

Submission #16 – Mr Wilson

13. I have not addressed comments raised by Mr Wilson regarding human health hazards as this is outside my scope of expertise.

14. I have recently visited the Dark Sky Park at 437 Wakefield-Kohatau Highway and note that the reserve area is surrounded by tall trees and the rest of the park is used as a working forest. In my opinion, the proposed billboard will not affect star gazing opportunities from the dark sky park.

Key conclusion

15. Ongoing luminance measurement is not warranted for LED billboards. Once the luminance limits have been independently verified after commissioning, the only way luminance can be increased is to reprogramme settings and this would not be in the operator's best interest. There is always the opportunity for complaints to be lodged with Council if a casual observer feels the billboard is too bright.

16. In my opinion, there is no sound technical basis for concerns about adverse effects arising as a result of the brightness of the proposed billboard, particularly in relation to Richmond's dark sky.

17. Please get in touch if you require further clarification.

On behalf of Kern Consultants Ltd

Russ Kern MIES