UNDER the Resource Management Act 1991 ("**RMA**")

AND

IN THE MATTER of a notice of requirement ("**NoR**") for a designation by KiwiRail Holdings Limited ("**KiwiRail**") for the Palmerston North Regional Freight Hub ("**Freight Hub**") under section 168 of the RMA

STATEMENT OF EVIDENCE OF JOHN MCKENSEY
ON BEHALF OF KIWIRAIL HOLDINGS LIMITED

LIGHTING

1. SUMMARY

1.1 I have peer reviewed the Lighting Report that was included with the Design, Construction and Operation Report as part of the Assessment of Environmental Effects ("**AEE**") for the Freight Hub. That report has subsequently been updated ("**Updated Lighting Design**") and is attached to my evidence at **Appendix 1**.

1.2 The Updated Lighting Design has been adjusted in terms of luminaire selection, height, location and tilt to ensure that the design now satisfies the obtrusive light limits recommended in AS / NZS 4282:2019,[1] for environmental zone A2.[2] This includes spill light, glare and sky glow effects.

1.3 As shown in the Updated Lighting Design, the exterior lighting for the Freight Hub will comprise 20m columns with asymmetric floodlights, 12m high building-mounted floodlights and 7.5m columns with roadway lights. The lights will all be LED. Almost all of the lights will be installed with zero upward tilt. The remainder will be installed at a maximum of 5 degree tilt and will be located no higher than 12m. The lighting will have a colour temperature of 4000K.

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1 Control of the obtrusive effects of outdoor lighting.

2 "Low District Brightness" – such as sparsely inhabited rural and semi-rural areas.

1.4 Based on Updated Lighting Design, I am of the opinion that the lighting effects will be suitably addressed as the calculated values comply with AS / NZS 4282:2019 zone A2 recommended limits for spill light, glare and sky glow. On that basis, in my opinion, the lighting effects will be low to negligible – ie less than minor.

2. INTRODUCTION

2.1 My full name is John Kinross McKensey. I am an Executive Engineer for LDP Ltd (Independent Electrical and Illumination Engineers).

Qualifications

2.2 I hold a Bachelor of Engineering (Electrical) degree from the Queensland Institute of Technology. I have completed the Consulting Engineering Practice and Management programme at the University of Melbourne.

2.3 I am a member of several relevant associations including Illuminating Engineering Society of Australia and New Zealand (MIES); Chartered Member of Engineering New Zealand (CMEngNZ); Chartered Member of the Institution of Engineers Australia (MIE Aust); Chartered Professional Engineer Australia (CPEng Aust); National Engineers Register, Australia (NER); APEC Engineer; International Professional Engineer, Australia (IntPE); Member of the Resource Management Law Association; Member of the International Dark Sky Association; and New Zealand Green Star Accredited Professional (GSAP).

Experience

2.4 I have over 40 years' experience in lighting design, providing consultancy services for a wide range of clients including local authorities, developers, road controlling authorities and infrastructure sectors. My experience includes:

(a) lighting advisor to Auckland Council during the Proposed Auckland Unitary Plan process;

(b) lighting advisor to Christchurch City Council during the Replacement District Plan process;

(c) author or co-author of five local government codes of practice with respect to exterior lighting, each containing environmental considerations;

(d) author of the Auckland Council Sportsfield Lighting Guidelines;

(e) lighting advisor to Auckland Transport; and

(f) lighting advisor to Waka Kotahi NZ Transport Agency.

2.5 I also have over 20 years' experience advising as to environmental lighting effects. I have provided consultancy services for private client applicants and local government regarding the assessment of lighting effects of an activity. In particular, I have prepared lighting assessment of effects for exterior lighting installations for the following projects:

(a) Waikato Expressway Cambridge to Tamahere, which included consideration of the effects of lighting on residents, motorists and biota other than people.

(b) Kennedy Point Marina Waiheke which included consideration of the effects of lighting on residents, motorists, navigation and biota other than people.

(c) Tekapo Drainage Canal which included consideration of lighting effects on Mt John Observatory.

(d) Lake Pukaki Development which was to be located in an intrinsically dark environment.

2.6 I have also reviewed lighting effects for local government in regards to sportsfields, signage and digital billboards, roads, pathways and carparks and private development exterior lighting for buildings, quarry, greenhouse and service stations. I have provided lighting advice to local government for the Devonport Domain, Vauxhall Park, Stanmore Bay League Fields, Waitakere Stadium, Replacement Wynyard Crossing Bridge and Auckland Harbour Bridge Skypath.

2.7 I have previously prepared and presented evidence in the Environment Court and for Independent Hearings Panels for lighting effects for a number of clients, including local government for the following projects:

(a) Michaels Avenue Reserve for Auckland Council;

(b) Waikeria Prison Expansion for Otorohanga District Council;

(c) Matiatia Marina – Waiheke Island for Auckland Council;

(d) Kennedy Point Marina – Waiheke Island for Kennedy Point Boat Harbour Ltd;

(e) Americas Cup AC36 Facilities – Auckland for Panuku Development Auckland (an Auckland Council CCO);

(f) Waste Management NZ proposed landfill at Wayby Valley for Auckland Council;

(g) Auckland Unitary Plan for Auckland Council;

(h) Christchurch Replacement District Plan for Christchurch City Council; and

(i) Amberfield Development for Hamilton City Council and the Applicant (common interest privilege).

Involvement in the Freight Hub

2.8 I was engaged by KiwiRail May 2021 to peer review the Lighting Report which was prepared by Stantec (dated October 2020) and included as part of the AEE for the Freight Hub. I have also reviewed KiwiRail's responses to Palmerston North City Council's ("**PNCC**") First Section 92 Request dated 14 December 2020, and agree with the responses relating to lighting matters (identified as item numbers 3, 4, 5 and 6).

2.9 With regard to KiwiRail's responses to the First Section 92 Request, I note that the calculated lighting effects have reduced since KiwiRail's response was provided. In particular, the maximum luminous intensity (ie Glare to Residents) has been reduced from over 60,000 candelas to 906 candelas and will now comply with the recommendations in AS / NZS 4282:2019 (as I explain further in detail below).

2.10 Improvements have also been achieved through changes to optic selection, tilt, and mounting height. This has enabled the glare effects to be contained within the site sufficient to achieve the limits recommended in AS / NZS 4282:2019.

2.11 In response to a query regarding potential train headlight sweep to residents (in the First Section 92 response), it is considered that the proposed 5m high site perimeter noise barrier will effectively mitigate such effects. I have considered the degree of coverage afforded as indicated in Figure 1 and I agree with this opinion.

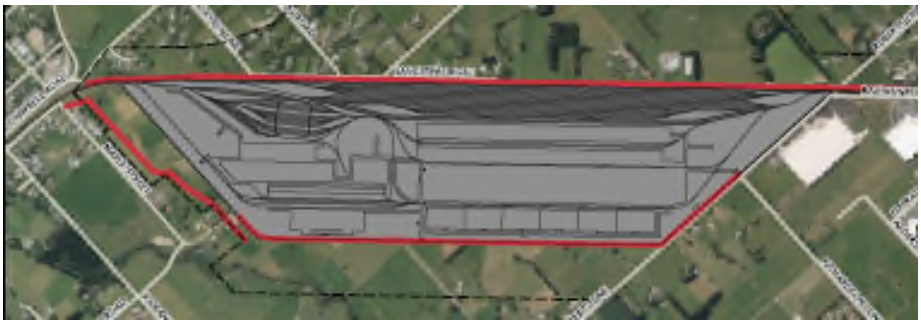

Figure 1. Proposed noise management barrier[3]

2.12 In the course of peer reviewing the Lighting Report I noted that the concept lighting design appended to that report at Appendix B[4] indicated potential lighting effects that were in some cases, above standard levels. I recommended that the lighting design for the Freight Hub be further developed to demonstrate that the lighting could be designed to suitably address those effects and to address concerns raised by submitters.

2.13 The lighting design was further developed and is shown in the Updated Lighting Design at **Appendix 1** to my evidence. I have based my assessment of the lighting effects of the Freight Hub on this Updated Lighting Design.

2.14 I have reviewed concerns regarding lighting effects raised by submitters, considered matters regarding lighting effects raised in the Section 42A Report ("**Section 42A Report**"), and the technical lighting evidence of Mr Wright, and address these matters later in my evidence.

Code of conduct

2.15 I confirm that I have read the Code of Conduct for Expert Witnesses contained in the Environment Court Practice Note 2014 and that I agree to comply with it. I confirm that I have considered all the material facts that I am aware of that might alter or detract from the opinions that I express, and that this evidence is within my area of expertise, except where I state that I am relying on the evidence of another person.

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3 Stephen Chiles Memo dated 12 February 2021 – Fig. 1 – Proposed Noise Management Boundary.

4 Stantec Report – Design, Construction and Operation – October 2020, Appendix B – Lighting Design, drawing set labelled as figures 67 - 76.

3. SCOPE OF EVIDENCE

3.1 This statement of evidence will:

(a) outline the key features of the Updated Lighting Design for the Freight Hub;

(b) set out the existing environment and potential receivers;

(c) consider the Updated Lighting Design against applicable standards;

(d) consider the lighting effects of the Freight Hub;

(e) respond to the submissions received that relate to lighting matters; and

(f) address relevant matters raised in the Section 42A Report.

4. UPDATED LIGHTING DESIGN

4.1 The Updated Lighting Design has been tailored to be as near as practicable to the minimum performance necessary for safe operation. Internal access roads are designed to category PR5 per AS / NZS 1158.3.1:2020 (target 0.85 lux average), car parking is designed to category PC3 per AS / NZS 1158.3.1:2020 (target 3.5 lux average) and the rail freight yard is designed in accordance with KiwiRail standard E-ST-EL-0131 for load / unload areas (target 30 lux average) and other areas (target 20 lux average).

4.2 The design has been adjusted in terms of luminaire optic selection, height and tilt to ensure that the design now satisfies the obtrusive light limits recommended in AS / NZS 4282:2019,[5] for environmental zone A2.[6] This includes spill light, glare and sky glow effects. The obtrusive lighting calculations were undertaken using initial light output with a maintenance factor of 1.0 to demonstrate the worst case effects.

4.3 To aid in understanding the nature of the proposed lighting I have included a number of images of comparable installations. Figure 2 shows tall column lighting similar to that proposed for the Freight Hub, with zero tilt lights. Figure 3 shows the style of luminaire proposed. The columns have been lowered

5 Control of the obtrusive effects of outdoor lighting.

6 "Low District Brightness" – such as sparsely inhabited rural and semi-rural areas.

approximately 2m from the original lighting design, but cannot be lowered further without increasing tilt and thereby increasing obtrusive light effects.

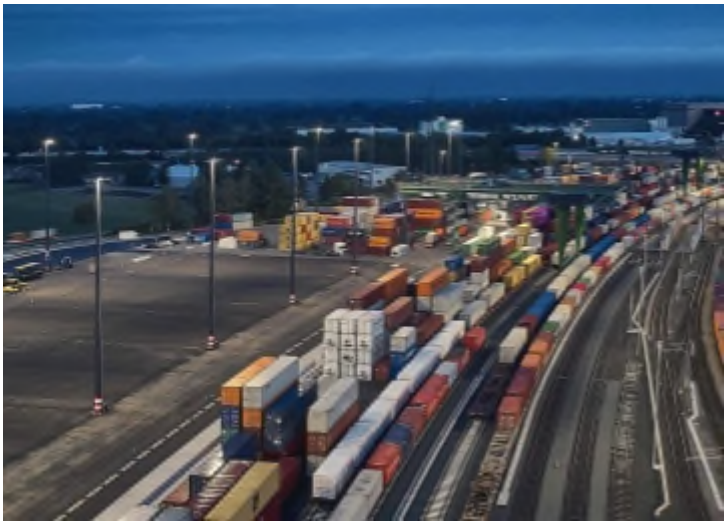

Figure 2. Indicative installation – freight yard lighting

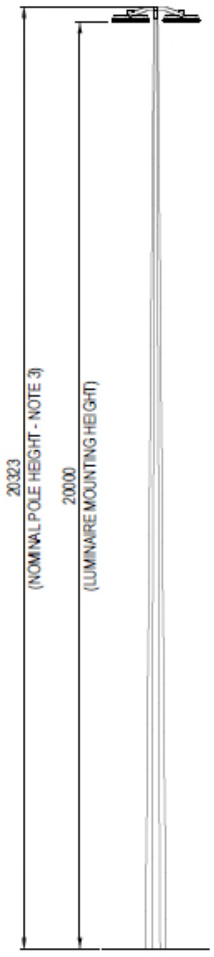

Figure 3. Proposed luminaire – freight yard lighting

4.4 I note that the lighting towers in the container terminal at KiwiRail's existing rail yard on Tremaine Avenue are approximately 36.5m in height. In my view the proposed lighting structures at the Freight Hub will look less imposing during the day than those at the Existing Freight Yard for a number of reasons, including that they will have a lower height and are proposed to be a thinner structure.

4.5 Figure 4 is representative of the expected appearance of the wall mounted floodlights with zero to 5 degree tilt. Figure 5 shows the style of luminaire proposed.

Figure 4. Indicative installation – wall mount area lighting

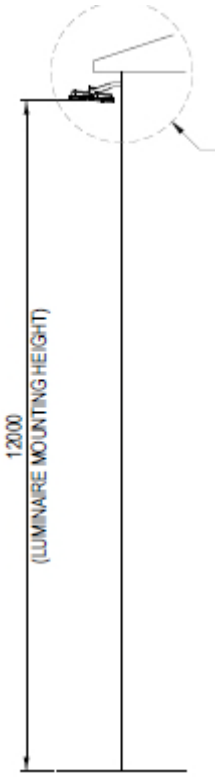

Figure 5. Proposed luminaire – wall mount area lighting

4.6 Figure 6 is representative of type of lighting proposed for access roads and car parking with zero to 5 degree tilt. Figure 7 shows the style of luminaire proposed.

Figure 6. Indicative – road / car park lighting

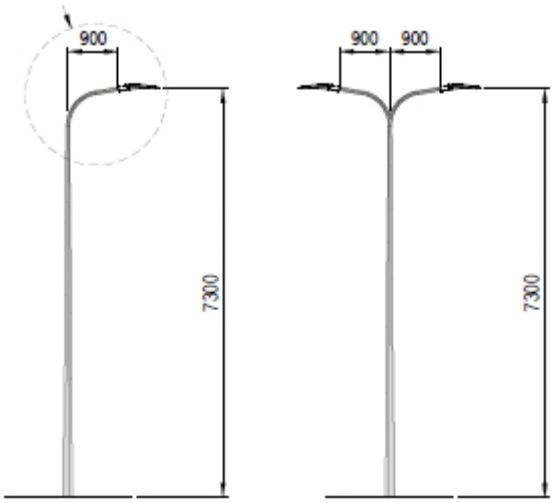

Figure 7. Proposed luminaire – road / car park lighting

5. EXISTING ENVIRONMENT AND RECEIVERS

5.1 The Freight Hub is located approximately 1km north of the Palmerston North Airport with Palmerston North City beyond. It is just south of the township of Bunnythorpe and it is bordered mostly by semi-rural properties with a residential component.

5.2 Part of the land to the south is zoned Industrial and there is an industrial neighbour to the south. The topography is generally flat. The elevation of surrounding properties is similar to the average site elevation, within a few metres.

5.3 The principal receivers are the surrounding residential buildings, the Palmerston North Airport and motorists on surrounding roads.

5.4 The existing environment for the residential buildings is relatively dark with generally no road lighting or other nearby lighting except neighbouring residential building lights and the more distant lights and skyglow effects of Palmerston North city and Bunnythorpe township. In my opinion, this would constitute Low District Brightness.

5.5 The Palmerston North Airport is close to Palmerston North residential and industrial buildings and most nearby roads appear to include lighting. A number of the nearby industrial buildings have roof skylights and exterior area lighting, with varying degrees of upward tilt. The airport itself has lighting. In my opinion, this would constitute Medium to High District Brightness.

6. LIGHTING EFFECTS ASSESSMENT

Applicable standards

6.1 In assessing the lighting effects of the Freight Hub, I have assessed the Updated Lighting Design in relation to:

(a) alignment with recommendations in the standard AS / NZS 4282:2019 (Control of the Obtrusive Effects of Outdoor Lighting); and

(b) compliance with the PNCC District Plan ("**District Plan"**) permitted activity lighting standards.

AS/NZS 4282:2019

6.2 The stated objective of AS / NZS 4282:2019 is "*to provide a common basis for assessment of the likely effects of developments that involve the provision of outdoor lighting*". In the context of this application, it recommends limits for spill light and glare to adjacent residential properties, and limits for glare to nearby motorists and sky glow effects that could affect public amenity (ie the visibility of the sky at night). It is the only current New Zealand and / or Australian standard addressing such matters and is therefore directly applicable to the Freight Hub. In addition, its predecessor (now superseded) AS4282:1997, is referenced in the District Plan.

6.3 The calculation summary accompanying the Updated Lighting Design sets out the recommended obtrusive light limits for the proposed site for the Freight Hub ("**Site**") and it shows that the limits in Standard AS / NZS 4282:2019 can be achieved.[7]

6.4 Spill light and glare calculations have been undertaken for each adjacent residential property as listed below:

(a) Clevely Line – 22A, 41A, 41B, 163;

(b) Nathan Place – 1, 3, 4, 5, 6, 7;

(c) Parrs Road – 27, 55D, 58, 59;

(d) Sangsters Road – 9, 11, 15, 25, 43, 73, 91, 95;

(e) Stoney Creek Road – 819, 821;

(f) Railway Road – 422;

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7 Stantec Report – Lighting Design – Revision D, dated 29 April 2021, at section 4.6.

(g) Roberts Line – 761, 771, 787, 803, 814, 824, 824A;

(h) Tukatai Road – 428;

(i) Maple Street – 1, 1A, 3, 5, 7, 7A, 9, 9A, 11, 11A, 13, 15, 17, 19, 21, 57; and

(j) Te Ngaio Road – 241, 242, 245.

6.5 Glare to motorists (ie Threshold Increment ("**TI**")) has been calculated for the western boundary perimeter – representing the closest and therefore most likely affected roads adjacent the Site.

6.6 Sky glow (analysed as the upward waste light ratio) has also been calculated.

6.7 My assessment of the Freight Hub's lighting effects against the limits in Standard AS / NZS 4282:2019 is set out in Table 1 below. This summarises the relevant parameters, limits and calculated results for the Freight Hub lighting effects. Note: The term 'cd' used in Table 1 is an abbreviation for 'candela'. This is a unit used to express luminous intensity. A common candle emits light with approximately 1 cd luminous intensity.

Table 1. Obtrusive Light Analysis – Current Standard

[(*) – Note: Based on "Low District Brightness" (eg sparsely inhabited rural and semi-rural areas)]

AS / NZS 4282:2019 OBTRUSIVE LIGHT ANALYSIS		
PARAMETER	**RECOMMENDED MAXIMUM LIMIT (*)**	**CALCULATED MAXIMUM VALUE**
Spill Light Vertical Illuminance at residential windows – curfew times[8]	1 lux	0.2 lux (at 422 Railway Rd)
Glare – Residents Luminous Intensity at residential windows – curfew times	1,000 cd	906 cd (at 9 Sangsters Rd)
Glare – Motorists TI for 0.2 Adaption Level	20 %	0 %
Sky Glow Upward Light Ratio	0.01	0.000

[8] AS / NZS 4282:2019 refers to curfew (11pm–dawn) & non-curfew (dawn–11pm) times and sets limits accordingly. Curfew limits are more stringent than non-curfew limits.

6.8 As demonstrated in Table 1, each of the calculated maximum values are within the recommended limits in Standard AS / NZS 4282:2019. Spill light and glare have been calculated for every adjacent residential property and the location where the maximum value occurs is noted. In my opinion, based on compliance with this Standard, the obtrusive light effects of the Freight Hub will be less than minor.

District Plan

6.9 While the NoR seeks a new designation for the Site and, I have analysed the lighting effects of the Freight Hub for compliance with the applicable rules under the existing zoning for completeness, particularly as they relate to adjacent residential use. The Site presently falls within both the Rural Zone and North East Industrial Zone ("**NEIZ**").

Rules relevant to the Rural Zone

6.10 The District Plan rules for the Rural Zone do not contain lighting rules directly relevant to the proposed Freight Hub activity. However, there is a requirement at Rule R9.5.3(f) (Permitted Activity – Performance standards for home occupations (without retailing from the Site) – Lighting) to limit light spill at residential windows to 8 lux vertical illuminance.

6.11 While this is not specifically required for an Industrial activity, the Updated Lighting Design confirms that the light spill from the Freight Hub at any adjacent residential window will be no more than 0.2 lux and therefore less than 8 lux.[9]

Rules relevant to the NEIZ

6.12 The District Plan rules for the NEIZ do contain lighting rules that are relevant to the Freight Hub with respect to lighting effects. Rule R12A.4.1 provides for a range of Permitted Activities (including Industrial activities) provided that they comply with the relevant performance standards. Performance Standard (f) requires that an activity:

(a) complies with R11.6.1.1(a)(iv); and

(b) any artificial lighting must be shielded from the approach and take-off paths to and from the Palmerston North Airport.

6.13 With respect to the first requirement, compliance with Rule R11.6.1.1(a)(vi) requires compliance with Australian standard AS 4282-1997, which has now

[9] Stantec Report – Lighting Design – Revision D ,dated 29 April 2021, at section 4.6.1.

been superseded by the Australia / New Zealand standard AS / NZS 4282:2019. Even though AS 4282-1997 has been superseded, I have assessed the Freight Hub for compliance against that standard given its reference in the Rule R11.6.1.1(a)(vi).

6.14 The now superseded standard AS 4282-1997 has different environmental descriptions and a different luminous intensity limit for compliance as summarised in Table 2 below.

Table 2. Obtrusive Light Analysis – Superseded Standard

[(*) – Note: Based on a "residential area with dark surrounds"]

(SUPERSEDED) AS 4282-1997 OBTRUSIVE LIGHT ANALYSIS		
PARAMETER	**RECOMMENDED MAXIMUM LIMIT (*)**	**CALCULATED MAXIMUM VALUE**
Spill Light Vertical Illuminance at residential windows – curfew times	1 lux	0.2 lux (at 422 Railway Rd)
Glare - Residents Luminous Intensity at residential windows – curfew times	500 cd	906 cd (at 9 Sangsters Rd)
Glare – Motorists Threshold Intensity (TI) for 0.2 Adaption Level	20 %	0 %
Sky Glow Upward Light Ratio	No specified limit	0.000

6.15 The limits for spill light to residents and glare to motorists in AS 4282-1997 are the same as those in the current standard, so it follows that the Updated Lighting Design complies.

6.16 AS 4282-1997 does not specify a limit for sky glow.

6.17 The AS 4282-1997 limit for glare to residents (ie luminous intensity) for dark surrounds at curfew times is 500cd. There are seven properties where the Updated Lighting Design may exceed this figure. These are:

(a) Clevely Line – 41A;

(b) Sangsters Road – 9, 43, 73;

(c) Stoney Creek Road – 819, 821; and

(d) Railway Road – 422.

6.18 However, of the seven properties affected, four have vegetation and / or buildings that would screen most or all of the glare effects. One is located in 'light surrounds' (ie next to a lit road) which would attract a 1,000cd limit and therefore comply with the superseded 1997 standard.

6.19 The remaining two properties are 819 and 821 Stoney Creek Road. The calculated glare at these properties is 530cd and 707cd respectively. The former is very close to the 500cd limit in the 1997 standard. The latter is mid-way between the 500cd limit in the 1997 standard and the 1,000cd limit in the 2019 standard. In my opinion, the 1,000cd figure in the most recent version of the standard (AS / NZS 4282:2019) is a more appropriate limit and the Updated Lighting Design demonstrates that this limit can be achieved.[10] I consider, effects on these properties will be less than minor.

6.20 The second requirement of the Performance Standard for Rule R12A.4.1 states that:

> Any artificial lighting must be shielded from the approach and take-off paths to and from the Palmerston North Airport.

6.21 The proposed lighting fixtures as shown in Figures 2 to 7 of my evidence emit all light downwards from the face of the fixture and the design is based on zero upward tilt for the majority of the lights with a maximum of 5 degree tilt. The maximum mounting height proposed is 20m. In my opinion, this design will effectively shield any direct view of the light source in relation to the approach and take-off paths for the Palmerston North Airport and as such will satisfy this part of the Performance Standard. I address this further in response to submissions below.

Airport Zone

6.22 The Freight Hub is also subject to the provisions in the Palmerston North Airport Zone (Rule 13.4.7) as it is in the Airport Protection Surface.

6.23 Lighting is identified as a Restricted Discretionary Activity under section R13.4.2.1. The Assessment Criteria are contained in R11.6.2.1(a)(i), (iii) and (iv) which provide:

(a) R11.6.2.1(a)(i): The extent to which exterior lighting is lit to an appropriate standard to ensure public and user safety, security and comfort;

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10 Stantec Report – Lighting Design – Revision D, dated 29 April 2021, at section 4.6.2.

(b) R11.6.2.1(a)(iii): The extent to which residents in any zone, or other nighttime property users, are not adversely affected by the obtrusive effects of exterior lighting; and

(c) R11.6.2.1(a)(iv): The extent to which road users are not adversely affected by the obtrusive effects of exterior lighting.

6.24 The closest point of the Site is more than 1.2km from the Palmerston North Airport runway and more than 2km from the air traffic control tower.

6.25 With respect to R11.6.2.1(a)(i) the Updated Lighting Design has been prepared to satisfy the recommendations in AS / NZS 1158.3.1:2020,[11] AS / NZS 4282:2019[12] and E-ST-EL-0131.[13] The latter document defines the target lighting requirements for outdoor operational areas.[14]

6.26 In addition, the Updated Lighting Design proposes the use of well controlled lighting fixtures with no more than 5 degrees upward tilt, proposes that all light be projected downwards and 0% Upward Waste Light Ratio ("**UWLR**").[15] Therefore, in practical terms, the light source will not be directly visible from airborne aircraft and will therefore not generate glare to pilots.

6.27 The majority of the outdoor space at the Freight Hub will be lit to an average of approximately 30 to 40 lux with a minimum overall uniformity of 0.4. In my opinion, the proposed lighting is not expected to cause confusion to a pilot as it will appear as distinctly different to the lighting that would be associated with an airstrip.

6.28 Based on the above, it is my opinion that R11.6.2.1(a)(i) is satisfied.

6.29 With respect to R11.6.2.1(a)(iii) the Updated Lighting Design satisfies the recommended obtrusive light limits defined in AS / NZS 4282:2019 (refer paragraphs 6.2– 6.8 of my evidence). Thus, in my opinion, R11.6.2.1(a)(iii) is satisfied.

6.30 Finally, with respect to R11.6.2.1(a)(iv) the Updated Lighting Design confirms the concept lighting design will satisfy the recommended limits in AS /

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11 Lighting for roads and public spaces – Part 3.1: Pedestrian area (Category P) lighting – Performance and design requirements.

12 Control of the obtrusive effects of outdoor lighting.

13 Traction and electrical standard.

14 Stantec Report – Lighting Design – Revision D, dated 29 April 2021, at section 3.

15 Stantec Report – Lighting Design – Revision D, dated 29 April 2021, at section 4.1.

NZS4282:2019 for glare to motorists.[16] Therefore, in my opinion, R11.6.2.1(a)(iv) is satisfied.

Navigation

6.31 Exterior lighting can potentially produce effects which are harmful to navigation. Typically this might be the case if the lighting could be confused with navigation lighting in terms of colour or disposition or if it could potentially create a veiling effect reducing navigation light visibility through diminished contrast. Navigation relates to water, air and land-based craft. While there are no District Plan requirements nor specific obtrusive light standards governing these matters, I have included this in my assessment for completeness.

6.32 There are no nearby navigable waterways. The Updated Lighting Design demonstrates that glare to motorists will be a maximum of 0% TI, versus a recommended limit of 20%. Hence, in my opinion, effects to motorists will be negligible.

6.33 Since the purpose of this facility is to service rail transport, lighting effects to train operators will be addressed by the designer as an internal matter. Nonetheless, considering the low glare effects to road traffic already noted, I would expect a similar level of effect to train operators. In my opinion, effects to train operators will be negligible.

6.34 I have considered the activities related to the Palmerston North Airport and have addressed the effects in my evidence, in the sections titled District Plan and Submissions. I consider that the lighting as proposed will result in negligible effects with respect to aircraft operations, control and safety.

6.35 However, I also recommend that during detailed design, the applicant confirm agreement with the Civil Aviation Authority (with respect to Palmerston North Airport).

6.36 There is also a local airfield approximately 4km to the north-northwest (ie Fielding Aerodrome), but I understand that this airport does not have night operation facilities and as such lighting effects would not be relevant.

Recommendations

6.37 While I have concluded above that the lighting effects of the Freight Hub will be less than minor, the lighting for the Freight Hub will be subject to further detailed design at a later stage of the process. In that regard, I consider that

16 Stantec Report – Lighting Design – Revision D, dated 29 April 2021, at section 4.6.3.

lighting conditions are required to ensure that lighting effects remain acceptable to the surrounding receivers. I reviewed the proposed Operational Lighting Design Plan Condition as lodged with the NoR and have recommended a number of changes, including that the condition be updated to require compliance with the latest standards rather than the District Plan. I address the changes to conditions further in response to the Section 42A Report.

6.38 My recommendations on the conditions have been included in the conditions in Appendix 1 to Ms Bell's evidence ("**Proposed Conditions**") and I support these conditions.

7. RESPONSE TO SUBMISSIONS

Air safety

7.1 Two submitters (Palmerston North Airport and Airways Corporation) have raised concerns regarding the potential for light and glare of the Freight Hub to cause air traffic controllers and pilots to have visibility, identification or perception issues. This includes exterior lighting as well as interior lighting emitted through skylights.

7.2 As demonstrated below at paragraph 7.3 of my evidence, the external lighting for the Freight Hub will be below the horizontal surface control. The lights will be aimed downwards with no more than 5 degrees of upward tilt. As such, the glare towards airborne craft will be negligible to nil. Aircraft at an altitude greater than 20m will have no direct visibility of the light source and thus no direct glare.

7.3 Aircraft below 20m will logically be on or very close to the airstrip, which is more than 1km from the Site and aligned perpendicular to the site. Hence, the lighting will not be in the direct line of sight of the aircraft pilot on take-off or final landing approach. Regardless, at that distance, the vertical angle of the light from an observer would be near 90 degrees and the glare would be negligible to nil.

7.4 In addition, the Site is not in direct line with the Palmerston North Airport runways, approach surfaces or take-off surfaces. It lies beneath the horizontal surface of the Airport Protection Surface which, at 90m AMSL, is more than 40m above the level of the runway. Also, the light sources will not be directly visible from the air above 20m and only to a very minor degree below 20m as

noted in paragraph 7.3. As such, the lighting will not cause any issues for pilot's navigating aircraft in my opinion.

7.5 The air traffic control tower is more than 2km from the Site. Considering the minimal tilt of the lights and the relative height of the lights to the air traffic controllers, the air traffic controllers will not have direct visibility of the light sources. As such, they are not expected to have any significant issues with respect to glare in my opinion.

7.6 While there would likely be some upward glow from building skylights at night, the size, shape, diffused nature of any emissions and the separation distance from the airport will result in negligible effects to aircraft pilots in my opinion.

7.7 Palmerston North Airport and Airways Corporation have sought confirmation that Civil Aviation Rules Part 77 will be complied with. Rule 77.7(b) of the CAA Rules – Objects and activities affecting navigable airspace – addresses lighting effects and reads as follows:

> (b) A person proposing to operate a light or a laser must notify the Director in accordance with rule 77.13 if—
>
> (1) because of its glare or affect on a pilot's vision, the light or laser is liable to endanger aircraft; or
>
> (2) for a laser, it would produce exposures in navigable air space exceeding the maximum permissible exposure defined for that laser in NZS / AS 2211; or
>
> (3) it is likely to endanger aircraft by being mistaken for—
>
> (i) a light or part of a system of lights established or approved for display at or near an aerodrome; or
>
> (ii) a light marking a hazard in navigable airspace.

7.8 Laser lighting is not proposed as part of the Freight Hub.

7.9 The proposed lighting will be selected and installed in a manner which will ensure that a pilot will not have a direct view of any light source. In that regard, and for the reasons set out at paragraph 6.21 of my evidence, any glare effects will be negligible in my opinion.

7.10 Navigation lights associated with the Palmerston North Airport will be aligned with the ends of the runway and are of a type that the light source is visible to

the pilot. Since the proposed lighting is not in line with the runway and the light sources will be screened from the view of pilot, in my opinion, it is unlikely that the proposed lighting could be mistaken for navigation lighting.

7.11 No red lights are proposed that could potentially be confused with navigable airspace hazard lights.

7.12 In my opinion, the proposed lighting will satisfy CAA Rule 77.7(b). I recommended that this be included in the Operational Lighting Design Plan.

Light spill

7.13 Some submitters have raised concerns relating to the potential for light spill to trespass into adjacent residential properties.

7.14 Light spill can be carefully controlled to ensure that light spill at any property is within the best practice recommendations in AS / NZS 4282:2019.[17] This standard has recently been updated from AS 4282-1997 which was world-leading when published. In my opinion, the latest iteration is best practice. The Updated Lighting Design has suitably addressed these requirements by careful selection of optical distributions and minimising upward tilt, which is now zero for some 98% of the lights and no more than 5% tilt for the remainder.

7.15 My extensive experience in applying this standard and its predecessor is that lighting designed to satisfy these requirements is very well controlled in terms of lighting effects. The Updated Lighting Design demonstrates compliance can be achieved. As such, in my opinion, a detailed lighting design will similarly be capable of compliance and will result in negligible spill light effects to the surrounding environment.

Glare

7.16 Some submitters have expressed concerns regarding traffic safety effects when exiting private property (eg the potential for veiling glare to obscure oncoming traffic). Glare from the Freight Hub has also been raised by submitters as a concern for residents (eg potential loss of amenity in terms of night time views).

7.17 Glare to motorists is termed TI with units expressed as a percentage. It is a term which indicates the degree to which glare impairs the visibility of objects. The maximum TI recommended in AS / NZS 4282:2019 is 20%.

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17 Control of the obtrusive effects of outdoor lighting.

7.18 Glare to residents is termed Luminous Intensity with units expressed in units of candela. As mentioned earlier, a common candle emits light with approximately 1 candela ("**cd**") luminous intensity. Luminous Intensity is assessed as the highest value experienced from any light and as such is evaluated separately for every light as seen from a selected observer location – in this case, the windows of each house adjacent to the site. The recommended limit is graduated in the standard to suit the nature of the receiving environment. The darker the environment, the lower the limit. In addition, the standard sets two limits – one pre-curfew and another post-curfew – and recommends a curfew time of 11pm. The post-curfew limit is lower than the pre-curfew limit with a view to limiting sleep disturbance, particularly post-curfew. Hence, the post-curfew limit is the most stringent. The standard lists Environmental Zone A2 as Low District Brightness (eg sparsely inhabited rural and semi-rural areas). The maximum post-curfew Luminous Intensity recommended in AS / NZS 4282:2019 for Zone A2 is 1,000cd.

7.19 The maximum glare from the Freight Hub to motorists has been calculated as a maximum TI of 0% (versus a limit of 20%) and the glare to residents has been calculated as a maximum Luminous Intensity of 906 candelas (versus a limit of 1,000 candelas). Hence, the Updated Lighting Design demonstrates that glare effects to traffic and residents will be within the best practice recommendations of AS / NZS 4282:2019.

7.20 The proposed lighting will be well controlled with the majority of lights installed with zero upward tilt and a small number with no more than 5 degree upward tilt. In my opinion, glare effects on traffic and adjacent residents will be low to negligible.

Night sky light pollution

7.21 Some submitters have raised concerns about how lighting from the Freight Hub will impact the night sky. Many related submissions simply cite "light pollution" as a potential concern. Some specifically mention "the night sky" and others just mention "lighting", which I presume infers light pollution.

7.22 Any exterior lighting installation will generate some amount of sky glow. This is most apparent when there is moisture or pollution in the atmosphere reflecting and refracting light. Sky glow is subjective. It is usually more of concern to astronomers than other people, but it does have the ability to reduce visibility and thus enjoyment of the night sky.

7.23 The lighting proposed for the Freight Hub is predominantly directed downwards and the Updated Lighting Design has calculated the sky glow as 0.000%.[18] This is the maximum value from any luminaire. AS / NZS 4282:2019 recommends a maximum of 1% for environmental zone A2 (low district brightness – eg sparsely inhabited rural and semi-rural areas). The standard addresses exterior lighting. There will also be a small component of light emitted upwards through building skylights. However, the interior lighting will be directed downwards such that only reflected light is emitted through the skylights. Hence, the Updated Lighting Design represents very good control with respect to light pollution and effects on the night sky. In my opinion, added sky glow effects will be negligible.

Sleep disturbance and health effects

7.24 Some submitters have also raised concerns regarding potential for lighting to disturb sleep and thereby potentially lead to health concerns. Some raised concerns around the increased perceived risk for specific conditions such as hearing impaired or autistic persons.

7.25 While stray light at night can increase sleep disturbance,[19] in my opinion, the spill light limits recommended in AS / NZS4282:2019 are appropriate to minimise this effect. In addition, the maximum spill light calculated for this Site at any residential location is well below the recommended limit at 0.2 lux compared with a limit of 1 lux.

7.26 As noted above, the obtrusive light effects have been proven by the Updated Lighting Design to be capable of satisfying the best practice obtrusive light guidelines recommended by AS / NZS 4282:2019. In my experience, satisfying those limits results in conditions that people generally consider to be satisfactory.

Operating hours

7.27 Some submitters have raised concerns regarding the impact of the proposed operating hours for the Freight Hub.

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18 Stantec Report – Lighting Design – Revision D – dated 29 April 2021 at section 4.6.4.

19 CIE Position Statement on Non-Visual Effects of Light – Recommending Proper Light at the Proper Time – 2nd edition – 3 October 2019 (https://cie.co.at/files/CIE%20Position%20Statement%20-%20Proper%20Light%20at%20the%20Proper%20Time%20(2019)_0.pdf).

7.28 As discussed in Mr Moyle's evidence, KiwiRail proposes that the facility will operate 7 days a week and 24 hours a day.[20]

7.29 As set out in my evidence above, the lighting design can comply with recommended best practice obtrusive lighting control and as such, in my opinion, the duration of the proposed operating hours will not be of particular concern with respect to lighting effects.

Potential for increased theft

7.30 There has been a concern raised regarding the potential for lighting leading to increased theft in the area surrounding the Freight Hub. In particular, submitter no. 53 states:

> In relation to light, the height of the light towers will make it difficult to sleep at night and will increase the risk of theft as the surrounding area will be more visible at night.

7.31 The majority view of professional opinion and research I have seen indicates that increased lighting most often has the opposite effect. A study undertaken in New York in 2019[21] established that a significant reduction in crime followed when outdoor (street) lighting was improved at selected housing developments compared with similar developments where the lighting was not improved.

7.32 In my opinion, the potential for increased theft due to the introduction of the lighting as proposed is unlikely.

7.33 Lighting effects are related to the intensity and optical characteristics of the light fixture (luminaire). As the height of the luminaire is reduced, it typically needs to increase in tilt to spread the light to where it is required. This increases obtrusive effects such as glare. In my opinion, the nominal height of the luminaires in the Updated Lighting Design has been optimised to the lowest height consistent with the performance requirements and the obtrusive lighting constraints.

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20 Evidence of Todd Moyle, dated 9 July 2021, at section 7.

21 Reducing Crime Through Environmental Design: Evidence from a Randomized Experiment of Street Lighting in New York City – A Chalfin et al, 24 April 2019 (https://urbanlabs.uchicago.edu/attachments/e95d751f7d91d0bcfeb209ddf6adcb4296868c12/store/cca92342e666b1ffb1c15be63b484e9b9687b57249dce44ad55ea92b1ec0/lights_04242016.pdf)

Effects from headlights from road and rail traffic

7.34 One submitter has raised a concern regarding the potential impact of vehicle headlights. The submission specifically related to road traffic. I have considered the potential for headlight sweep from both road vehicles and locomotives and in my opinion, any potential effects can be satisfactorily addressed during detailed design as proposed in conditions.[22] In my opinion, any such effects will be less than minor.

8. RESPONSE TO SECTION 42A REPORT

8.1 I have reviewed the sections of the Section 42A Report relevant to my evidence, particularly the Effects and Recommendations Summary Table at Section 9.9 – Lighting ("**Section 42A Summary Table**"). I have also reviewed the technical evidence of Mr Wright. I respond to each of the items raised as follows.

8.2 The Section 42A Report has been prepared on the basis of the Lighting Report which was included with the Design, Construction and Operation Report as part of the AEE for the Freight Hub. As set out above, the lighting design has now been updated to better address the lighting effects and demonstrate compliance with AS / NZS 4282:2019 zone A2 recommendations for obtrusive light which includes spill light, glare and sky glow. In my view, the Updated Lighting Design already addresses a number of concerns raised in the Section 42A Report.

Obtrusive effects from glare and spill light

8.3 The Section 42A Report raises an issue regarding glare to residential dwellings.[23] To address, this the Section 42A Summary Table recommends that:

> KiwiRail should submit the final lighting design for expert peer review and certification. The detailed lighting design should:
>
> a) Demonstrate reduction in glare to meet curfew limits
>
> b) Satisfy R12A.4(f), road user glare effects via Threshold Increment calculations in accordance with recommendations of AS / NZS4282:2019
>
> c) Include details of under carriage lighting and low level security lighting

22 Evidence of Karen Bell, dated 9 July 2021, at Appendix 1.

23 Section 42A Report, dated 18 June 2021, at paragraph 592(a).

> d) Consider selective dimming of offending floodlights to reduce their brightness.
>
> To ensure that obtrusive lighting effects are adequately mitigated, we recommend that the lighting design is required to comply with AS / NZS 4282:2019, Zone A2 limits.

8.4 As noted above, the Updated Lighting Design demonstrates that the complete outdoor lighting installation for the Freight Hub satisfies the best practice recommendations in AS / NZS 4282.2019 (Control of the obtrusive effects of outdoor lighting) for zone A2. I nonetheless address each point in turn:

(a) The lighting effects will be the same both pre-curfew and post-curfew. The Updated Lighting Design has demonstrated compliance with the more stringent post-curfew limits.

(b) The Updated Lighting Design demonstrates compliance with AS / NZS 4282:2019 in terms of Threshold Limit (ie glare to motorists).

(c) I support the requirement for detailed lighting design to include details of under carriage lighting.

(d) The ability to comply with the obtrusive light limits recommended by AS / NZS 4282:2019 has now been established by the Updated Lighting Design. Hence, dimming or switching is not required to achieve compliance.

8.5 I agree that once detailed design has been undertaken, the lighting design should be submitted to the Council for certification that it meets the relevant standards. The Section 42A Summary Table recommends amendments to the proposed designation conditions. I have considered the proposed amendments to the conditions as recommended by the Council Officers and my recommendations on the conditions have been included in the conditions attached to Ms Bell's evidence and I agree with those conditions.[24]

Sky glow effects

8.6 The Section 42A Report also raises concerns regarding sky glow effects. The Council Officers have recommended in the Section 42A Summary Table that KiwiRail adopt the following measures to reduce sky glow where practicable:

> a) Use lights with 3000K colour temperature LEDs in lieu of the proposed 4000K LED's, this can be expected to

[24] Evidence of Karen Bell, dated 9 July 2021, at Appendix 1.

reduce the blue light content within the white light by up to 25%.

b) Minimise the light projected at or above the horizontal, ideally no lights should be tilted above the horizontal and no lights should project light above the horizontal.

c) Do not overlight, only provide the lighting level required for the user/task.

d) Turn off lights when not required. We recommend appropriate lighting control systems are incorporated into the lighting design so that lights are turned off when not required for operational safety.

8.7 I agree with these recommendations in part, as addressed below:

(a) Higher colour temperatures are typically used for working environments and lower values for residential amenity or similar. The primary reason for choosing 4000K for the Freight Hub lighting is that the higher values tend to increase alertness. It is important to ensure that the lighting is selected to suit to maximise safety. There are numerous similar installations throughout New Zealand and they invariably use 4000K lighting. A recent example is the Ports of Auckland Inland Freight Terminal in Horotiu. That has a similar surrounding environment to this project. Therefore, in my opinion, the lighting should have a 4000K colour temperature as currently proposed.

(b) I agree that luminaire tilt should be minimised. However, the Updated Lighting Design has already addressed the suggestion to minimise tilt, with most lights at zero tilt and a small number at no more than 5 degree tilt. The latter represents a total of 9 out of 382 lights or approximately 2% of the total.

(c) I agree that the Site should not be over lit. However, the Updated Lighting Design has been optimised. It is not over lit.

(d) I agree that it would be desirable to turn off lights when not required and encourage the designer to do so, if practical. However, I understand that there may be complicating variable arrival, departure and duration aspects that might make this impractical and potentially unsafe to automate.

8.8 The Section 42A Summary Table recommends a new condition be included on the designation which requires skyglow caused by artificial lighting have a Sky

Glow Upward Light Ratio of no greater than 0.003, calculated in accordance with AS / NZS 4282.2019. I support this condition, however I consider that the limit should be 0.01 rather than 0.003 to reflect the limit prescribed in the Standard for Zone A2. This has been incorporated into the Proposed Conditions.[25]

Effects from headlights from road and rail traffic

Construction effects

8.9 The Section 42A Summary Table recommends that:

> The Construction Traffic Management Plan and Operational Traffic Management Plan conditions be amended to require consideration of the effects of headlight sweep on residential dwellings and mitigation of any identified adverse effects.

8.10 I agree with these recommendations and I consider that the conditions at Appendix 1 to Ms Bell's evidence addresses this matter.[26]

8.11 I have reviewed the proposed Site and surrounding environment and in my opinion, placing a condition on the detailed design to address any such issues will be adequate to ensure any such effects associated with the construction of the Freight Hub are less than minor.

8.12 The selection of construction access points will be considered as part of the Construction Traffic Management Plan, which will include consideration of whether that they can be located remote from residential properties thereby reducing the effects of headlight sweep on those properties.

Operational effects

8.13 In regards to headlights from rail traffic once the Freight Hub is operational, I consider that the proposed noise walls will also suffice to ensure that locomotive headlights, approaching and operating within the Site, will be suitably screened to ensure that any added effects are negligible to the receiving environment.

8.14 Similarly, in my opinion, the noise walls will also screen vehicle headlight effects from vehicles manoeuvring within the Site when the Freight Hub is operational.

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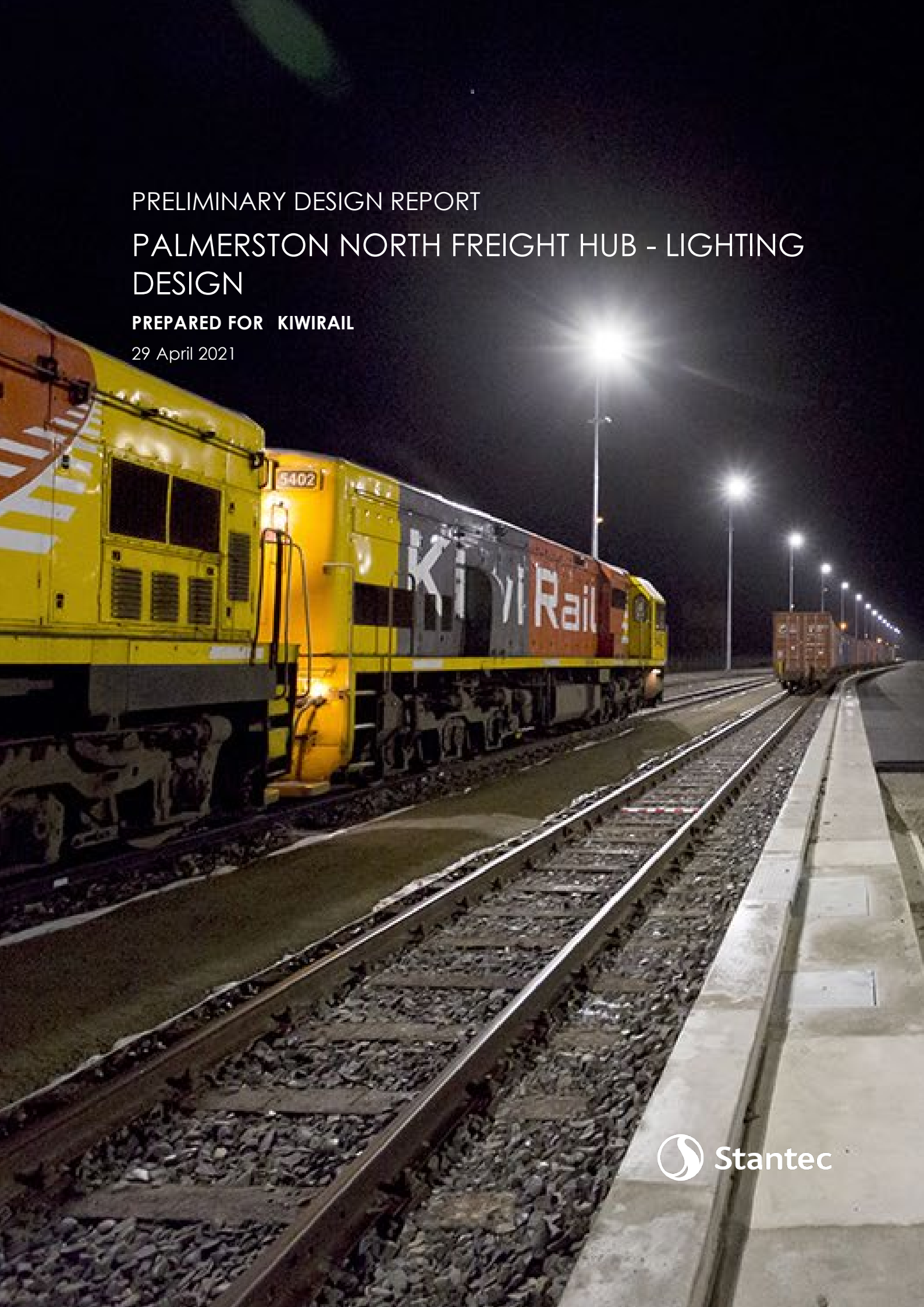
25 Evidence of Karen Bell, dated 9 July 2021, at Appendix 1.

26 Evidence of Karen Bell, dated 9 July 2021, at Appendix 1.

8.15 With regards to headlight sweep from vehicles entering and exiting the Site, the minor permanent egress points are clear from nearby residential properties and the main entry / exit point roundabout is some distance from the nearest residences and there is also intervening foliage. In my opinion, headlight sweep effects from vehicles entering and existing the Site are likely be less than minor.

John McKensey
9 July 2021

APPENDIX 1



PRELIMINARY DESIGN REPORT

PALMERSTON NORTH FREIGHT HUB - LIGHTING DESIGN

PREPARED FOR KIWIRAIL

29 April 2021

Stantec

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QUALITY STATEMENT

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REVISION SCHEDULE

Rev No.	Date	Description	Signature or Typed Name (documentation on file)			
			Prepared by	Checked by	Reviewed by	Approved by
A	28/07/2020	FINAL	IC			
B	22/09/2020	FINAL - LAYOUT CHANGES	IC			
C	04/02/2021	FINAL - OBTRUSIVE LIGHTING CALCULATIONS ADDED	IC			
D	29/04/2021	FINAL - LIGHTING RE-DESIGN TO MITIGATE OBTRUSIVE LIGHTING EFFECTS	IC			

KiwiRail

Palmerston North Freight Hub - Lighting DESIGN

CONTENTS

APPENDICES

1. Background

In conjunction with the proposed Regional Freight Hub (Freight Hub) north of Palmerston North, new lighting is required for the internal access roads, car parks and outdoor operational areas. The outdoor operational areas include the maintenance facilities, network service depot, log loading siding, tank siding, rail marshalling yard, container terminal and freight forwarding private sidings.

2. Scope

This report specifies the performance and light technical parameters (LTPs) of the lighting design required to achieve compliance with specific KiwiRail requirements as well as relevant AS/NZS standards.

Power supply requirements associated with the proposed lighting are excluded from this design report.

3. Applicable Lighting Levels

The standards applicable are:

AS/NZS 1158.3.1:2020 (Part 3.1) - Pedestrian area (Category P) lighting - Performance and design requirements

AS/NZS 4282:2019 - Control of the obtrusive effects of outdoor lighting

E-ST-EL-0131 - Traction and Electrical Standard

As requested by KiwiRail the lighting for the internal access roads and car parks has been designed in accordance with the relevant parts of AS/NZS 1158.3.1; and the outdoor operational areas have been designed in accordance with E-ST-EL-0131.

Obtrusive lighting (spill light and glare) calculations were completed (for the closest residential buildings to the proposed Freight Hub) against the requirements of AS/NZS 4282:2019.

3.1 Basis of Design - Access Roads

Based on the selection criteria from Table 2.1 of AS/NZS 1158.3.1 the lighting subcategory PR5 was applied to the internal access roads. Refer highlighted portions of the table below.

Table 2.1 from AS/NZS 1158.3.1:

TABLE 2.1

LIGHTING SUBCATEGORIES FOR ROAD RESERVES IN LOCAL AREAS

1	2	3	4	5	6
Type of road or pathway		Selection criteria[a,b]			Applicable lighting subcategory[c,d]
General description	Basic operating characteristics	Pedestrian/ cycle activity	Fear of crime	Need to enhance amenity	
Collector roads or non-arterial roads which collect and distribute traffic in an area, as well as serving abutting properties	Mixed vehicle and pedestrian traffic	N/A	High	N/A	PR1
		High	Medium	High	PR2
		Medium	Low	Medium	PR3[f] or PR4[f]
		Low	Low	Low	PR5
Local roads or streets used primarily for access to abutting properties, including residential, commercial and industrial precincts		N/A	High	N/A	PR1
		High	Medium	High	PR2
		Medium	Low	Medium	PR3[f] or PR4[f]
		Low	Low	Low	PR5
		N/A	N/A	N/A	PR6[e]
Common area, forecourts of cluster housing		N/A	High	N/A	PR1
		High	Medium	High	PR2
		Medium	Low	Medium	PR3[f] or PR4[f]
		Low	Low	Low	PR5

The lighting of the internal roads was designed to achieve the PR5 requirements from Table 3.3 of AS/NZS 1158.3.1. Refer highlighted portions of the table below:

TABLE 3.3

VALUES OF LIGHT TECHNICAL PARAMETERS FOR ROADS IN LOCAL AREAS

1	2	3	4
Lighting subcategory	Light technical parameters (LTP)		
	Average horizontal illuminance[a,b] $(\bar{E}_h)$ lx	Point horizontal illuminance[a,b] (E_{Ph}) lx	Illuminance (horizontal) uniformity[c] Cat. P (U_{E2})
PR1	7	2	8
PR2	3.5	0.7	8
PR3[e]	1.75	0.3	8
PR4[d,e]	1.3	0.22	8
PR5[d,e]	0.85	0.14	10
PR6[d]	0.7	0.07	10

3.2 Basis of Design - Car Parks

Based on the selection criteria from Table 2.5 of AS/NZS 1158.3.1 the lighting subcategory PC3 was applied to the internal car parks. Refer highlighted portions of the table below.

Table 2.5 from AS/NZS 1158.3.1:

TABLE 2.5

LIGHTING SUBCATEGORIES FOR OUTDOOR CAR PARKS (INCLUDING ROOF-TOP CAR PARKS)

1	2	3	4
Type of area	Selection criteria[a,c]		
	Night time vehicle and/or pedestrian movements	Fear of crime	Applicable lighting subcategory[b]
Parking spaces, aisles and circulation roadways	High	High	PC1
	Medium	Medium	PC2
	Low	Low	PC3
Designated parking spaces specifically intended for people with disabilities	N/A	N/A	PCD
For any designated areas for pedestrians to cross	N/A	N/A	PCX

The lighting of the internal car parks was designed to achieve the PC3 requirements from Table 3.7 of AS/NZS 1158.3.1. Refer highlighted portions of the table below:

TABLE 3.7

VALUES OF LIGHT TECHNICAL PARAMETERS FOR OUTDOOR CAR PARKS (INCLUDING ROOF-TOP CAR PARKS)

1	2	3	4	5
Lighting subcategory	Light technical parameters (LTP)			
	Average horizontal illuminance[a,b] $(\bar{E}_h)$ lx	Point horizontal illuminance[a,b] (E_{Ph}) lx	Illuminance (horizontal) uniformity[c] Cat. P (U_{E2})	Point vertical illuminance[a,b] (E_{Pv}) lx
PC1	14	3	8	3
PC2	7	1.5	8	1
PC3	3.5	0.7	8	—
PCD[d]	—	≥14 and ≥$(\bar{E}_h)$ [d]	—	—
PCX[e]	21	5	8	—

3.3 Basis of Design - Outdoor Operational Areas

The lighting of the outdoor operational areas was designed to achieve the applicable requirements from Table 6.1 of E-ST-EL-0131. Refer highlighted portions of the table below:

Table 6.1 Lighting levels and quality

Type of area	E_m	U_o	GR_L	R_a	U_d
Railway Marshalling Yards - Anywhere shunting operations are carried out	≥ 10 lux	≤ 0.40	≤ 50	≥ 20	≥ 1/5
Freight Track, short duration operations - The portion of a rail siding where loading and unloading does not occur. Rail movements are infrequent.	≥ 10 lux	≤ 0.25	≤ 50	≥ 20	≥ 1/8
Freight Track, continuous operations - The portion of a rail freight yard where loading and unloading does not occur. Rail movements are frequent. Road traffic and pedestrians are likely to be present.	≥ 20 lux	≤ 0.40	≤ 50	≥ 20	≥ 1/5
Railway Yards Handing Areas - Anywhere that wagons are being loaded with cranes or forklifts. This includes most of the main freight sidings and the Interisland Line terminal areas where wagons are loaded/unloaded	≥ 30 lux	≤ 0.40	≤ 50	≥ 20	≥ 1/5

3.4 Basis of Design - Obtrusive Lighting

The applicable levels of maximum obtrusive light (spill light and glare), threshold increment (TI) and sky glow (Upward Waste Light Ratio - UWLR) are based on what particular environment zone the residential properties are within. Zone A2 was selected based on low district brightness associated with sparsely inhabited rural / semi-rural areas. Refer highlighted portions of table below.

Table 3.1 from AS/NZS 4282 - Environmental Zones:

TABLE 3.1

ENVIRONMENTAL ZONES

Zones	Description	Examples
A0	Intrinsically dark	UNESCO Starlight Reserve. IDA Dark Sky Parks. Major optical observatories No road lighting -unless specifically required by the road controlling authority
A1	Dark	Relatively uninhabited rural areas No road lighting - unless specifically required by the road controlling authority
A2	Low district brightness	Sparsely inhabited rural and semi-rural areas
A3	Medium district brightness	Suburban areas in towns and cities
A4	High district brightness	Town and city centres and other commercial areas Residential areas abutting commercial areas

Spill Light:

The maximum level of spill light (vertical illuminance - Lux), threshold increment (TI) and sky glow (UWLR) for Zone A2, during curfew, is provided in the following table:

TABLE 3.2

MAXIMUM VALUES OF LIGHT TECHNICAL PARAMETERS

Zones	Vertical illuminance levels (E_v) lx		Threshold increment (TI)		Sky glow
	Non-curfew	Curfew	%	Default adaptation level (L_{ad})	Upward light ratio
A0	See Note 1	0	N/A	N/A	0
A1	2	0.1	N/A	N/A	0
A2	5	1	20%	0.2	0.01
A3	10	2	20%	1	0.02
A4	25	5	20%	5	0.03
TV	See Table 3.4	N/A	20%	10	0.08

Glare:

The maximum level of glare (maximum luminous intensity per luminaire - cd) for Zone A2, during curfew, is provided in the following table:

TABLE 3.3

MAXIMUM LUMINOUS INTENSITIES PER LUMINAIRE

Zone	Luminous intensity (*I*), cd		
	Non-curfew L1	Non-curfew L2	Curfew
A0	See Note	See Note	0
A1	2 500	5 000	500
A2	7 500	12 500	1 000
A3	12 500	25 000	2 500
A4	25 000	50 000	2 500
TV	100 000	150 000	0

NOTE: For A0, *I* shall be as close to zero as practicable without impacting safety considerations.

4. Design Modelling Results

In accordance with AS/NZS 1158.3.1 and E-ST-EL-0131 illuminance and uniformity calculations were carried out for the internal access roads, car parks and outdoor operational areas.

In accordance with AS/NZS 4282:2019 obtrusive lighting calculations have been completed to identify any residential properties that may be adversely affected by the proposed Freight Hub lighting.

All calculations were completed using the lighting software program AGi32, version 2.31, supplied by Lighting Analysts, Inc.

The photometric files (used in the illuminance and luminance calculations) were provided by the luminaire suppliers TECHLIGHT (AEC Italo) and ENERGYLIGHT (EWO R4).

4.1 Luminaire and Mounting Parameters

Refer to Appendix A for details of the new luminaires and Appendix B for details of the new lighting poles.

The new lighting poles shall be located where shown on the layout drawings.

The design results were achieved using a maintenance factor of 0.8, and the following luminaire and mounting parameters:

Type A

Luminaire: AEC Italo 1 (STAN0 4000K 350mA 3M) 27W (3320 lm) LED.

Mounting: 7.3m mounting height with 0º tilt on new ground planted tapered octagonal steel lighting pole complete with 0.9m curved outreach arm.

Type B

Luminaire: AEC Italo 1 (STAN0 4000K 525mA 4M) 51W (6020 lm) LED.

Mounting: 7.3m mounting height with 5º tilt on new ground planted tapered octagonal steel lighting pole complete with 0.9m curved outreach arm.

Type C

Luminaire: AEC Italo 1 (S05 4000K 350mA 2M) 27W (3400 lm) LED.

Mounting: 7.3m mounting height with 0º tilt on new ground planted tapered octagonal steel lighting pole complete with 0.9m curved outreach arm.

Type D

Luminaire: AEC Italo 1 (S05 4000K 350mA 2M) 27W (3400 lm) LED (2 off).

Mounting: 7.3m mounting height with 0º tilt on new ground planted tapered octagonal steel lighting pole complete with double 0.9m curved outreach arms.

Type E

Luminaire: AEC Italo 1 (S05 4000K 350mA 3M) 39W (4970 lm) LED.

Mounting: 7.3m mounting height with 0º tilt on new ground planted tapered octagonal steel lighting pole complete with 0.9m curved outreach arm.

Type F

Luminaire: AEC Italo 1 (S05 4000K 350mA 3M) 39W (4970 lm) LED (2 off).

Mounting: 7.3m mounting height with 0º tilt on new ground planted tapered octagonal steel lighting pole complete with double 0.9m curved outreach arms.

Type G

Luminaire: EWO R4 (Gen 3 EP09 LR FCO Optic 4000K 1850mA) 1614W (166642 lm) LED Floodlight.

Mounting: 20m mounting height with 0º tilt on new flange based tapered octagonal steel flood lighting pole complete with 0.6m horizontal cross arm. Luminaire mounted to front face of cross arm using proprietary over-frame bracket.

Type H

Luminaire: EWO R4 (Gen 3 EP09 LR FCO Optic 4000K 1850mA) 1614W (166642 lm) LED Floodlight (2 per pole).

Mounting: 20m mounting height with 0º tilt on new flange based tapered octagonal steel flood lighting pole complete with 0.6m horizontal cross arm. Luminaires mounted to front faces of cross arm, using proprietary over-frame brackets, to form opposing (180°) aiming directions.

Type J

Luminaire: EWO R4 (Gen 3 EP09 LR RBL-FCO Optic 4000K 1850mA) 1614W (118881 lm) LED Floodlight.

Mounting: 20m mounting height with 0º tilt on new flange based tapered octagonal steel flood lighting pole complete with 0.6m horizontal cross arm. Luminaire mounted to front face of cross arm using proprietary over-frame bracket.

Type K

Luminaire: EWO R4 (Gen 3 EP09 LR RBL-FCO Optic 4000K 1850mA) 1614W (118881 lm) LED Floodlight (2 per pole).

Mounting: 20m mounting height with 0º tilt on new flange based tapered octagonal steel flood lighting pole complete with 0.6m horizontal cross arm. Luminaire mounted to front face of cross arm using proprietary over-frame bracket.

Type L

Luminaire: EWO R2 (Gen 3 EP09 LR RBL-FCO Optic 4000K 400mA) 168W (17036 lm) LED Floodlight.

Mounting: 6m mounting height with 0º tilt secured to front face of building using propriety stirrup bracket.

Type M

Luminaire: EWO R4 (Gen 3 EP09 LR RBL-FCO Optic 4000K 800mA) 683W (63953 lm) LED Floodlight.

Mounting: 12m mounting height with 5º tilt secured to front face of building using propriety stirrup bracket.

Type N

Luminaire: EWO R4 (Gen 3 EP09 LR FCO Optic 4000K 1850mA) 1614W (166642 lm) LED Floodlight.

Mounting: 12m mounting height with 0º tilt secured to front face of building using propriety stirrup bracket.

4.2 Maintenance Factor - Italo Luminaires

A design maintenance factor (MF) is used in the calculations to account for the combined light losses resulting from depreciation in the LED's lumen output and accumulation of dirt on the luminaire.

The MF is calculated as the product of the following depreciation factors:

(a) *Luminaire Maintenance Factor (LMF):* The factor selected from table B.1 of BS 5489-1 which considers the environmental zone, mounting height and cleaning interval. An environmental zone of E3/E4 was selected (corresponding to moderate/high ambient luminance areas), the mounting heights are not more than 6m and a maximum luminaire cleaning interval of 72 months (6 years or 25,200 hours operation) was selected resulting in an LMF of 0.84.

Table B.1 **Luminaire maintenance factors**

Environ-mental zone	Mounting height	Maintenance factor					
		Cleaning frequency 12 months	Cleaning frequency 24 months	Cleaning frequency 36 months	Cleaning frequency 48 months	Cleaning frequency 60 months	Cleaning frequency 72 months
E1/E2	≤6 m	0.96	0.96	0.95	0.94	0.93	0.92
E1/E2	>6 m	0.96	0.96	0.95	0.94	0.93	0.92
E3/E4	≤6 m	0.94	0.92	0.90	0.88	0.86	0.84
E3/E4	>6 m	0.96	0.96	0.95	0.94	0.93	0.92

(b) *Light Source Lumen Depreciation Factor (LLD):* The amount of light (lumen output) available at the end of a nominated operating period, as a proportion of the initial lumen output (when the LED was new), expressed as a decimal fraction. An LLD of 0.98 was provided by the LED supplier.

(c) *Luminaire Survival Factor (LSF):* This is the expected number of failures after 85,000 hours of operation (including electronic components, drivers, lenses, premature failures or mechanical failure). An LSF of 0.99 was provided by the LED supplier.

Table B.1 of BS 5489-1 and the manufacturer supplied data has provided in an LMF of 0.92, an LLD of 0.92 and an LSF of 0.99.

MF = LMF x LLD x LSF

MF = 0.84 x 0.98 x 0.99

MF = 0.815

A design maintenance factor of 0.8 was applied to the calculations.

It is important to note that the design results are based on a maintenance interval (luminaire cleaning cycle) of 6 years. At the end of 6 years the lighting should still comply with the road lighting standards (AS/NZS 1158), but the luminaires will require cleaning before the performance of the lighting installation degrades below the requirements of the standards. If the luminaires are not routinely cleaned the gradual accumulation of dirt will eventually compromise the optical performance of the installation.

4.3 Maintenance Factor - EWO R4 LED Flood Lights

A design maintenance factor (MF) is used in the calculations to account for the combined light losses resulting from depreciation in the LED's lumen output and accumulation of dirt on the luminaire.

The MF is calculated as the product of the following depreciation factors:

(d) *Luminaire Maintenance Factor (LMF):* The amount of light (lumen output) available at the end of a nominated period (cleaning interval) where the output has fallen due to the accumulation of dirt. An LMF of 0.92 was provided by the LED supplier based on an 8 year cleaning cycle, glass visor and PMMA lens.

(e) *Light Source Lumen Depreciation Factor (LLD):* The amount of light (lumen output) available at the end of a nominated operating period as a proportion of the initial lumen output (when the LED was new). An LLD of 0.99 was provided by the LED supplier based on 85,000 hours of operation and an ambient temperature of 25°C.

(f) *Luminaire Survival Factor (LSF):* This is the expected number of failures after 85,000 hours of operation (including electronic components, drivers, lenses, premature failures or mechanical failure). An LSF of 1.0 was provided by the LED supplier based on no reported failures.

MF = LMF x LLD x LSF

MF = 0.92 x 0.99 x 1.0

MF = 0.91

A conservative design maintenance factor of 0.8 was applied to the calculations.

It is important to note that the design results are based on a maintenance interval (luminaire cleaning cycle) of 8 years. At the end of 8 years the lighting should still achieve the maintained average illuminance, but the luminaires will require cleaning before the output of the lighting installation falls below current design levels. If the luminaires are not routinely cleaned the gradual accumulation of dirt will eventually compromise the optical performance of the installation.

4.4 Illuminance Design Results - Access Roads and Car Parks

An illuminance based design was carried out to determine the average horizontal illuminance (E_h), point horizontal illuminance (E_{Ph}) and horizontal uniformity (U_{E2}) using the lighting software program AGi32, version 2.31, supplied by Lighting Analysts, Inc.

The applicable design areas are the internal roads and parking spaces.

Design area boundaries and calculation points were established in accordance with AS/NZS 1158.2. Refer to the design results below:

Illuminance Calculation Summary Table - AS/NZS 1158.3.1:2020						
Label	CalcType	Units	Avg	Min	Max/Avg	Description
Access Roads	Illuminance	Lux	2.2	0.14	9.7	Cat PR5 - 0.85 Lux (Avg), 0.14 Lux (Min) and Uniformity (Max/Avg) of 10 (Max)
Container Terminal Car Park 1	Illuminance	Lux	3.8	0.8	3.1	Cat PC3 - 3.5 Lux (Avg), 0.7 Lux (Min) and Uniformity (Max/Avg) of 8 (Max)
Container Terminal Car Park 2	Illuminance	Lux	4.8	0.8	3.3	Cat PC3 - 3.5 Lux (Avg), 0.7 Lux (Min) and Uniformity (Max/Avg) of 8 (Max)
Container Terminal Car Park 3	Illuminance	Lux	3.8	0.9	4.0	Cat PC3 - 3.5 Lux (Avg), 0.7 Lux (Min) and Uniformity (Max/Avg) of 8 (Max)
Freight Forwarding Car Park	Illuminance	Lux	4.6	0.8	4.9	Cat PC3 - 3.5 Lux (Avg), 0.7 Lux (Min) and Uniformity (Max/Avg) of 8 (Max)
Network Services Car Park 1	Illuminance	Lux	3.9	0.9	3.1	Cat PC3 - 3.5 Lux (Avg), 0.7 Lux (Min) and Uniformity (Max/Avg) of 8 (Max)
Network Services Car Park 2	Illuminance	Lux	3.6	0.9	3.5	Cat PC3 - 3.5 Lux (Avg), 0.7 Lux (Min) and Uniformity (Max/Avg) of 8 (Max)
Network Services Car Park 3	Illuminance	Lux	3.5	0.7	3.4	Cat PC3 - 3.5 Lux (Avg), 0.7 Lux (Min) and Uniformity (Max/Avg) of 8 (Max)
Network Services Car Park 4	Illuminance	Lux	5.3	0.9	3.4	Cat PC3 - 3.5 Lux (Avg), 0.7 Lux (Min) and Uniformity (Max/Avg) of 8 (Max)
Network Services Car Park 5	Illuminance	Lux	4.6	0.8	3.8	Cat PC3 - 3.5 Lux (Avg), 0.7 Lux (Min) and Uniformity (Max/Avg) of 8 (Max)

4.5 Illuminance Design Results - Outdoor Operational Areas

An illuminance based design was carried out to determine the average horizontal illuminance (E_m), illuminance uniformity (U_o) and illuminance diversity (U_d) using the lighting software program AGi32, version 2.31, supplied by Lighting Analysts, Inc.

The applicable design areas include the network services depot, log loading siding, tank siding, rail marshalling yard (including maintenance facilities and general areas), container terminal and freight forwarding private sidings.

Design area boundaries and calculation grid points were established in accordance with E-ST-EL-0131. Refer to the design results below:

Illuminance Calculation Summary Table - KiwiRail Traction and Electrical Standard E-ST-EL-0131						
Label	CalcType	Units	Avg	Uo (Min/Avg)	Ud (Min/Max)	Design Requirements
Container Terminal Handling Area	Illuminance	Lux	34.8	0.5	0.4	Table 6.1 - Avg >= 30 Lux, Uo >= 0.4 and Ud >= 0.2
Freight Forwarding Area 1	Illuminance	Lux	35.6	0.4	0.2	Table 6.1 - Avg >= 30 Lux, Uo >= 0.4 and Ud >= 0.2
Freight Forwarding Area 2	Illuminance	Lux	37.6	0.4	0.2	Table 6.1 - Avg >= 30 Lux, Uo >= 0.4 and Ud >= 0.2
Log Loading Area and Tank Siding	Illuminance	Lux	32.1	0.4	0.2	Table 6.1 - Avg >= 30 Lux, Uo >= 0.4 and Ud >= 0.2
Network Services Handling Areas	Illuminance	Lux	32.2	0.4	0.2	Table 6.1 - Avg >= 30 Lux, Uo >= 0.4 and Ud >= 0.2
Railway Marshalling Areas	Illuminance	Lux	21.3	0.4	0.2	Table 6.1 - Avg >= 20 Lux, Uo >= 0.4 and Ud >= 0.2

4.6 Obtrusive Lighting Calculation Results

In accordance with AS/NZS 4282:2019 all obtrusive lighting calculations were carried out using a maintenance factor (MF) of 1.0 to represent the lighting installation when new.

4.6.1 Spill Light

Spill light calculations were caried out to determine the maximum point vertical illuminance (Lux) on the front faces of residential buildings in close proximity of the proposed Fright Hub. The existing trees and vegetation (between the properties and proposed Freight Hub) were not considered therefore the actual spill light should be less than the results indicate.

Refer to the design results below:

North East Properties:

SPILL LIGHT CALCULATION RESULTS - NORTH EAST PROPERTIES		
Maximum Vertical Illuminance of 1 Lux (Zone A2 Curfew Hours)		
Location	**Maximum Calculated Value**	**Complies (Y/N)**
22A Clevely Line	0.0	Y
41A Clevely Line	0.0	Y
41B Clevely Line	0.0	Y
1 Nathan Place	0.0	Y
2 Nathan Place	0.0	Y
3 Nathan Place	0.0	Y
4 Nathan Place	0.0	Y
5 Nathan Place	0.0	Y
6 Nathan Place	0.0	Y
7 Nathan Place	0.0	Y
27 Parrs Road	0.1	Y
55D Parrs Road	0.0	Y
58 Parrs Road	0.0	Y
59 Parrs Road	0.0	Y
9 Sangsters Road	0.0	Y
11 Sangsters Road	0.0	Y

15 Sangsters Road	0.0	Y
25 Sangsters Road	0.1	Y
43 Sangsters Road	0.1	Y
819 Stoney Creek Road	0.0	Y
821 Stoney Creek Road	0.0	Y

South East and South West Properties:

SPILL LIGHT CALCULATION RESULTS - SOUTH EAST AND SOUTH WEST PROPERTIES		
Maximum Vertical Illuminance of 1 Lux (Zone A2 Curfew Hours)		
Location	**Maximum Calculated Value**	**Complies (Y/N)**
163 Clevely Line	0.0	Y
422 Railway Road	0.2	Y
761 Roberts Line	0.0	Y
771 Roberts Line	0.0	Y
787 Roberts Line	0.0	Y
803 Roberts Line	0.0	Y
814 Roberts Line	0.0	Y
824 Roberts Line	0.0	Y
824A Roberts Line	0.0	Y
73 Sangsters Road	0.1	Y
91 Sangsters Road	0.1	Y
95 Sangsters Road	0.1	Y
428 Tutaki Road	0.0	Y

North West Properties:

SPILL LIGHT CALCULATION RESULTS - NORTH WEST PROPERTIES		
Maximum Vertical Illuminance of 1 Lux (Zone A2 Curfew Hours)		
Location	**Maximum Calculated Value**	**Complies (Y/N)**
1 Maple Street	0.0	Y
1A Maple Street	0.0	Y
3 Maple Street	0.0	Y
5 Maple Street	0.0	Y
7 Maple Street	0.0	Y
7A Maple Street	0.0	Y
9 Maple Street	0.0	Y
9A Maple Street	0.0	Y
11 Maple Street	0.0	Y
11A Maple Street	0.0	Y
13 Maple Street	0.0	Y
15 Maple Street	0.0	Y
17 Maple Street	0.0	Y
19 Maple Street	0.0	Y

21 Maple Street	0.0	Y
57 Maple Street	0.0	Y
241 Te Ngaio Road	0.0	Y
242 Te Ngaio Road	0.0	Y
245 Te Ngaio Road	0.0	Y

The calculations indicate that spill light will not be an issue as the values are under the Zone A2 limit of 1 Lux during curfew hours.

4.6.2 Glare

Glare calculations were caried out to determine the maximum luminous intensity (cd) per luminaire on the front faces of residential buildings in close proximity of the proposed Fright Hub. The existing trees and vegetation (between the properties and proposed Freight Hub) were not considered therefore the actual glare values should be less than the results indicate.

Refer to the design results below:

North East Properties:

GLARE CALCULATION RESULTS - NORTH EAST PROPERTIES		
Maximum Luminous Intensity of 1,000 cd (Zone A2 Curfew Hours)		
Location	**Maximum Calculated Value**	**Complies (Y/N)**
22A Clevely Line	349	Y
41A Clevely Line	649	Y
41B Clevely Line	383	Y
1 Nathan Place	363	Y
2 Nathan Place	349	Y
3 Nathan Place	39	Y
4 Nathan Place	40	Y
5 Nathan Place	361	Y
6 Nathan Place	42	Y
7 Nathan Place	446	Y
27 Parrs Road	402	Y
55D Parrs Road	192	Y
58 Parrs Road	262	Y
59 Parrs Road	188	Y
9 Sangsters Road	906	Y
11 Sangsters Road	99	Y
15 Sangsters Road	199	Y
25 Sangsters Road	293	Y
43 Sangsters Road	573	Y
819 Stoney Creek Road	530	Y
821 Stoney Creek Road	707	Y

South East and South West Properties:

SPILL LIGHT CALCULATION RESULTS - SOUTH EAST AND SOUTH WEST PROPERTIES		
Maximum Luminous Intensity of 1,000 cd (Zone A2 Curfew Hours)		
Location	**Maximum Calculated Value**	**Complies (Y/N)**
163 Clevely Line	79	Y
422 Railway Road	515	Y
761 Roberts Line	222	Y
771 Roberts Line	75	Y
787 Roberts Line	29	Y
803 Roberts Line	43	Y
814 Roberts Line	28	Y
824 Roberts Line	37	Y
824A Roberts Line	49	Y
73 Sangsters Road	504	Y
91 Sangsters Road	401	Y
95 Sangsters Road	379	Y
428 Tutaki Road	79	Y

North West Properties:

SPILL LIGHT CALCULATION RESULTS - NORTH WEST PROPERTIES		
Maximum Luminous Intensity of 1,000 cd (Zone A2 Curfew Hours)		
Location	**Maximum Calculated Value**	**Complies (Y/N)**
1 Maple Street	30	Y
1A Maple Street	0	Y
3 Maple Street	0	Y
5 Maple Street	57	Y
7 Maple Street	31	Y
7A Maple Street	32	Y
9 Maple Street	0	Y
9A Maple Street	56	Y
11 Maple Street	30	Y
11A Maple Street	33	Y
13 Maple Street	31	Y
15 Maple Street	31	Y
17 Maple Street	31	Y
19 Maple Street	32	Y
21 Maple Street	463	Y
57 Maple Street	147	Y
241 Te Ngaio Road	96	Y

242 Te Ngaio Road	246	Y
245 Te Ngaio Road	96	Y

The calculations indicate that glare will not be an issue as the values do not exceed the Zone A2 limit of 1,000 cd during curfew hours.

4.6.3 Threshold Increment (TI)

The TI was calculated, using a default adaption luminance of 0.2 (as per Table 3.2 of AS/NZS 4282:2019), along the western boundary perimeter of the proposed Freight Hub site.

Refer to the design results below:

AS/NZS 4282:2019 Control of Obtrusive Lighting Effects - Calculation Summary - Threshold Increment (TI)				
Label	CalcType	Units	TI	Description
ObtrusiveLight_TI_West Bdy N	Obtrusive - TI	%	0	Maximum TI of 20% (Zone A2 - Adaption Luminance of 0.2 cd/m2)
ObtrusiveLight_TI_West Bdy S	Obtrusive - TI	%	0	Maximum TI of 20% (Zone A2 - Adaption Luminance of 0.2 cd/m2)

The results indicate that the calculated TI of 0% is well below the Zone A2 maximum limit of 20%.

4.6.4 Sky Glow (Upward Waste Light Ratio - UWLR)

The UWLR was calculated for the proposed Freight Hub site for all luminaires.

Refer to the design results below:

UWLR Area Summary	
Label	UWLR
LPDArea_1	0.000

The results indicate that the calculated UWLR of 0.000 is well below the Zone A2 maximum limit of 0.01.

5. Flood Lighting Poles

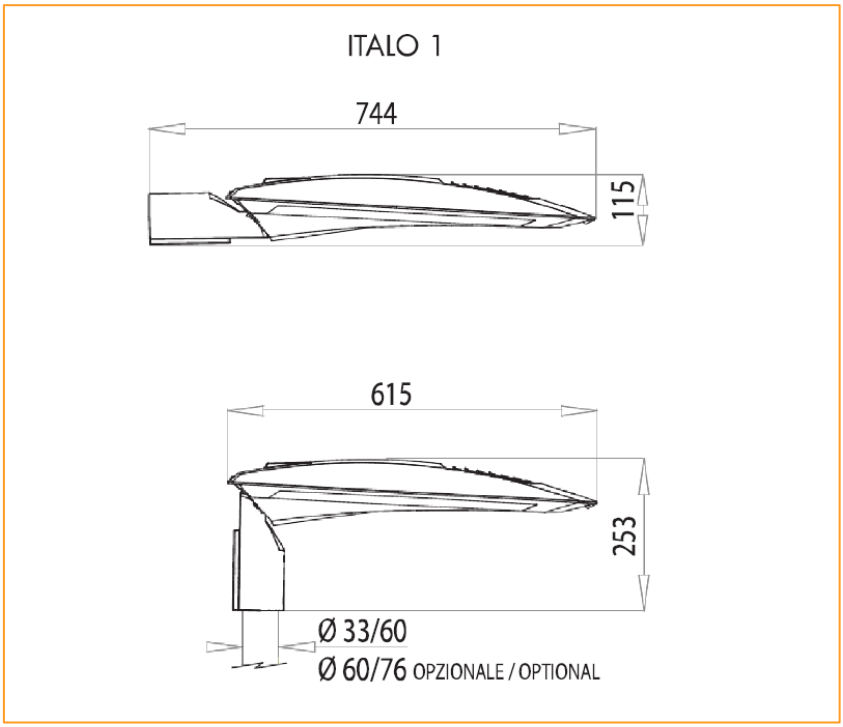
All new access road / car parking poles shall be Spunlite Subdivisional (or equal) hot dip galvanised tapered octagonal steel ground planted poles complete with curved outreach arms.

The new outdoor operational area poles shall be Spunlite (or equal) flange based general purpose flood lighting poles fabricated and assembled to provide a luminaire mounting height of 20m complete with 0.6m long cross arms.

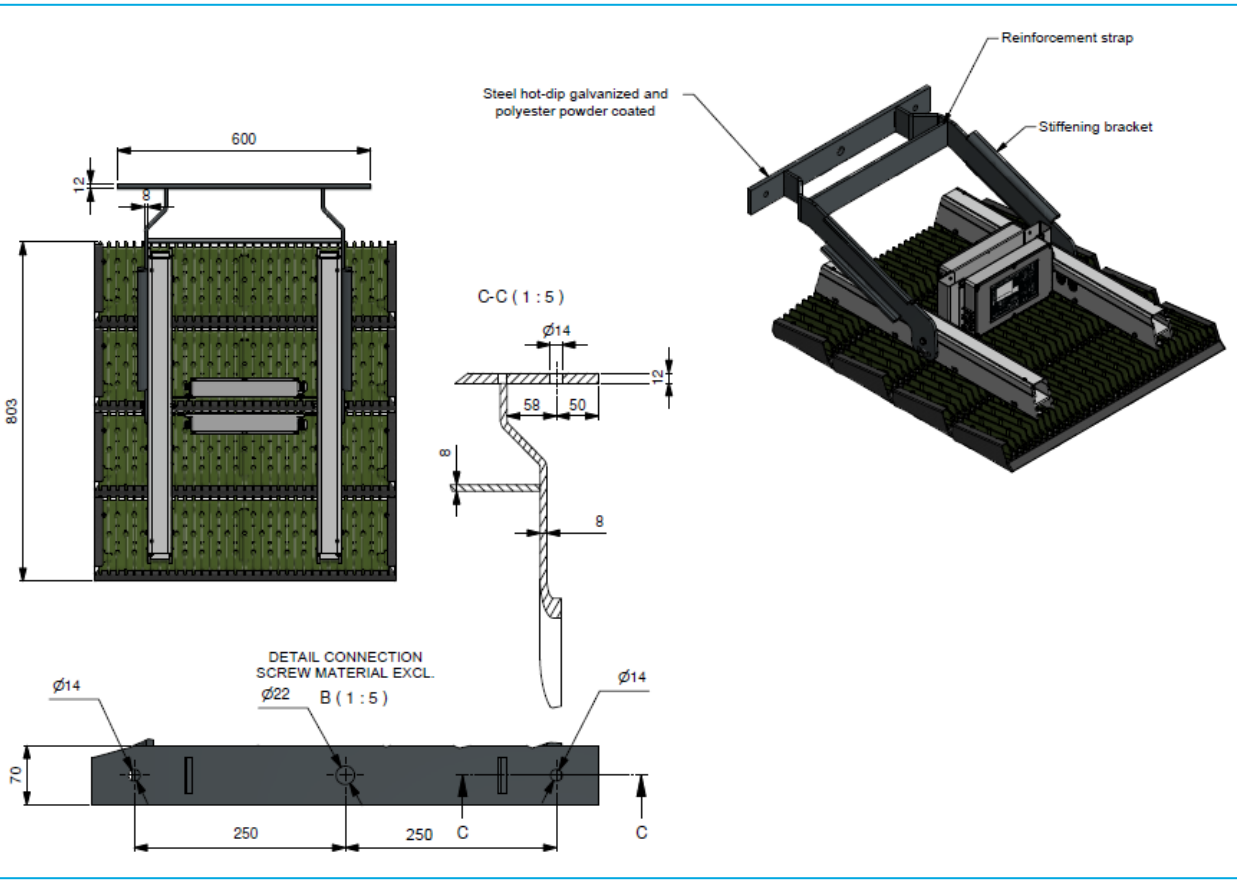
Refer to Appendix B for typical lighting pole details.

Appendix A LED Floodlight Luminaire Details

A.1 AEC Italo 1 Luminaire

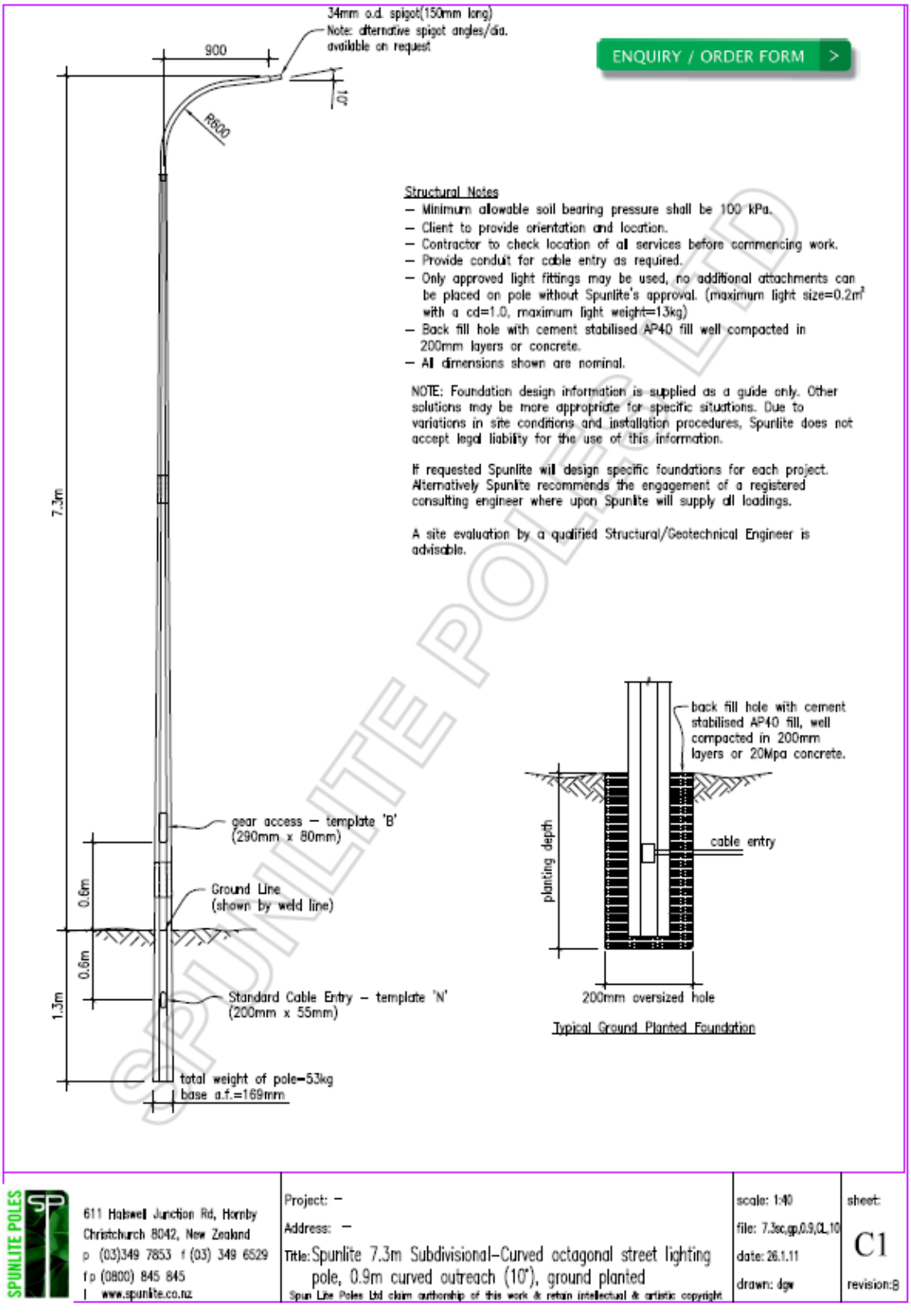


A.2 EWO R4 LED Floodlight

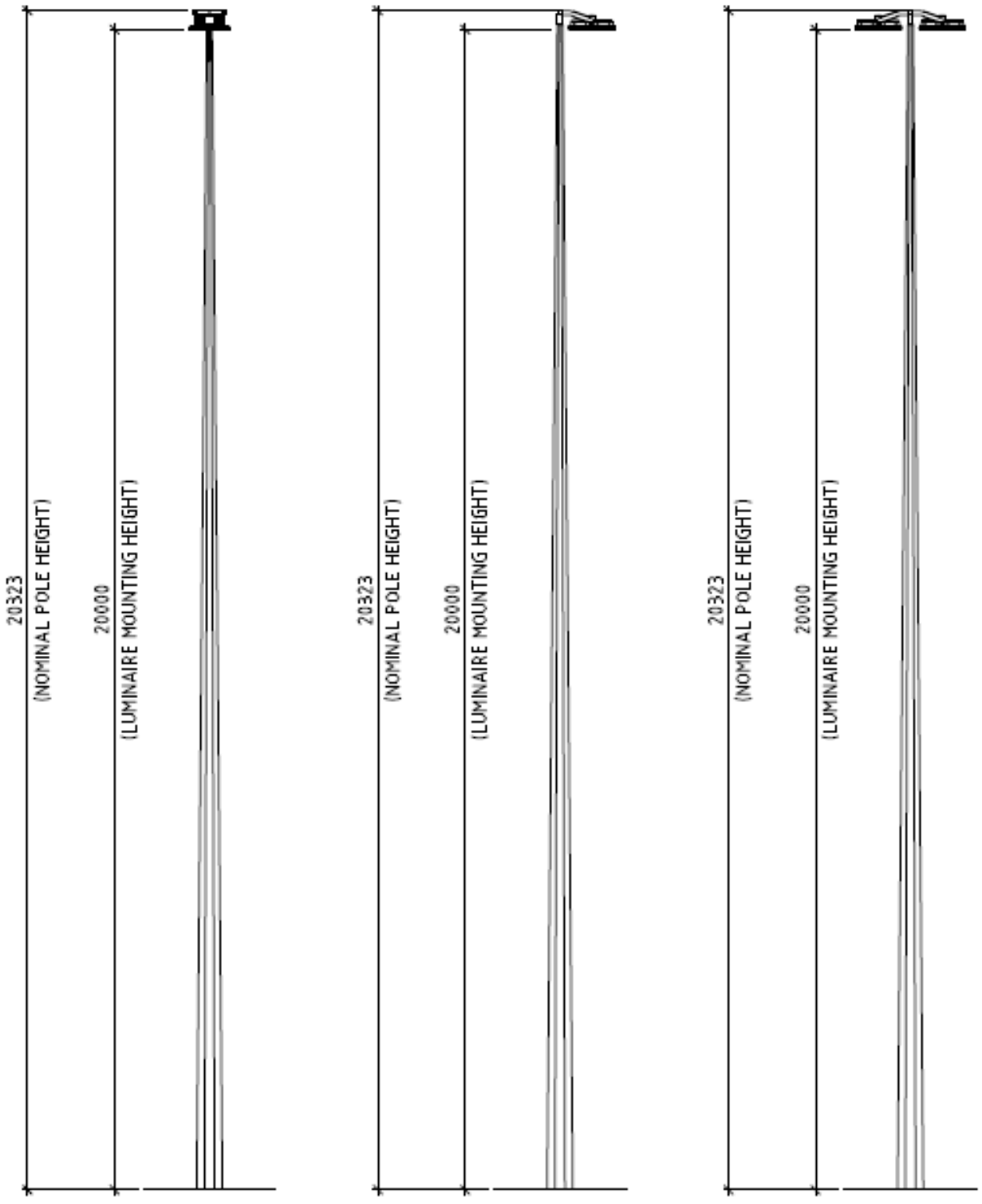


Appendix B Lighting Pole Details

B.1 Spunlite 7.3m Subdivisional Lighting Pole



B.2 Spunlite 22.4m Flange Based Flood Lighting Pole



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LUMINAIRE AND POLE LIST

TYPE	LED LUMINAIRE DESCRIPTION	POLE / MOUNTING DESCRIPTION	MOUNTING HEIGHT	OUTREACH ARM / BRACKET MOUNTING DETAILS	TILT ANGLE	LUMINAIRE QTY
A	AEC ITALO 1 STAN0 4000K 350mA 3M 27W LED	SPUNLITE SUBDIVISIONAL GP LIGHTING POLE C/W SINGLE ARM	7.3m	0.9M SINGLE CURVED OUTREACH ARM	0	123
B	AEC ITALO 1 STAN0 4000K 525mA 4M 51W LED	SPUNLITE SUBDIVISIONAL GP LIGHTING POLE C/W SINGLE ARM	7.3m	0.9M SINGLE CURVED OUTREACH ARM	5	3
C	AEC ITALO 1 S05 4000K 350mA 2M 27W LED	SPUNLITE SUBDIVISIONAL GP LIGHTING POLE C/W SINGLE ARM	7.3m	0.9M SINGLE CURVED OUTREACH ARM	0	27
D	AEC ITALO 1 S05 4000K 350mA 2M 27W LED (2 PER POLE)	SPUNLITE SUBDIVISIONAL GP LIGHTING POLE C/W DOUBLE ARMS	7.3m	0.9M DOUBLE CURVED OUTREACH ARMS	0	4
E	AEC ITALO 1 S05 4000K 350mA 3M 39W LED	SPUNLITE SUBDIVISIONAL GP LIGHTING POLE C/W SINGLE ARM	7.3m	0.9M SINGLE CURVED OUTREACH ARM	0	16
F	AEC ITALO 1 S05 4000K 350mA 3M 39W LED (2 PER POLE)	SPUNLITE SUBDIVISIONAL GP LIGHTING POLE C/W DOUBLE ARMS	7.3m	0.9M DOUBLE CURVED OUTREACH ARMS	0	4
G	EWO R4 GEN 3 EP09 LR FCO 4000K 1850mA 1614W	SPUNLITE 20m FLB FLOOD LIGHTING POLE C/W 0.6m CROSS ARM	20m	PROPRIETARY OVER-FRAME BRACKET MOUNTED TO POLE CROSS ARM (VERTICAL FACE)	0	22
H	EWO R4 GEN 3 EP09 LR FCO 4000K 1850mA 1614W (2 PER POLE)	SPUNLITE 20m FLB FLOOD LIGHTING POLE C/W 0.6m CROSS ARM	20m	PROPRIETARY OVER-FRAME BRACKET MOUNTED TO POLE CROSS ARM (VERTICAL FACE)	0	14
J	EWO R4 GEN 3 EP09 LR RBL-FCO 4000K 1850mA 1614W	SPUNLITE 20m FLB FLOOD LIGHTING POLE C/W 0.6m CROSS ARM	20m	PROPRIETARY OVER-FRAME BRACKET MOUNTED TO POLE CROSS ARM (VERTICAL FACE)	0	31
K	EWO R4 GEN 3 EP09 LR RBL-FCO 4000K 1850mA 1614W (2 PER POLE)	SPUNLITE 20m FLB FLOOD LIGHTING POLE C/W 0.6m CROSS ARM	20m	PROPRIETARY OVER-FRAME BRACKET MOUNTED TO POLE CROSS ARM (VERTICAL FACE)	0	106
L	EWO R2 GEN 3 EP09 LR RBL-FCO 4000K 400mA 168W	BUILDING MOUNTED	6m	PROPRIETARY STIRRUP BRACKET MOUNTED TO BUILDING (VERTICAL FACE)	0	4
M	EWO R4 GEN 3 EP09 LR RBL-FCO 4000K 800mA 683W	BUILDING MOUNTED	12m	PROPRIETARY STIRRUP BRACKET MOUNTED TO BUILDING (VERTICAL FACE)	5	6
N	EWO R4 GEN 3 EP09 LR FCO 4000K 1850mA 1614W	BUILDING MOUNTED	12m	PROPRIETARY STIRRUP BRACKET MOUNTED TO BUILDING (VERTICAL FACE)	0	22

LEGEND

A — NEW LED LUMINAIRE MOUNTED ON NEW GROUND PLANTED LIGHTING POLE (LETTER DENOTES PARTICULAR LUMINAIRE TYPE AND MOUNTING PARAMETERS AS PER THE LUMINAIRE AND POLE LIST)

D D — NEW LED LUMINAIRES (2 OFF) MOUNTED ON NEW GROUND PLANTED LIGHTING POLE (LETTER DENOTES PARTICULAR LUMINAIRE TYPE AND MOUNTING PARAMETERS AS PER THE LUMINAIRE AND POLE LIST)

G — NEW LED FLOODLIGHT MOUNTED ON NEW FLANGE BASED LIGHTING POLE (LETTER DENOTES PARTICULAR LUMINAIRE TYPE AND MOUNTING PARAMETERS AS PER THE LUMINAIRE AND POLE LIST)

H H — NEW LED FLOODLIGHTS (2 OFF) MOUNTED ON NEW FLANGE BASED LIGHTING POLE (LETTER DENOTES PARTICULAR LUMINAIRE TYPE AND MOUNTING PARAMETERS AS PER THE LUMINAIRE AND POLE LIST)

PROPOSED LIGHTING ISOLUX CONTOUR LINES

SPILL LIGHTING ISOLUX CONTOUR LINES (1 LUX AT MF = 1.0)

CALCULATION RESULTS - ACCESS ROADS AND CAR PARKS - ILLUMINANCE LEVELS AND UNIFORMITIES

Illuminance Calculation Summary Table - AS/NZS 1158.3.1:2020

Label	CalcType	Units	Avg	Min	Max/Avg	Description
Access Roads	Illuminance	Lux	2.2	0.14	9.7	Cat PR5 - 0.85 Lux (Avg), 0.14 Lux (Min) and Uniformity (Max/Avg) of 10 (Max)
Container Terminal Car Park 1	Illuminance	Lux	3.8	0.8	3.1	Cat PC3 - 3.5 Lux (Avg), 0.7 Lux (Min) and Uniformity (Max/Avg) of 8 (Max)
Container Terminal Car Park 2	Illuminance	Lux	4.8	0.8	3.3	Cat PC3 - 3.5 Lux (Avg), 0.7 Lux (Min) and Uniformity (Max/Avg) of 8 (Max)
Container Terminal Car Park 3	Illuminance	Lux	3.8	0.9	4.0	Cat PC3 - 3.5 Lux (Avg), 0.7 Lux (Min) and Uniformity (Max/Avg) of 8 (Max)
Freight Forwarding Car Park	Illuminance	Lux	4.6	0.8	4.9	Cat PC3 - 3.5 Lux (Avg), 0.7 Lux (Min) and Uniformity (Max/Avg) of 8 (Max)
Network Services Car Park 1	Illuminance	Lux	3.9	0.9	3.1	Cat PC3 - 3.5 Lux (Avg), 0.7 Lux (Min) and Uniformity (Max/Avg) of 8 (Max)
Network Services Car Park 2	Illuminance	Lux	3.6	0.9	3.5	Cat PC3 - 3.5 Lux (Avg), 0.7 Lux (Min) and Uniformity (Max/Avg) of 8 (Max)
Network Services Car Park 3	Illuminance	Lux	3.5	0.7	3.4	Cat PC3 - 3.5 Lux (Avg), 0.7 Lux (Min) and Uniformity (Max/Avg) of 8 (Max)
Network Services Car Park 4	Illuminance	Lux	5.3	0.9	3.4	Cat PC3 - 3.5 Lux (Avg), 0.7 Lux (Min) and Uniformity (Max/Avg) of 8 (Max)
Network Services Car Park 5	Illuminance	Lux	4.6	0.8	3.8	Cat PC3 - 3.5 Lux (Avg), 0.7 Lux (Min) and Uniformity (Max/Avg) of 8 (Max)

CALCULATION RESULTS - OUTDOOR OPERATIONAL AREAS - ILLUMINANCE LEVELS AND UNIFORMITIES

Illuminance Calculation Summary Table - KiwiRail Traction and Electrical Standard E-ST-EL-0131

Label	CalcType	Units	Avg	Uo (Min/Avg)	Ud (Min/Max)	Design Requirements
Container Terminal Handling Area	Illuminance	Lux	34.8	0.5	0.4	Table 6.1 - Avg >= 30 Lux, Uo >= 0.4 and Ud >= 0.2
Freight Forwarding Area 1	Illuminance	Lux	35.6	0.4	0.2	Table 6.1 - Avg >= 30 Lux, Uo >= 0.4 and Ud >= 0.2
Freight Forwarding Area 2	Illuminance	Lux	37.6	0.4	0.2	Table 6.1 - Avg >= 30 Lux, Uo >= 0.4 and Ud >= 0.2
Log Loading Area and Tank Siding	Illuminance	Lux	32.1	0.4	0.2	Table 6.1 - Avg >= 30 Lux, Uo >= 0.4 and Ud >= 0.2
Network Services Handling Areas	Illuminance	Lux	32.2	0.4	0.2	Table 6.1 - Avg >= 30 Lux, Uo >= 0.4 and Ud >= 0.2
Railway Marshalling Areas	Illuminance	Lux	21.3	0.4	0.2	Table 6.1 - Avg >= 20 Lux, Uo >= 0.4 and Ud >= 0.2

NOTES

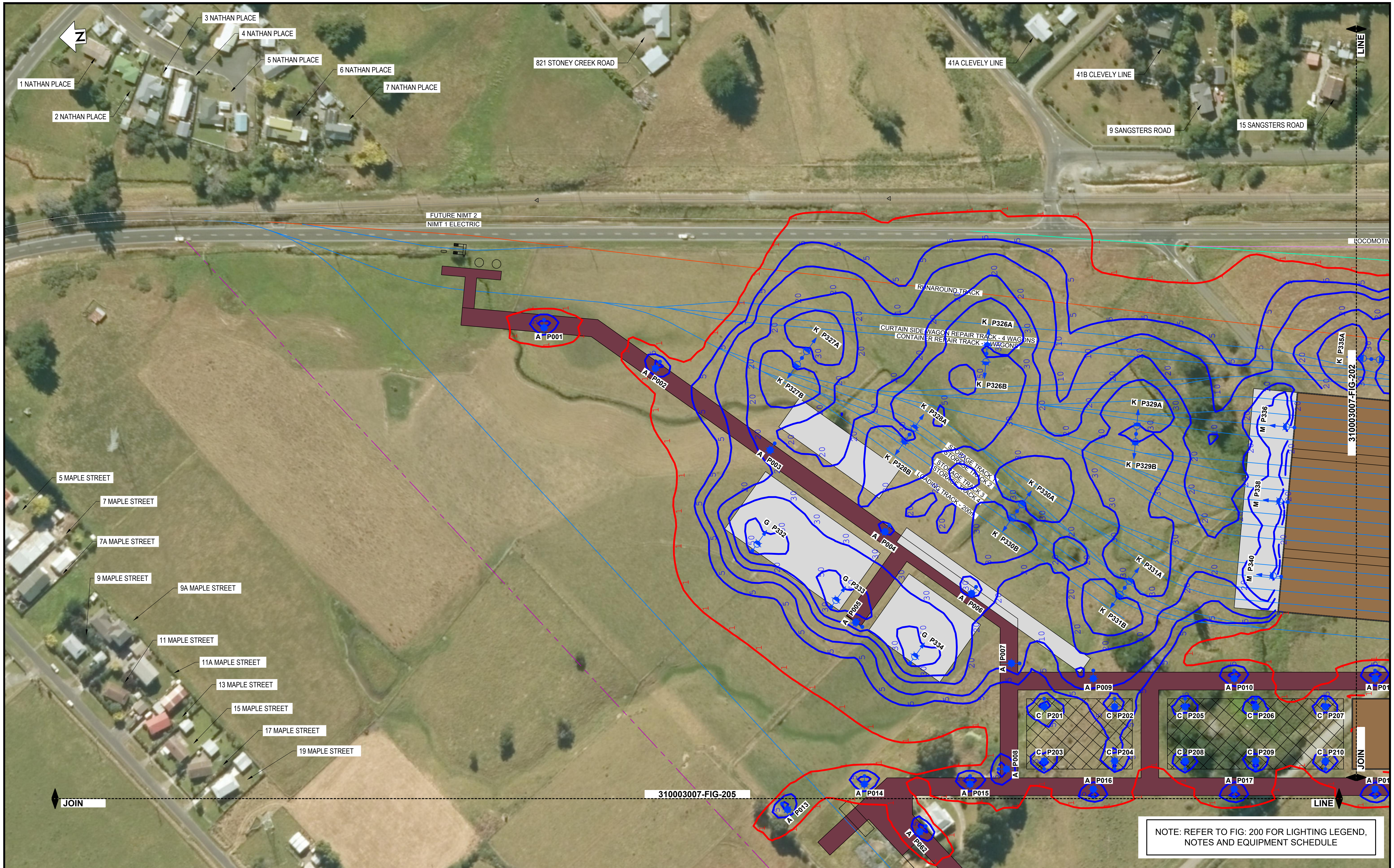
1. THE ACCESS ROAD LIGHTING HAS BEEN DESIGNED TO COMPLY WITH THE SUBCATEGORY PR5 REQUIREMENTS OF AS/NZS 1158.3.1:2020 (PEDESTRIAN AREA (CATEGORY P) LIGHTING - PERFORMANCE AND DESIGN REQUIREMENTS), AND THE CAR PARK LIGHTING HAS BEEN DESIGNED TO COMPLY WITH THE SUBCATEGORY PC3 REQUIREMENTS OF AS/NZS 1158.3.1:2020. REFER TO THE CALCULATION RESULTS SUMMARY TABLE. THE CALCULATIONS WERE COMPLETED WITHOUT ANY CONTRIBUTION FROM THE OUTDOOR WORK AREA LED FLOODLIGHTING.
2. THE OUTDOOR OPERATIONAL AREAS (FREIGHT MARSHALLING YARDS, RAIL MOVEMENTS AND FREIGHT HANDLING AREAS) ARE DESIGNED TO COMPLY WITH THE RELEVANT LIGHTING REQUIREMENTS FROM TABLE 6.1 OF THE KIWIRAIL TRACTION AND ELECTRICAL STANDARD E-ST-EL-0131.
3. THE ACCESS ROAD AND CAR PARK LUMINAIRES SHALL BE AEC ITALO LEDs WITH MODULES AND WATTAGES AS SPECIFIED IN THE LUMINAIRE AND POLE LIST. THE QUALITY OF MANUFACTURE AND OPTICAL PERFORMANCE OF ANY ALTERNATIVE LUMINAIRES SHALL MATCH OR EXCEED THAT OF THE ITALO (INCLUDING THE CURRENT DESIGN ILLUMINANCE LEVELS) AND SUPPORTING CALCULATIONS SHALL BE REQUIRED TO BE SUBMITTED ALONG WITH ANY ALTERNATIVE LUMINAIRES OFFERED.
4. THE LED FLOODLIGHTS SHALL BE EWO R4 GENERATION 3 LED FLOODLIGHTS (OR EQUAL), SUPPLIED BY ENERGYLIGHT LTD, WITH OPTICS AND WATTAGES AS SPECIFIED IN THE LUMINAIRE AND POLE LIST. THE QUALITY OF MANUFACTURE AND OPTICAL PERFORMANCE OF ANY ALTERNATIVE LED FLOODLIGHTS SHALL MATCH OR EXCEED THAT OF THE EWO R4 (INCLUDING THE CURRENT DESIGN ILLUMINANCE LEVELS) AND SUPPORTING CALCULATIONS (ILLUMINANCE AND OBTRUSIVE LIGHT) SHALL BE REQUIRED TO BE SUBMITTED ALONG WITH ANY ALTERNATIVE LUMINAIRES OFFERED.
5. WHEN INSTALLED ALL NEW LUMINAIRES SHALL HAVE THE MOUNTING HEIGHTS AND TILT ANGLES AS SPECIFIED IN THE LUMINAIRE AND POLE LIST. THE NEW FLOODLIGHTING LUMINAIRES SHALL BE ATTACHED TO THE FRONT FACE OF THE LIGHTING POLE CROSS ARMS (0.6m LONG - SUPPLIED WITH THE LIGHTING POLES) IN ACCORDANCE WITH THE LED MANUFACTURES INSTRUCTIONS USING PROPRIETARY EWO R4 STANDARD STIRRUP BRACKETS (SUPPLIED WITH THE NEW LUMINAIRES). ALL LUMINAIRES SHALL BE AIMED IN ACCORDANCE WITH THE ORIENTATIONS DEPICTED ON THE LAYOUT DRAWINGS.
6. A LIGHTING CONTROL SYSTEM SHALL BE SPECIFIED DURING DETAILED DESIGN, HOWEVER THE ACCESS ROAD AND CAR PARK LIGHTING SHALL BE CONTROLLED INDEPENDENTLY FROM THE OUTDOOR WORK AREA FLOODLIGHTS. THE OUTDOOR FLOODLIGHTS SHALL BE MANUALLY CONTROLLED FROM WITHIN EACH SPECIFIC WORK AREA. LOW LEVEL SECURITY LIGHTING SHALL BE PROVIDED FROM SELECTED ACCESS ROAD LIGHTS THAT WILL OPERATE DURING THE HOURS OF DARKNESS WHEN OPERATIONS HAVE STOPPED.
7. THE COMPLETE LIGHTING UPGRADE REQUIRES NEW LED LUMINAIRES TO BE MOUNTED ONTO NEW LIGHTING POLES.
8. ALL MATERIALS (INCLUDING LUMINAIRES, POLES, CROSS ARMS, BRACKETS AND MOUNTING HARDWARE) SHALL COMPLY WITH THE DURABILITY REQUIREMENTS OF KIWIRAIL.
9. THIS DRAWING ONLY DEPICTS THE LUMINAIRES AND MOUNTING REQUIREMENTS ASSOCIATED WITH THE LIGHTING DESIGN. ANY WORK ASSOCIATED WITH PROVIDING POWER SUPPLY INFRASTRUCTURE (TO SUPPLY THE NEW LUMINAIRES) IS OUTSIDE THE SCOPE OF THIS DESIGN.
10. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY POWER SUPPLY DESIGN AND INSTALLATION (REQUIRED TO PROVIDE POWER AND CONTROLS TO THE NEW LIGHTING) AND SHALL PAY ANY ASSOCIATED LOCAL ELECTRICITY NETWORK FEES. THE CONTRACTOR SHALL COMPLY WITH THE ELECTRICITY (SAFETY) REGULATIONS, AS/NZS 3000 (NZ WIRING RULES) AND ANY SPECIFIC KIWIRAIL RULES AND PROCEDURES AS APPLICABLE.
11. EACH NEW STEEL LIGHTING POLE SHALL BE EARTHED / BONDED TO THE FREIGHT HUB ELECTRICAL EARTHING SYSTEM IN ACCORDANCE WITH KIWIRAIL REQUIREMENTS.

OBTRUSIVE LIGHTING NOTES

1. ACCORDING TO AS/NZS 4282:2019 (CONTROL OF THE OBTRUSIVE EFFECTS OF OUTDOOR LIGHTING) THE FREIGHT HUB IS WITHIN ZONE A2 (SPARSELY INHABITED RURAL / SEMI-RURAL AREAS WITH LOW DISTRICT BRIGHTNESS) WHERE SPILL LIGHT, THRESHOLD INCREMENT, SKY GLOW AND GLARE HAVE TO BE CONTROLLED TO SPECIFIED LEVELS IN ACCORDANCE WITH ZONE A2 REQUIREMENTS.
2. REFER TO FIG 210 FOR THE SPILL LIGHT, THRESHOLD INCREMENT AND SKY GLOW CALCULATIONS AND FIG 211 FOR THE GLARE CALCULATIONS AT SPECIFIED RESIDENTIAL BUILDINGS.

REFERENCE DRAWINGS

REV: B



N
3 NATHAN PLACE
4 NATHAN PLACE
5 NATHAN PLACE
6 NATHAN PLACE
7 NATHAN PLACE
1 NATHAN PLACE
2 NATHAN PLACE
821 STONEY CREEK ROAD
41A CLEVELY LINE
41B CLEVELY LINE
9 SANGSTERS ROAD
15 SANGSTERS ROAD
LINE
FUTURE NIMT 2
NIMT 1 ELECTRIC
RUNAROUND TRACK
CURTAIN SIDE WAGON REPAIR TRACK - 4 WAGONS
CONTAINER REPAIR TRACK - 4 WAGONS
STORAGE TRACK 1
STORAGE TRACK 2
STORAGE TRACK 3
STORAGE TRACK 4
LOADING TRACK - 200m
310003007-FIG-202
5 MAPLE STREET
7 MAPLE STREET
7A MAPLE STREET
9 MAPLE STREET
9A MAPLE STREET
11 MAPLE STREET
11A MAPLE STREET
13 MAPLE STREET
15 MAPLE STREET
17 MAPLE STREET
19 MAPLE STREET
A P001
A P002
A P003
A P004
A P005
A P006
A P007
A P008
A P009
A P010
A P013
A P014
A P015
A P016
A P017
A P062
K P326A
K P326B
K P327A
K P327B
K P328A
K P328B
K P329A
K P329B
K P330A
K P330B
K P331A
K P331B
K P335A
G P332
G P333
G P334
M P336
M P338
M P340
C P201
C P202
C P203
C P204
C P205
C P206
C P207
C P208
C P209
C P210
JOIN
310003007-FIG-205
LINE
JOIN
NOTE: REFER TO FIG: 200 FOR LIGHTING LEGEND, NOTES AND EQUIPMENT SCHEDULE

PLAN

SCALE 1:1,000

10 0 10 20 30 40 50m

A1 SCALE 1:1,000 A3 1:2,000

KiwiRail — Backbone of integrated transport networks

Stantec

Job No: 310003007

KIWIRAIL HUB
SITE 3-G2 LIGHTING LAYOUT
SHEET 1 OF 8

REV: B

Drawn By: IAN CAMPBELL
Scale: 1:1000

FIG: 201

4/28/2021 11:43 am

C:\pwworkdir\ap_projects01\d0117046\310003007-FIG-201-SITE 3-G2 Lighting Layout.dwg

58 PARRS ROAD
59 PARRS ROAD
55D PARRS ROAD
25 SANGSTERS ROAD
27 SANGSTERS ROAD
43 SANGSTERS ROAD
73 SANGSTERS ROAD
91 SANGSTERS ROAD
LINE
N
LOCOMOTIVE SETOFF TRACK -100m ELECTRIC
FUTURE NIMT 2
NIMT 1 ELECTRIC
J P301 J P302 J P303 J P304 J P305 J P306 J P307 J P308 J P309 J P310
K P335A K P335B
310003007-FIG-201
310003007-FIG-203
L P342 L P343
K P348A K P348B K P349A K P349B K P350A K P350B K P351A K P351B K P352A K P352B K P353A K P353B K P354A K P354B K P355A K P355B
K P346A K P346B K P347A K P347B
M P337 M P339 M P341
A P031 A P032 A P033 A P034 A P035
K P384A K P384B K P385A K P385B K P386A K P386B K P387A K P387B K P388A K P388B K P389A K P389B
J P380 K P381A K P381B K P382A K P382B
A P027 A P030
E P214 E P215 E P216 E P217 E P218 E P219
A P011 A P012 C P211 C P212 C P213 P207 P210
JOIN
A P018 A P019 A P020 A P021 A P023 A P024 A P025 A P026 A P028 A P029 A P090 A P071
310003007-FIG-206
A P047 A P048 A P049
G P404 G P405 G P406 G P407 G P408 G P409
SERVICE TRACK
NOTE: REFER TO FIG: 200 FOR LIGHTING LEGEND, NOTES AND EQUIPMENT SCHEDULE

PLAN
SCALE 1:1,000

10 0 10 20 30 40 50m
A1 SCALE 1:1,000 A3 1:2,000

KiwiRail
Stantec
Job No: 310003007

KIWIRAIL HUB
SITE 3-G2 LIGHTING LAYOUT
SHEET 2 OF 8

REV: B
Drawn By: IAN CAMPBELL
Scale: 1:1000
FIG: 202

4/28/2021 11:29 am

95 SANGSTERS ROAD

422 RAILWAY ROAD

LINE

LINE

310003007-FIG-202

310003007-FIG-204

310003007-FIG-207

JOIN

JOIN

JOIN

LINE

NOTE: REFER TO FIG: 200 FOR LIGHTING LEGEND, NOTES AND EQUIPMENT SCHEDULE

PLAN
SCALE 1:1,000

10 0 10 20 30 40 50m
A1 SCALE 1:1,000 A3 1:2,000

KiwiRail

Stantec

Job No: 310003007

KIWIRAIL HUB
SITE 3-G2 LIGHTING LAYOUT
SHEET 3 OF 8

Drawn By: IAN CAMPBELL
Scale: 1:1000

REV: B

FIG: 203

C:\Data\Export - Import\310003007-FIG-203-SITE 3-G2 Lighting Layout.dwg

4/28/2021 11:46 am

N

LINE

FUTURE NIMT 2
NIMT 1 ELECTRIC

LOCOMOTIVE SET-OFF TRACK -100m ELECTRIC

PULLBACK TRACK -1500m

J P321 J P322 J P323 J P324 J P325

L P344 L P345

K P366A K P366B K P367A K P367B K P368A K P368B K P369A K P369B J P370

C P234 C P235 C P236
C P237 C P238 C P239
J P403 A P046

K P371A K P371B

C P240 C P241 C P242
D P243A D P243B D P244A D P244B
C P245 C P246 C P247

310003007-FIG-203

JOIN

A P060 JOIN A P061

310003007-FIG-208

LINE

NOTE: REFER TO FIG: 200 FOR LIGHTING LEGEND, NOTES AND EQUIPMENT SCHEDULE

PLAN
SCALE 1:1,000

10 0 10 20 30 40 50m
A1 SCALE 1:1,000 A3 1:2,000

KiwiRail

Stantec

Job No: 310003007

KIWIRAIL HUB
SITE 3-G2 LIGHTING LAYOUT
SHEET 4 OF 8

REV: B

Drawn By: IAN CAMPBELL
Scale: 1,1000

FIG: 204

C:\pwworkdir\wp_projects\011\01170463\310003007-FIG-204-SITE 3-G2 Lighting Layout.dwg

4/28/2021 11:47 am

JOIN

310003007-FIG-201

LINE

21 MAPLE STREET

57 MAPLE STREET

245 TE NGAIO ROAD

241 TE NGAIO ROAD

242 TE NGAIO ROAD

A P013 A P014 A P015 A P016 A P017 A P082 A P083 A P064 A P065 A P066 A P074 A P075 H P373A H P374A J P372 H P373B H P374B A P076

310003007-FIG-206

JOIN

N

NOTE: REFER TO FIG: 200 FOR LIGHTING LEGEND, NOTES AND EQUIPMENT SCHEDULE

PLAN
SCALE 1:1,000

10 0 10 20 30 40 50m
A1 SCALE 1:1,000 A3 1:2,000

KiwiRail

Stantec

Job No: 310003007

KIWIRAIL HUB
SITE 3-G2 LIGHTING LAYOUT
SHEET 5 OF 8

Drawn By: IAN CAMPBELL
Scale: 1:1000

REV: B

FIG: 205

C:\pwworkdir\sap_projects\id\d0117046\i310003007-FIG-205-SITE 3-G2 Lighting Layout.dwg

4/28/2021 11:48 am

LINE JOIN

310003007-FIG-202

310003007-FIG-205

310003007-FIG-207

LINE

JOIN

JOIN

163 CLEVELY LINE

NOTE: REFER TO FIG: 200 FOR LIGHTING LEGEND, NOTES AND EQUIPMENT SCHEDULE

N

PLAN
SCALE 1:1,000

10 0 10 20 30 40 50m
A1 SCALE 1:1,000 A3 1:2,000

KiwiRail

Stantec

Job No: 310003007

KIWIRAIL HUB
SITE 3-G2 LIGHTING LAYOUT
SHEET 6 OF 8

REV: B

Drawn By: IAN CAMPBELL
Scale: 1:1000

FIG: 206

C:\pwworkdir\sap_projects\01\d01170463\310003007-FIG-206-SITE 3-G2 Lighting Layout.dwg

4/28/2021 11:49 am

G P413 G P414 G P415 G P416 G P418 G P419 G P420 G P421 G P422

LINE JOIN

310003007-FIG-203

E P222 LINE E LINE

F P226A

E P225

E P228

F P229A

E P231 E

N P436 N P438 N P440

A P101 A P102 A P103 A P104 A P105 A P106 P107

N P434 N P435 N P437 N P439 N P441 N P442 N P443 N P444

310003007-FIG-206

310003007-FIG-208

LOADING TRACK
SERVICE TRACK
LOADING TRACK

A P122

A P121

P114 A P115 A P116 A P117 A P118 A P119 A P120

JOIN JOIN

787 ROBERTS LINE

803 ROBERTS LINE

N

NOTE: REFER TO FIG: 200 FOR LIGHTING LEGEND, NOTES AND EQUIPMENT SCHEDULE

PLAN
SCALE 1:1,000

10 0 10 20 30 40 50m
A1 SCALE 1:1,000 A3 1:2,000

KiwiRail

Stantec

Job No: 310003007

KIWIRAIL HUB
SITE 3-G2 LIGHTING LAYOUT
SHEET 7 OF 8

REV: B

Drawn By: IAN CAMPBELL
Scale: 1:1000

FIG: 207

C:\pwworkdir\sp_projects\d11d0117046\310003007-FIG-207-SITE 3-G2 Lighting Layout.dwg

4/28/2021 11:50 am

NOTE: REFER TO FIG: 200 FOR LIGHTING LEGEND, NOTES AND EQUIPMENT SCHEDULE

PLAN
SCALE 1:1,000

10 0 10 20 30 40 50m
A1 SCALE 1:1,000 A3 1:2,000

KiwiRail
Backbone of integrated transport networks

Stantec

Job No: 310003007

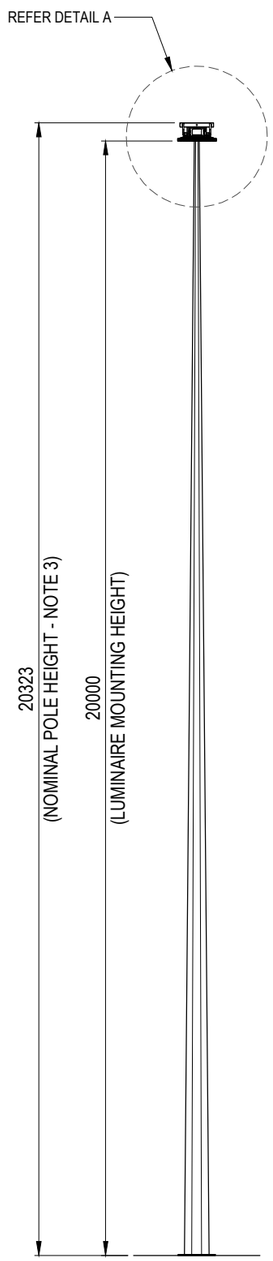
KIWIRAIL HUB
SITE 3-G2 LIGHTING LAYOUT
SHEET 8 OF 8

REV: B

Drawn By: IAN CAMPBELL
Scale: 1:1000

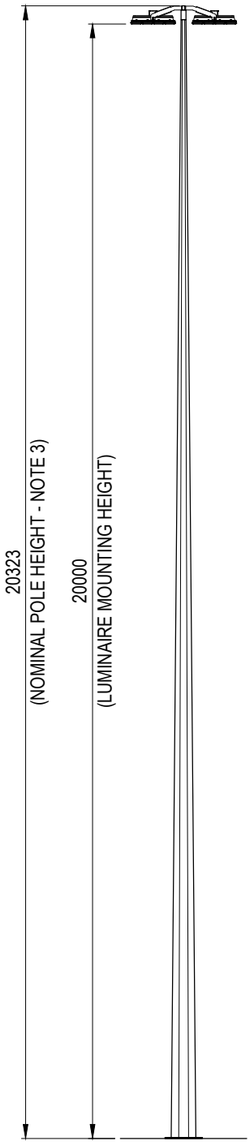
FIG: 208

C:\pwworkdir\ap_projects01\d0117046\310003007-FIG-208-SITE 3-G2 Lighting Layout.dwg



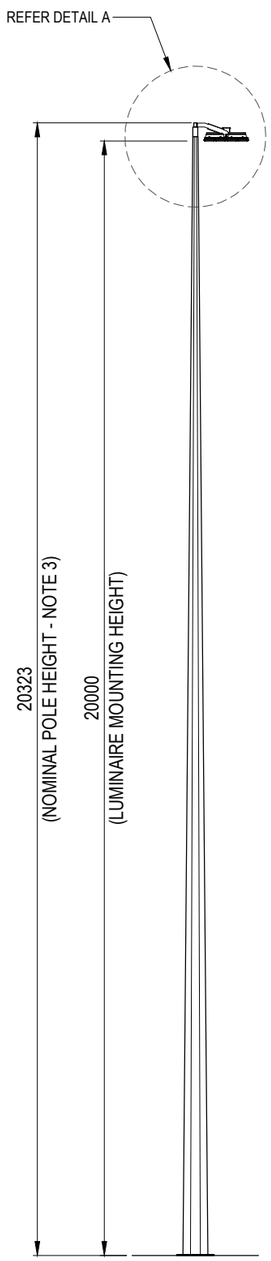
FRONT ELEVATION

SPUNLITE 20m OCTAGONAL GENERAL PURPOSE FLANGE BASED POLE AND EWO R4 LED FLOODLIGHT MOUNTED TO 0.6m CROSS ARM



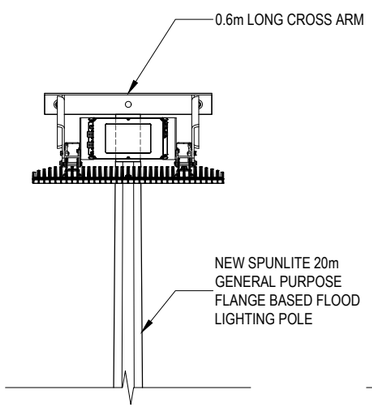
END ELEVATION

SPUNLITE 20m OCTAGONAL GENERAL PURPOSE FLANGE BASED POLE AND EWO R4 LED FLOODLIGHTS (2 OFF) MOUNTED TO EACH SIDE OF 0.6m CROSS ARM

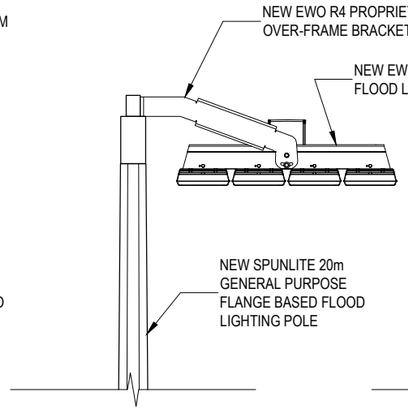


END ELEVATION

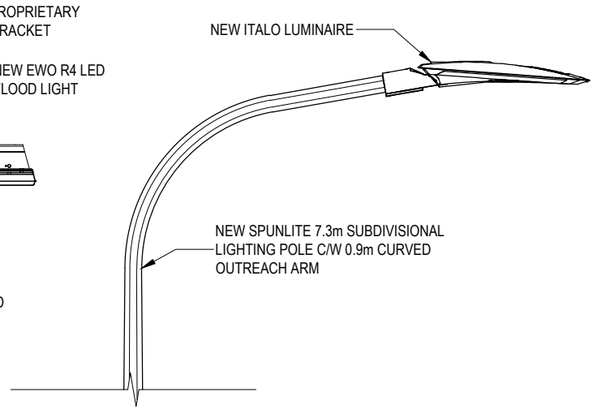
SPUNLITE 20m OCTAGONAL GENERAL PURPOSE FLANGE BASED POLE AND EWO R4 LED FLOODLIGHT MOUNTED TO 0.6m CROSS ARM



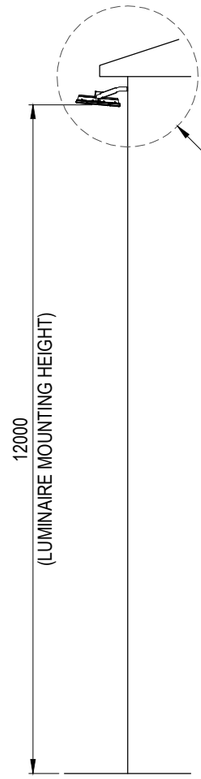
DETAIL A



DETAIL B

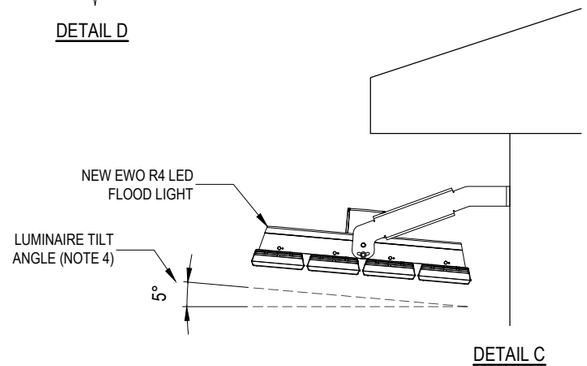


DETAIL D

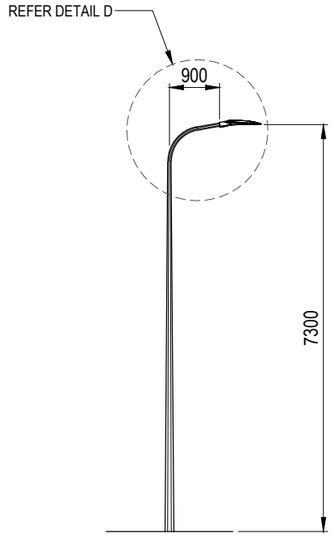


END ELEVATION

BUILDING MOUNTED EWO R4 LED FLOODLIGHT

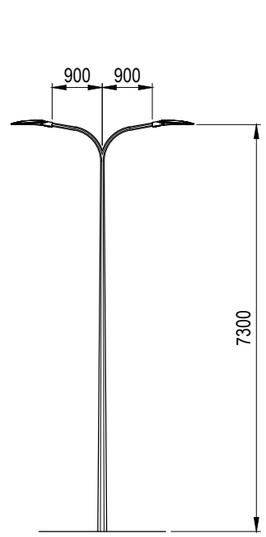


DETAIL C



END ELEVATION

SPUNLITE 7.3m SUBDIVISIONAL GROUND PLANTED POLE C/W 0.9m SINGLE CURVED ARM AND ITALO LED LUMINAIRE



END ELEVATION

SPUNLITE 7.3m SUBDIVISIONAL GROUND PLANTED POLE C/W 0.9m DOUBLE CURVED ARMS AND ITALO LED LUMINAIRES (2 OFF)

NOTES

1. POLE AND LUMINAIRE DETAILS ARE INDICATIVE ONLY.
2. FINAL POLE CONFIGURATIONS, LUMINAIRE DETAILS AND MOUNTING ARRANGEMENTS SHALL BE FINALISED DURING DETAILED DESIGN.
3. NOMINAL POLE HEIGHTS (REQUIRED TO ACHIEVE THE SPECIFIED LUMINAIRE MOUNTING HEIGHTS) AND FABRICATION DETAILS TO BE CONFIRMED BY POLE SUPPLIER.
4. ALL LUMINAIRE TILT ANGLES SHALL BE AS NOTED ON THE INFORMATION SHEET (FIG: 200).

NOTE: REFER TO FIG: 200 FOR LIGHTING LEGEND, NOTES AND EQUIPMENT SCHEDULE

REV: B

KiwiRail — Stantec

Job No: 310003007

KIWIRAIL HUB
SITE 3-G2 LIGHTING POLE
AND LUMINAIRE MOUNTING DETAILS

Drawn By: IAN CAMPBELL
Scale: NTS

FIG: 209

SPILL LIGHT CALCULATION RESULTS - NE PROPERTIES

AS/NZS4282:2019 Control of Obtrusive Lighting Effects - Calculation Summary - Spill Light				
Label	CalcType	Units	Max	Description
Clevely Line - No 22A_III_Seg1	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Clevely Line - No 22A_III_Seg2	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Clevely Line - No 22A_III_Seg3	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Clevely Line - No 22A_III_Seg4	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Clevely Line - No 22A_III_Seg5	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Clevely Line - No 22A_III_Seg6	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Clevely Line - No 41A_III_Seg1	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Clevely Line - No 41A_III_Seg2	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Clevely Line - No 41A_III_Seg3	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Clevely Line - No 41A_III_Seg4	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Clevely Line - No 41A_III_Seg5	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Clevely Line - No 41A_III_Seg6	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Clevely Line - No 41B_III_Seg1	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Clevely Line - No 41B_III_Seg2	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Clevely Line - No 41B_III_Seg3	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Clevely Line - No 41B_III_Seg4	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Clevely Line - No 41B_III_Seg5	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Nathan Pl - No 1_III_Seg1	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Nathan Pl - No 1_III_Seg2	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Nathan Pl - No 1_III_Seg3	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Nathan Pl - No 2_III_Seg1	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Nathan Pl - No 2_III_Seg2	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Nathan Pl - No 2_III_Seg3	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Nathan Pl - No 3_III_Seg1	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Nathan Pl - No 3_III_Seg2	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Nathan Pl - No 3_III_Seg3	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Nathan Pl - No 3_III_Seg4	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Nathan Pl - No 3_III_Seg5	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Nathan Pl - No 3_III_Seg6	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Nathan Pl - No 3_III_Seg7	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Nathan Pl - No 4_III_Seg1	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Nathan Pl - No 4_III_Seg2	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Nathan Pl - No 4_III_Seg3	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Nathan Pl - No 4_III_Seg4	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Nathan Pl - No 5_III_Seg1	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Nathan Pl - No 5_III_Seg2	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Nathan Pl - No 5_III_Seg3	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Nathan Pl - No 5_III_Seg4	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Nathan Pl - No 6_III_Seg1	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Nathan Pl - No 6_III_Seg2	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Nathan Pl - No 6_III_Seg3	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Nathan Pl - No 6_III_Seg4	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Nathan Pl - No 6_III_Seg5	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Nathan Pl - No 6_III_Seg6	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Nathan Pl - No 6_III_Seg7	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Nathan Pl - No 6_III_Seg8	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Nathan Pl - No 7_III_Seg1	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Nathan Pl - No 7_III_Seg2	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Nathan Pl - No 7_III_Seg3	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Nathan Pl - No 7_III_Seg4	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Parrs Rd - No 27_III_Seg1	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Parrs Rd - No 27_III_Seg2	Obtrusive - III	Lux	0.1	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Parrs Rd - No 27_III_Seg3	Obtrusive - III	Lux	0.1	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Parrs Rd - No 27_III_Seg4	Obtrusive - III	Lux	0.1	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Parrs Rd - No 27_III_Seg5	Obtrusive - III	Lux	0.1	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Parrs Rd - No 27_III_Seg6	Obtrusive - III	Lux	0.1	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Parrs Rd - No 27_III_Seg7	Obtrusive - III	Lux	0.1	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Parrs Rd - No 55D_III_Seg1	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Parrs Rd - No 55D_III_Seg2	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Parrs Rd - No 55D_III_Seg3	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Parrs Rd - No 55D_III_Seg4	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Parrs Rd - No 55D_III_Seg5	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Parrs Rd - No 55D_III_Seg6	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Parrs Rd - No 55D_III_Seg7	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Parrs Rd - No 58_III_Seg1	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Parrs Rd - No 58_III_Seg2	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Parrs Rd - No 58_III_Seg3	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Parrs Rd - No 58_III_Seg4	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Parrs Rd - No 58_III_Seg5	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Parrs Rd - No 59_III_Seg1	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Parrs Rd - No 59_III_Seg10	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Parrs Rd - No 59_III_Seg2	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Parrs Rd - No 59_III_Seg3	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Parrs Rd - No 59_III_Seg4	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Parrs Rd - No 59_III_Seg5	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Parrs Rd - No 59_III_Seg6	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Parrs Rd - No 59_III_Seg7	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Parrs Rd - No 59_III_Seg8	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Parrs Rd - No 59_III_Seg9	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Sangsters Rd - No 09_III_Seg1	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Sangsters Rd - No 09_III_Seg2	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Sangsters Rd - No 09_III_Seg3	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Sangsters Rd - No 09_III_Seg4	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Sangsters Rd - No 09_III_Seg5	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Sangsters Rd - No 09_III_Seg6	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Sangsters Rd - No 09_III_Seg7	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Sangsters Rd - No 11_III_Seg1	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Sangsters Rd - No 11_III_Seg10	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Sangsters Rd - No 11_III_Seg2	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Sangsters Rd - No 11_III_Seg3	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Sangsters Rd - No 11_III_Seg4	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Sangsters Rd - No 11_III_Seg5	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Sangsters Rd - No 11_III_Seg6	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Sangsters Rd - No 11_III_Seg7	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Sangsters Rd - No 11_III_Seg8	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Sangsters Rd - No 11_III_Seg9	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Sangsters Rd - No 15_III_Seg1	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Sangsters Rd - No 15_III_Seg2	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Sangsters Rd - No 15_III_Seg3	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Sangsters Rd - No 25_III_Seg1	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Sangsters Rd - No 25_III_Seg2	Obtrusive - III	Lux	0.1	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Sangsters Rd - No 25_III_Seg3	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Sangsters Rd - No 43_III_Seg1	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Sangsters Rd - No 43_III_Seg2	Obtrusive - III	Lux	0.1	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Sangsters Rd - No 43_III_Seg3	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Sangsters Rd - No 43_III_Seg4	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Sangsters Rd - No 43_III_Seg5	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Sangsters Rd - No 43_III_Seg6	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Sangsters Rd - No 43_III_Seg7	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Stoney Creek Rd - No 819_III_Seg1	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Stoney Creek Rd - No 819_III_Seg2	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Stoney Creek Rd - No 819_III_Seg3	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Stoney Creek Rd - No 819_III_Seg4	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Stoney Creek Rd - No 819_III_Seg5	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Stoney Creek Rd - No 819_III_Seg6	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Stoney Creek Rd - No 819_III_Seg7	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Stoney Creek Rd - No 819_III_Seg8	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Stoney Creek Rd - No 821_III_Seg1	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Stoney Creek Rd - No 821_III_Seg2	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Stoney Creek Rd - No 821_III_Seg3	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Stoney Creek Rd - No 821_III_Seg4	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)

SPILL LIGHT CALCULATION RESULTS - SE AND SW PROPERTIES

AS/NZS4282:2019 Control of Obtrusive Lighting Effects - Calculation Summary - Spill Light				
Label	CalcType	Units	Max	Description
Clevely Line - No 163_III_Seg1	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Clevely Line - No 163_III_Seg2	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Clevely Line - No 163_III_Seg3	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Clevely Line - No 163_III_Seg4	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Clevely Line - No 163_III_Seg5	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Clevely Line - No 163_III_Seg6	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Clevely Line - No 163_III_Seg7	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Railway Rd - No 422_III_Seg1	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Railway Rd - No 422_III_Seg2	Obtrusive - III	Lux	0.2	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Railway Rd - No 422_III_Seg3	Obtrusive - III	Lux	0.1	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Railway Rd - No 422_III_Seg4	Obtrusive - III	Lux	0.1	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Railway Rd - No 422_III_Seg5	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Railway Rd - No 422_III_Seg6	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Railway Rd - No 422_III_Seg7	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Roberts Line - No 761_III_Seg1	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Roberts Line - No 761_III_Seg2	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Roberts Line - No 761_III_Seg3	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Roberts Line - No 761_III_Seg4	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Roberts Line - No 761_III_Seg5	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Roberts Line - No 761_III_Seg6	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Roberts Line - No 761_III_Seg7	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Roberts Line - No 771_III_Seg1	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Roberts Line - No 771_III_Seg10	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Roberts Line - No 771_III_Seg11	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Roberts Line - No 771_III_Seg2	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Roberts Line - No 771_III_Seg3	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Roberts Line - No 771_III_Seg4	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Roberts Line - No 771_III_Seg5	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Roberts Line - No 771_III_Seg6	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Roberts Line - No 771_III_Seg7	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Roberts Line - No 771_III_Seg8	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Roberts Line - No 771_III_Seg9	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Roberts Line - No 787_III_Seg1	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Roberts Line - No 787_III_Seg2	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Roberts Line - No 787_III_Seg3	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Roberts Line - No 787_III_Seg4	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Roberts Line - No 787_III_Seg5	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Roberts Line - No 787_III_Seg6	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Roberts Line - No 787_III_Seg7	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Roberts Line - No 787_III_Seg8	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Roberts Line - No 803_III_Seg1	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Roberts Line - No 803_III_Seg2	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Roberts Line - No 803_III_Seg3	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Roberts Line - No 803_III_Seg4	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Roberts Line - No 803_III_Seg5	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Roberts Line - No 803_III_Seg6	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Roberts Line - No 814_III_Seg1	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Roberts Line - No 814_III_Seg2	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Roberts Line - No 814_III_Seg3	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Roberts Line - No 814_III_Seg4	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Roberts Line - No 824_III_Seg1	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Roberts Line - No 824_III_Seg2	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Roberts Line - No 824_III_Seg3	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Roberts Line - No 824_III_Seg4	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Roberts Line - No 824A_III_Seg1	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Roberts Line - No 824A_III_Seg10	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Roberts Line - No 824A_III_Seg11	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Roberts Line - No 824A_III_Seg2	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Roberts Line - No 824A_III_Seg3	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Roberts Line - No 824A_III_Seg4	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Roberts Line - No 824A_III_Seg5	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Roberts Line - No 824A_III_Seg6	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Roberts Line - No 824A_III_Seg7	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Roberts Line - No 824A_III_Seg8	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Roberts Line - No 824A_III_Seg9	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Sangsters Rd - No 73_III_Seg1	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Sangsters Rd - No 73_III_Seg2	Obtrusive - III	Lux	0.1	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Sangsters Rd - No 73_III_Seg3	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Sangsters Rd - No 73_III_Seg4	Obtrusive - III	Lux	0.1	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Sangsters Rd - No 73_III_Seg5	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Sangsters Rd - No 91_III_Seg1	Obtrusive - III	Lux	0.1	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Sangsters Rd - No 91_III_Seg2	Obtrusive - III	Lux	0.1	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Sangsters Rd - No 91_III_Seg3	Obtrusive - III	Lux	0.1	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Sangsters Rd - No 91_III_Seg4	Obtrusive - III	Lux	0.1	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Sangsters Rd - No 91_III_Seg5	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Sangsters Rd - No 91_III_Seg6	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Sangsters Rd - No 91_III_Seg7	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Sangsters Rd - No 91_III_Seg8	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Sangsters Rd - No 95_III_Seg1	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Sangsters Rd - No 95_III_Seg2	Obtrusive - III	Lux	0.1	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Sangsters Rd - No 95_III_Seg3	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Sangsters Rd - No 95_III_Seg4	Obtrusive - III	Lux	0.1	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Sangsters Rd - No 95_III_Seg5	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Tutaki Rd - No 428_III_Seg1	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Tutaki Rd - No 428_III_Seg2	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Tutaki Rd - No 428_III_Seg3	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)

THRESHOLD INCREMENT (TI)

AS/NZS 4282:2019 Control of Obtrusive Lighting Effects - Calculation Summary - Threshold Increment (TI)				
Label	CalcType	Units	TI	Description
ObtrusiveLight_TI_West Bdy N	Obtrusive - TI	%	0	Maximum TI of 20% (Zone A2 - Adaption Luminance of 0.2 cd/m2)
ObtrusiveLight_TI_West Bdy S	Obtrusive - TI	%	0	Maximum TI of 20% (Zone A2 - Adaption Luminance of 0.2 cd/m2)

SKY GLOW - UPWARD WASTE LIGHT RATIO (UWLR)

UWLR Area Summary	
Label	UWLR
LPDArea_1	0.000

SPILL LIGHT CALCULATION RESULTS - NW PROPERTIES

AS/NZS4282:2019 Control of Obtrusive Lighting Effects - Calculation Summary - Spill Light				
Label	CalcType	Units	Max	Description
Maple St - No 01_III_Seg1	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Maple St - No 01_III_Seg2	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Maple St - No 01_III_Seg3	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Maple St - No 01_III_Seg4	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Maple St - No 01_III_Seg5	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Maple St - No 01_III_Seg6	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Maple St - No 01A_III_Seg1	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Maple St - No 01A_III_Seg2	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Maple St - No 01A_III_Seg3	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Maple St - No 01A_III_Seg4	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Maple St - No 01A_III_Seg5	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Maple St - No 01A_III_Seg6	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Maple St - No 01A_III_Seg7	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Maple St - No 01A_III_Seg8	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Maple St - No 03_III_Seg1	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Maple St - No 03_III_Seg2	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Maple St - No 03_III_Seg3	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Maple St - No 03_III_Seg4	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Maple St - No 03_III_Seg5	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Maple St - No 05 (2 Storey)_III_Seg1	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Maple St - No 05 (2 Storey)_III_Seg2	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Maple St - No 05 (2 Storey)_III_Seg3	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Maple St - No 05 (2 Storey)_III_Seg4	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Maple St - No 05 (2 Storey)_III_Seg5	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Maple St - No 05 (2 Storey)_III_Seg6	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Maple St - No 05 (2 Storey)_III_Seg7	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Maple St - No 07_III_Seg1	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Maple St - No 07_III_Seg2	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Maple St - No 07A_III_Seg1	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Maple St - No 07A_III_Seg2	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Maple St - No 09_III_Seg1	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Maple St - No 09_III_Seg2	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Maple St - No 09A (2 Storey)_III_Seg1	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Maple St - No 09A (2 Storey)_III_Seg2	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Maple St - No 09A (2 Storey)_III_Seg3	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Maple St - No 09A (2 Storey)_III_Seg4	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Maple St - No 09A (2 Storey)_III_Seg5	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Maple St - No 09A (2 Storey)_III_Seg6	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Maple St - No 11_III_Seg1	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Maple St - No 11_III_Seg2	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Maple St - No 11A_III_Seg1	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Maple St - No 11A_III_Seg2	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Maple St - No 13_III_Seg1	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Maple St - No 13_III_Seg2	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Maple St - No 15_III_Seg1	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Maple St - No 15_III_Seg2	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Maple St - No 17_III_Seg1	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Maple St - No 17_III_Seg2	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Maple St - No 19_III_Seg1	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Maple St - No 19_III_Seg2	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Maple St - No 19_III_Seg3	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Maple St - No 21_III_Seg1	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Maple St - No 21_III_Seg2	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Maple St - No 21_III_Seg3	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Maple St - No 21_III_Seg4	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Maple St - No 57_III_Seg1	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Maple St - No 57_III_Seg2	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Maple St - No 57_III_Seg3	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Maple St - No 57_III_Seg4	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Maple St - No 57_III_Seg5	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Te Ngaio Rd - No 241 (2 Storey)_III_Seg1	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Te Ngaio Rd - No 241 (2 Storey)_III_Seg10	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Te Ngaio Rd - No 241 (2 Storey)_III_Seg11	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Te Ngaio Rd - No 241 (2 Storey)_III_Seg12	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Te Ngaio Rd - No 241 (2 Storey)_III_Seg13	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Te Ngaio Rd - No 241 (2 Storey)_III_Seg14	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Te Ngaio Rd - No 241 (2 Storey)_III_Seg2	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Te Ngaio Rd - No 241 (2 Storey)_III_Seg3	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Te Ngaio Rd - No 241 (2 Storey)_III_Seg4	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Te Ngaio Rd - No 241 (2 Storey)_III_Seg5	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Te Ngaio Rd - No 241 (2 Storey)_III_Seg6	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Te Ngaio Rd - No 241 (2 Storey)_III_Seg7	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Te Ngaio Rd - No 241 (2 Storey)_III_Seg8	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Te Ngaio Rd - No 241 (2 Storey)_III_Seg9	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Te Ngaio Rd - No 242_III_Seg1	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Te Ngaio Rd - No 242_III_Seg2	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Te Ngaio Rd - No 242_III_Seg3	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Te Ngaio Rd - No 242_III_Seg4	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Te Ngaio Rd - No 242_III_Seg5	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Te Ngaio Rd - No 245_III_Seg1	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Te Ngaio Rd - No 245_III_Seg2	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Te Ngaio Rd - No 245_III_Seg3	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Te Ngaio Rd - No 245_III_Seg4	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)
Te Ngaio Rd - No 245_III_Seg5	Obtrusive - III	Lux	0.0	Maximum Vertical Illuminance of 1 Lux (Zone A2 curfew hours)

OBTRUSIVE LIGHTING NOTES

1. ACCORDING TO AS/NZS 4282:2019 (CONTROL OF THE OBTRUSIVE EFFECTS OF OUTDOOR LIGHTING) THE FREIGHT HUB IS WITHIN ENVIRONMENTAL ZONE A2 (SPARSELY INHABITED RURAL / SEMI-RURAL AREAS WITH LOW DISTRICT BRIGHTNESS) WHERE THE VERTICAL ILLUMINATION (ON THE FRONT FACES OF RESIDENTIAL BUILDINGS CONTAINING WINDOWS) AND OTHER LIGHT TECHNICAL PARAMETERS (LTPs) ARE NOT PERMITTED TO EXCEED SPECIFIED MAXIMUMS. THE POINT VERTICAL ILLUMINATION IS NOT PERMITTED TO EXCEED 1 LUX DURING CURFEW HOURS (BETWEEN 11pm AND 6am). DURING NON-CURFEW HOURS THIS LIMIT INCREASES TO 5 LUX. THE THRESHOLD LIMIT (TI) IS NOT PERMITTED TO BE GREATER THAN 20% (WITH ADAPTION LUMINANCE LEVEL OF 0.2 cd/m2). THE AMOUNT OF SKY GLOW (UWLR) IS NOT PERMITTED TO EXCEED 0.01.
2. ONLY THE CLOSEST RESIDENTIAL BUILDINGS SURROUNDING THE PROPOSED RAIL FREIGHT HUB SITE WERE CONSIDERED AND THE CALCULATION RESULTS INDICATE THAT THE AMOUNT OF SPILL LIGHT, THRESHOLD INCREMENT AND SKY GLOW DOES NOT EXCEED THE MAXIMUM LIMITS SPECIFIED FOR ENVIRONMENTAL ZONE A2. THE EXISTING TREES AND VEGETATION (BETWEEN THE PROPERTIES AND RAIL FREIGHT HUB) WERE NOT TAKEN INTO ACCOUNT THEREFORE THE ACTUAL SPILL LIGHT (WITHIN THE RESIDENTIAL PROPERTIES) SHOULD BE LOWER THAN THE CURRENT RESULTS INDICATE.

REV: B

KiwiRail
Backbone of integrated transport networks

Stantec

Job No: 310003007

KIWIRAIL HUB
SITE 3-G2 LIGHTING
SPILL LIGHT & LTP CALCULATION RESULTS

Drawn By: IAN CAMPBELL
Scale: AS SHOWN
FIG: 210

4/28/2021 2:03 pm

GLARE CALCULATION RESULTS - NE PROPERTIES

AS/NZS4282:2019 Control of Obtrusive Lighting Effects - Calculation Summary - Glare

Label	CalcType	Units	Max	Description
Clevely Line - No 22A_Cd_Seg1	Obtrusive - Cd	N.A.	154	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Clevely Line - No 22A_Cd_Seg2	Obtrusive - Cd	N.A.	349	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Clevely Line - No 22A_Cd_Seg3	Obtrusive - Cd	N.A.	136	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Clevely Line - No 22A_Cd_Seg4	Obtrusive - Cd	N.A.	251	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Clevely Line - No 22A_Cd_Seg5	Obtrusive - Cd	N.A.	193	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Clevely Line - No 22A_Cd_Seg6	Obtrusive - Cd	N.A.	186	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Clevely Line - No 41A_Cd_Seg1	Obtrusive - Cd	N.A.	600	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Clevely Line - No 41A_Cd_Seg2	Obtrusive - Cd	N.A.	613	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Clevely Line - No 41A_Cd_Seg3	Obtrusive - Cd	N.A.	588	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Clevely Line - No 41A_Cd_Seg4	Obtrusive - Cd	N.A.	649	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Clevely Line - No 41A_Cd_Seg5	Obtrusive - Cd	N.A.	123	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Clevely Line - No 41A_Cd_Seg6	Obtrusive - Cd	N.A.	121	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Clevely Line - No 41B_Cd_Seg1	Obtrusive - Cd	N.A.	142	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Clevely Line - No 41B_Cd_Seg2	Obtrusive - Cd	N.A.	144	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Clevely Line - No 41B_Cd_Seg3	Obtrusive - Cd	N.A.	147	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Clevely Line - No 41B_Cd_Seg4	Obtrusive - Cd	N.A.	366	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Clevely Line - No 41B_Cd_Seg5	Obtrusive - Cd	N.A.	383	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Nathan Pl - No 1_Cd_Seg1	Obtrusive - Cd	N.A.	363	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Nathan Pl - No 1_Cd_Seg2	Obtrusive - Cd	N.A.	341	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Nathan Pl - No 1_Cd_Seg3	Obtrusive - Cd	N.A.	342	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Nathan Pl - No 2_Cd_Seg1	Obtrusive - Cd	N.A.	349	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Nathan Pl - No 2_Cd_Seg2	Obtrusive - Cd	N.A.	13	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Nathan Pl - No 2_Cd_Seg3	Obtrusive - Cd	N.A.	11	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Nathan Pl - No 3_Cd_Seg1	Obtrusive - Cd	N.A.	0	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Nathan Pl - No 3_Cd_Seg2	Obtrusive - Cd	N.A.	0	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Nathan Pl - No 3_Cd_Seg3	Obtrusive - Cd	N.A.	0	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Nathan Pl - No 3_Cd_Seg4	Obtrusive - Cd	N.A.	0	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Nathan Pl - No 3_Cd_Seg5	Obtrusive - Cd	N.A.	0	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Nathan Pl - No 3_Cd_Seg6	Obtrusive - Cd	N.A.	39	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Nathan Pl - No 3_Cd_Seg7	Obtrusive - Cd	N.A.	39	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Nathan Pl - No 4_Cd_Seg1	Obtrusive - Cd	N.A.	31	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Nathan Pl - No 4_Cd_Seg2	Obtrusive - Cd	N.A.	13	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Nathan Pl - No 4_Cd_Seg3	Obtrusive - Cd	N.A.	40	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Nathan Pl - No 4_Cd_Seg4	Obtrusive - Cd	N.A.	40	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Nathan Pl - No 5_Cd_Seg1	Obtrusive - Cd	N.A.	40	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Nathan Pl - No 5_Cd_Seg2	Obtrusive - Cd	N.A.	0	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Nathan Pl - No 5_Cd_Seg3	Obtrusive - Cd	N.A.	40	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Nathan Pl - No 5_Cd_Seg4	Obtrusive - Cd	N.A.	361	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Nathan Pl - No 6_Cd_Seg1	Obtrusive - Cd	N.A.	37	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Nathan Pl - No 6_Cd_Seg2	Obtrusive - Cd	N.A.	0	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Nathan Pl - No 6_Cd_Seg3	Obtrusive - Cd	N.A.	0	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Nathan Pl - No 6_Cd_Seg4	Obtrusive - Cd	N.A.	0	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Nathan Pl - No 6_Cd_Seg5	Obtrusive - Cd	N.A.	42	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Nathan Pl - No 6_Cd_Seg6	Obtrusive - Cd	N.A.	41	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Nathan Pl - No 6_Cd_Seg7	Obtrusive - Cd	N.A.	41	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Nathan Pl - No 6_Cd_Seg8	Obtrusive - Cd	N.A.	42	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Nathan Pl - No 7_Cd_Seg1	Obtrusive - Cd	N.A.	446	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Nathan Pl - No 7_Cd_Seg2	Obtrusive - Cd	N.A.	8	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Nathan Pl - No 7_Cd_Seg3	Obtrusive - Cd	N.A.	444	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Nathan Pl - No 7_Cd_Seg4	Obtrusive - Cd	N.A.	53	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Parrs Rd - No 27_Cd_Seg1	Obtrusive - Cd	N.A.	116	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Parrs Rd - No 27_Cd_Seg2	Obtrusive - Cd	N.A.	352	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Parrs Rd - No 27_Cd_Seg3	Obtrusive - Cd	N.A.	355	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Parrs Rd - No 27_Cd_Seg4	Obtrusive - Cd	N.A.	350	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Parrs Rd - No 27_Cd_Seg5	Obtrusive - Cd	N.A.	374	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Parrs Rd - No 27_Cd_Seg6	Obtrusive - Cd	N.A.	377	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Parrs Rd - No 27_Cd_Seg7	Obtrusive - Cd	N.A.	402	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Parrs Rd - No 55D_Cd_Seg1	Obtrusive - Cd	N.A.	85	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Parrs Rd - No 55D_Cd_Seg2	Obtrusive - Cd	N.A.	163	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Parrs Rd - No 55D_Cd_Seg3	Obtrusive - Cd	N.A.	86	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Parrs Rd - No 55D_Cd_Seg4	Obtrusive - Cd	N.A.	182	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Parrs Rd - No 55D_Cd_Seg5	Obtrusive - Cd	N.A.	192	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Parrs Rd - No 55D_Cd_Seg6	Obtrusive - Cd	N.A.	103	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Parrs Rd - No 55D_Cd_Seg7	Obtrusive - Cd	N.A.	102	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Parrs Rd - No 58_Cd_Seg1	Obtrusive - Cd	N.A.	113	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Parrs Rd - No 58_Cd_Seg2	Obtrusive - Cd	N.A.	257	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Parrs Rd - No 58_Cd_Seg3	Obtrusive - Cd	N.A.	262	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Parrs Rd - No 58_Cd_Seg4	Obtrusive - Cd	N.A.	7	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Parrs Rd - No 58_Cd_Seg5	Obtrusive - Cd	N.A.	107	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Parrs Rd - No 59_Cd_Seg1	Obtrusive - Cd	N.A.	103	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Parrs Rd - No 59_Cd_Seg10	Obtrusive - Cd	N.A.	123	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Parrs Rd - No 59_Cd_Seg2	Obtrusive - Cd	N.A.	87	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Parrs Rd - No 59_Cd_Seg3	Obtrusive - Cd	N.A.	141	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Parrs Rd - No 59_Cd_Seg4	Obtrusive - Cd	N.A.	95	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Parrs Rd - No 59_Cd_Seg5	Obtrusive - Cd	N.A.	188	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Parrs Rd - No 59_Cd_Seg6	Obtrusive - Cd	N.A.	134	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Parrs Rd - No 59_Cd_Seg7	Obtrusive - Cd	N.A.	130	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Parrs Rd - No 59_Cd_Seg8	Obtrusive - Cd	N.A.	129	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Parrs Rd - No 59_Cd_Seg9	Obtrusive - Cd	N.A.	155	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Sangsters Rd - No 09_Cd_Seg1	Obtrusive - Cd	N.A.	888	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Sangsters Rd - No 09_Cd_Seg2	Obtrusive - Cd	N.A.	906	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Sangsters Rd - No 09_Cd_Seg3	Obtrusive - Cd	N.A.	807	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Sangsters Rd - No 09_Cd_Seg4	Obtrusive - Cd	N.A.	808	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Sangsters Rd - No 09_Cd_Seg5	Obtrusive - Cd	N.A.	375	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Sangsters Rd - No 09_Cd_Seg6	Obtrusive - Cd	N.A.	336	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Sangsters Rd - No 09_Cd_Seg7	Obtrusive - Cd	N.A.	334	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Sangsters Rd - No 11_Cd_Seg1	Obtrusive - Cd	N.A.	83	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Sangsters Rd - No 11_Cd_Seg10	Obtrusive - Cd	N.A.	99	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Sangsters Rd - No 11_Cd_Seg2	Obtrusive - Cd	N.A.	7	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Sangsters Rd - No 11_Cd_Seg3	Obtrusive - Cd	N.A.	32	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Sangsters Rd - No 11_Cd_Seg4	Obtrusive - Cd	N.A.	6	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Sangsters Rd - No 11_Cd_Seg5	Obtrusive - Cd	N.A.	85	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Sangsters Rd - No 11_Cd_Seg6	Obtrusive - Cd	N.A.	95	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Sangsters Rd - No 11_Cd_Seg7	Obtrusive - Cd	N.A.	87	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Sangsters Rd - No 11_Cd_Seg8	Obtrusive - Cd	N.A.	90	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Sangsters Rd - No 11_Cd_Seg9	Obtrusive - Cd	N.A.	91	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Sangsters Rd - No 15_Cd_Seg1	Obtrusive - Cd	N.A.	131	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Sangsters Rd - No 15_Cd_Seg2	Obtrusive - Cd	N.A.	199	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Sangsters Rd - No 15_Cd_Seg3	Obtrusive - Cd	N.A.	183	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Sangsters Rd - No 25_Cd_Seg1	Obtrusive - Cd	N.A.	223	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Sangsters Rd - No 25_Cd_Seg2	Obtrusive - Cd	N.A.	284	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Sangsters Rd - No 25_Cd_Seg3	Obtrusive - Cd	N.A.	293	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Sangsters Rd - No 43_Cd_Seg1	Obtrusive - Cd	N.A.	503	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Sangsters Rd - No 43_Cd_Seg2	Obtrusive - Cd	N.A.	573	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Sangsters Rd - No 43_Cd_Seg3	Obtrusive - Cd	N.A.	295	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Sangsters Rd - No 43_Cd_Seg4	Obtrusive - Cd	N.A.	0	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Sangsters Rd - No 43_Cd_Seg5	Obtrusive - Cd	N.A.	0	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Sangsters Rd - No 43_Cd_Seg6	Obtrusive - Cd	N.A.	107	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Sangsters Rd - No 43_Cd_Seg7	Obtrusive - Cd	N.A.	231	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Stoney Creek Rd - No 819_Cd_Seg1	Obtrusive - Cd	N.A.	515	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Stoney Creek Rd - No 819_Cd_Seg2	Obtrusive - Cd	N.A.	520	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Stoney Creek Rd - No 819_Cd_Seg3	Obtrusive - Cd	N.A.	0	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Stoney Creek Rd - No 819_Cd_Seg4	Obtrusive - Cd	N.A.	510	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Stoney Creek Rd - No 819_Cd_Seg5	Obtrusive - Cd	N.A.	519	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Stoney Creek Rd - No 819_Cd_Seg6	Obtrusive - Cd	N.A.	521	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Stoney Creek Rd - No 819_Cd_Seg7	Obtrusive - Cd	N.A.	520	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Stoney Creek Rd - No 819_Cd_Seg8	Obtrusive - Cd	N.A.	530	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Stoney Creek Rd - No 821_Cd_Seg1	Obtrusive - Cd	N.A.	213	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Stoney Creek Rd - No 821_Cd_Seg2	Obtrusive - Cd	N.A.	0	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Stoney Creek Rd - No 821_Cd_Seg3	Obtrusive - Cd	N.A.	702	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Stoney Creek Rd - No 821_Cd_Seg4	Obtrusive - Cd	N.A.	707	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)

GLARE CALCULATION RESULTS - SE AND SW PROPERTIES

AS/NZS4282:2019 Control of Obtrusive Lighting Effects - Calculation Summary - Glare

Label	CalcType	Units	Max	Description
Clevely Line - No 163_Cd_Seg1	Obtrusive - Cd	N.A.	76	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Clevely Line - No 163_Cd_Seg2	Obtrusive - Cd	N.A.	76	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Clevely Line - No 163_Cd_Seg3	Obtrusive - Cd	N.A.	77	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Clevely Line - No 163_Cd_Seg4	Obtrusive - Cd	N.A.	78	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Clevely Line - No 163_Cd_Seg5	Obtrusive - Cd	N.A.	79	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Clevely Line - No 163_Cd_Seg6	Obtrusive - Cd	N.A.	79	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Clevely Line - No 163_Cd_Seg7	Obtrusive - Cd	N.A.	10	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Railway Rd - No 422_Cd_Seg1	Obtrusive - Cd	N.A.	312	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Railway Rd - No 422_Cd_Seg2	Obtrusive - Cd	N.A.	515	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Railway Rd - No 422_Cd_Seg3	Obtrusive - Cd	N.A.	514	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Railway Rd - No 422_Cd_Seg4	Obtrusive - Cd	N.A.	425	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Railway Rd - No 422_Cd_Seg5	Obtrusive - Cd	N.A.	439	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Railway Rd - No 422_Cd_Seg6	Obtrusive - Cd	N.A.	0	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Railway Rd - No 422_Cd_Seg7	Obtrusive - Cd	N.A.	383	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Roberts Line - No 761_Cd_Seg1	Obtrusive - Cd	N.A.	212	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Roberts Line - No 761_Cd_Seg2	Obtrusive - Cd	N.A.	217	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Roberts Line - No 761_Cd_Seg3	Obtrusive - Cd	N.A.	216	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Roberts Line - No 761_Cd_Seg4	Obtrusive - Cd	N.A.	222	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Roberts Line - No 761_Cd_Seg5	Obtrusive - Cd	N.A.	84	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Roberts Line - No 761_Cd_Seg6	Obtrusive - Cd	N.A.	214	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Roberts Line - No 761_Cd_Seg7	Obtrusive - Cd	N.A.	85	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Roberts Line - No 771_Cd_Seg1	Obtrusive - Cd	N.A.	52	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Roberts Line - No 771_Cd_Seg10	Obtrusive - Cd	N.A.	54	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Roberts Line - No 771_Cd_Seg11	Obtrusive - Cd	N.A.	22	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Roberts Line - No 771_Cd_Seg2	Obtrusive - Cd	N.A.	53	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Roberts Line - No 771_Cd_Seg3	Obtrusive - Cd	N.A.	68	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Roberts Line - No 771_Cd_Seg4	Obtrusive - Cd	N.A.	0	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Roberts Line - No 771_Cd_Seg5	Obtrusive - Cd	N.A.	73	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Roberts Line - No 771_Cd_Seg6	Obtrusive - Cd	N.A.	75	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Roberts Line - No 771_Cd_Seg7	Obtrusive - Cd	N.A.	24	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Roberts Line - No 771_Cd_Seg8	Obtrusive - Cd	N.A.	68	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Roberts Line - No 771_Cd_Seg9	Obtrusive - Cd	N.A.	23	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Roberts Line - No 787_Cd_Seg1	Obtrusive - Cd	N.A.	17	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Roberts Line - No 787_Cd_Seg2	Obtrusive - Cd	N.A.	29	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Roberts Line - No 787_Cd_Seg3	Obtrusive - Cd	N.A.	17	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Roberts Line - No 787_Cd_Seg4	Obtrusive - Cd	N.A.	13	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Roberts Line - No 787_Cd_Seg5	Obtrusive - Cd	N.A.	17	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Roberts Line - No 787_Cd_Seg6	Obtrusive - Cd	N.A.	28	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Roberts Line - No 787_Cd_Seg7	Obtrusive - Cd	N.A.	27	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Roberts Line - No 787_Cd_Seg8	Obtrusive - Cd	N.A.	26	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Roberts Line - No 803_Cd_Seg1	Obtrusive - Cd	N.A.	43	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Roberts Line - No 803_Cd_Seg2	Obtrusive - Cd	N.A.	17	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Roberts Line - No 803_Cd_Seg3	Obtrusive - Cd	N.A.	43	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Roberts Line - No 803_Cd_Seg4	Obtrusive - Cd	N.A.	43	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Roberts Line - No 803_Cd_Seg5	Obtrusive - Cd	N.A.	0	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Roberts Line - No 803_Cd_Seg6	Obtrusive - Cd	N.A.	40	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Roberts Line - No 814_Cd_Seg1	Obtrusive - Cd	N.A.	28	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Roberts Line - No 814_Cd_Seg2	Obtrusive - Cd	N.A.	6	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Roberts Line - No 814_Cd_Seg3	Obtrusive - Cd	N.A.	0	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Roberts Line - No 814_Cd_Seg4	Obtrusive - Cd	N.A.	6	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Roberts Line - No 824_Cd_Seg1	Obtrusive - Cd	N.A.	37	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Roberts Line - No 824_Cd_Seg2	Obtrusive - Cd	N.A.	36	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Roberts Line - No 824_Cd_Seg3	Obtrusive - Cd	N.A.	36	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Roberts Line - No 824_Cd_Seg4	Obtrusive - Cd	N.A.	6	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Roberts Line - No 824A_Cd_Seg1	Obtrusive - Cd	N.A.	49	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Roberts Line - No 824A_Cd_Seg10	Obtrusive - Cd	N.A.	48	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Roberts Line - No 824A_Cd_Seg11	Obtrusive - Cd	N.A.	4	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Roberts Line - No 824A_Cd_Seg2	Obtrusive - Cd	N.A.	49	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Roberts Line - No 824A_Cd_Seg3	Obtrusive - Cd	N.A.	48	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Roberts Line - No 824A_Cd_Seg4	Obtrusive - Cd	N.A.	48	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Roberts Line - No 824A_Cd_Seg5	Obtrusive - Cd	N.A.	48	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Roberts Line - No 824A_Cd_Seg6	Obtrusive - Cd	N.A.	48	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Roberts Line - No 824A_Cd_Seg7	Obtrusive - Cd	N.A.	4	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Roberts Line - No 824A_Cd_Seg8	Obtrusive - Cd	N.A.	29	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Roberts Line - No 824A_Cd_Seg9	Obtrusive - Cd	N.A.	4	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Sangsters Rd - No 73_Cd_Seg1	Obtrusive - Cd	N.A.	488	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Sangsters Rd - No 73_Cd_Seg2	Obtrusive - Cd	N.A.	490	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Sangsters Rd - No 73_Cd_Seg3	Obtrusive - Cd	N.A.	496	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Sangsters Rd - No 73_Cd_Seg4	Obtrusive - Cd	N.A.	504	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Sangsters Rd - No 73_Cd_Seg5	Obtrusive - Cd	N.A.	246	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Sangsters Rd - No 91_Cd_Seg1	Obtrusive - Cd	N.A.	399	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Sangsters Rd - No 91_Cd_Seg2	Obtrusive - Cd	N.A.	304	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Sangsters Rd - No 91_Cd_Seg3	Obtrusive - Cd	N.A.	401	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Sangsters Rd - No 91_Cd_Seg4	Obtrusive - Cd	N.A.	378	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Sangsters Rd - No 91_Cd_Seg5	Obtrusive - Cd	N.A.	133	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Sangsters Rd - No 91_Cd_Seg6	Obtrusive - Cd	N.A.	344	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Sangsters Rd - No 91_Cd_Seg7	Obtrusive - Cd	N.A.	130	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Sangsters Rd - No 91_Cd_Seg8	Obtrusive - Cd	N.A.	278	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Sangsters Rd - No 95_Cd_Seg1	Obtrusive - Cd	N.A.	372	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Sangsters Rd - No 95_Cd_Seg2	Obtrusive - Cd	N.A.	374	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Sangsters Rd - No 95_Cd_Seg3	Obtrusive - Cd	N.A.	377	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Sangsters Rd - No 95_Cd_Seg4	Obtrusive - Cd	N.A.	379	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Sangsters Rd - No 95_Cd_Seg5	Obtrusive - Cd	N.A.	367	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Tutaki Rd - No 428_Cd_Seg1	Obtrusive - Cd	N.A.	79	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Tutaki Rd - No 428_Cd_Seg2	Obtrusive - Cd	N.A.	79	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Tutaki Rd - No 428_Cd_Seg3	Obtrusive - Cd	N.A.	77	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)

GLARE CALCULATION RESULTS - NW PROPERTIES

AS/NZS4282:2019 Control of Obtrusive Lighting Effects - Calculation Summary - Glare

Label	CalcType	Units	Max	Description
Maple St - No 01_Cd_Seg1	Obtrusive - Cd	N.A.	0	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Maple St - No 01_Cd_Seg2	Obtrusive - Cd	N.A.	0	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Maple St - No 01_Cd_Seg3	Obtrusive - Cd	N.A.	0	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Maple St - No 01_Cd_Seg4	Obtrusive - Cd	N.A.	0	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Maple St - No 01_Cd_Seg5	Obtrusive - Cd	N.A.	30	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Maple St - No 01_Cd_Seg6	Obtrusive - Cd	N.A.	30	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Maple St - No 01A_Cd_Seg1	Obtrusive - Cd	N.A.	0	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Maple St - No 01A_Cd_Seg2	Obtrusive - Cd	N.A.	0	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Maple St - No 01A_Cd_Seg3	Obtrusive - Cd	N.A.	0	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Maple St - No 01A_Cd_Seg4	Obtrusive - Cd	N.A.	0	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Maple St - No 01A_Cd_Seg5	Obtrusive - Cd	N.A.	0	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Maple St - No 01A_Cd_Seg6	Obtrusive - Cd	N.A.	0	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Maple St - No 01A_Cd_Seg7	Obtrusive - Cd	N.A.	0	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Maple St - No 01A_Cd_Seg8	Obtrusive - Cd	N.A.	0	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Maple St - No 03_Cd_Seg1	Obtrusive - Cd	N.A.	0	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Maple St - No 03_Cd_Seg2	Obtrusive - Cd	N.A.	0	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Maple St - No 03_Cd_Seg3	Obtrusive - Cd	N.A.	0	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Maple St - No 03_Cd_Seg4	Obtrusive - Cd	N.A.	0	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Maple St - No 03_Cd_Seg5	Obtrusive - Cd	N.A.	0	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Maple St - No 05 (2 Storey)_Cd_Seg1	Obtrusive - Cd	N.A.	56	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Maple St - No 05 (2 Storey)_Cd_Seg2	Obtrusive - Cd	N.A.	56	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Maple St - No 05 (2 Storey)_Cd_Seg3	Obtrusive - Cd	N.A.	55	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Maple St - No 05 (2 Storey)_Cd_Seg4	Obtrusive - Cd	N.A.	0	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Maple St - No 05 (2 Storey)_Cd_Seg5	Obtrusive - Cd	N.A.	56	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Maple St - No 05 (2 Storey)_Cd_Seg6	Obtrusive - Cd	N.A.	0	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Maple St - No 05 (2 Storey)_Cd_Seg7	Obtrusive - Cd	N.A.	57	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Maple St - No 07_Cd_Seg1	Obtrusive - Cd	N.A.	0	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Maple St - No 07_Cd_Seg2	Obtrusive - Cd	N.A.	31	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Maple St - No 07A_Cd_Seg1	Obtrusive - Cd	N.A.	32	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Maple St - No 07A_Cd_Seg2	Obtrusive - Cd	N.A.	32	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Maple St - No 09_Cd_Seg1	Obtrusive - Cd	N.A.	0	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Maple St - No 09_Cd_Seg2	Obtrusive - Cd	N.A.	0	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Maple St - No 09A (2 Storey)_Cd_Seg1	Obtrusive - Cd	N.A.	55	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Maple St - No 09A (2 Storey)_Cd_Seg2	Obtrusive - Cd	N.A.	55	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Maple St - No 09A (2 Storey)_Cd_Seg3	Obtrusive - Cd	N.A.	55	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Maple St - No 09A (2 Storey)_Cd_Seg4	Obtrusive - Cd	N.A.	0	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Maple St - No 09A (2 Storey)_Cd_Seg5	Obtrusive - Cd	N.A.	56	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Maple St - No 09A (2 Storey)_Cd_Seg6	Obtrusive - Cd	N.A.	56	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Maple St - No 11_Cd_Seg1	Obtrusive - Cd	N.A.	30	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Maple St - No 11_Cd_Seg2	Obtrusive - Cd	N.A.	30	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Maple St - No 11A_Cd_Seg1	Obtrusive - Cd	N.A.	33	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Maple St - No 11A_Cd_Seg2	Obtrusive - Cd	N.A.	33	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Maple St - No 13_Cd_Seg1	Obtrusive - Cd	N.A.	31	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Maple St - No 13_Cd_Seg2	Obtrusive - Cd	N.A.	31	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Maple St - No 15_Cd_Seg1	Obtrusive - Cd	N.A.	31	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Maple St - No 15_Cd_Seg2	Obtrusive - Cd	N.A.	25	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Maple St - No 17_Cd_Seg1	Obtrusive - Cd	N.A.	17	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Maple St - No 17_Cd_Seg2	Obtrusive - Cd	N.A.	31	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Maple St - No 19_Cd_Seg1	Obtrusive - Cd	N.A.	0	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Maple St - No 19_Cd_Seg2	Obtrusive - Cd	N.A.	32	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Maple St - No 19_Cd_Seg3	Obtrusive - Cd	N.A.	32	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Maple St - No 21_Cd_Seg1	Obtrusive - Cd	N.A.	59	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Maple St - No 21_Cd_Seg2	Obtrusive - Cd	N.A.	0	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Maple St - No 21_Cd_Seg3	Obtrusive - Cd	N.A.	59	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Maple St - No 21_Cd_Seg4	Obtrusive - Cd	N.A.	463	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Maple St - No 57_Cd_Seg1	Obtrusive - Cd	N.A.	64	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Maple St - No 57_Cd_Seg2	Obtrusive - Cd	N.A.	147	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Maple St - No 57_Cd_Seg3	Obtrusive - Cd	N.A.	63	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Maple St - No 57_Cd_Seg4	Obtrusive - Cd	N.A.	137	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Maple St - No 57_Cd_Seg5	Obtrusive - Cd	N.A.	114	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Te Ngaio Rd - No 241 (2 Storey)_Cd_Seg1	Obtrusive - Cd	N.A.	70	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Te Ngaio Rd - No 241 (2 Storey)_Cd_Seg10	Obtrusive - Cd	N.A.	96	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Te Ngaio Rd - No 241 (2 Storey)_Cd_Seg11	Obtrusive - Cd	N.A.	32	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Te Ngaio Rd - No 241 (2 Storey)_Cd_Seg12	Obtrusive - Cd	N.A.	32	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Te Ngaio Rd - No 241 (2 Storey)_Cd_Seg13	Obtrusive - Cd	N.A.	32	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Te Ngaio Rd - No 241 (2 Storey)_Cd_Seg14	Obtrusive - Cd	N.A.	32	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Te Ngaio Rd - No 241 (2 Storey)_Cd_Seg2	Obtrusive - Cd	N.A.	69	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Te Ngaio Rd - No 241 (2 Storey)_Cd_Seg3	Obtrusive - Cd	N.A.	57	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Te Ngaio Rd - No 241 (2 Storey)_Cd_Seg4	Obtrusive - Cd	N.A.	0	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Te Ngaio Rd - No 241 (2 Storey)_Cd_Seg5	Obtrusive - Cd	N.A.	87	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Te Ngaio Rd - No 241 (2 Storey)_Cd_Seg6	Obtrusive - Cd	N.A.	94	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Te Ngaio Rd - No 241 (2 Storey)_Cd_Seg7	Obtrusive - Cd	N.A.	54	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Te Ngaio Rd - No 241 (2 Storey)_Cd_Seg8	Obtrusive - Cd	N.A.	0	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Te Ngaio Rd - No 241 (2 Storey)_Cd_Seg9	Obtrusive - Cd	N.A.	0	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Te Ngaio Rd - No 242_Cd_Seg1	Obtrusive - Cd	N.A.	60	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Te Ngaio Rd - No 242_Cd_Seg2	Obtrusive - Cd	N.A.	241	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Te Ngaio Rd - No 242_Cd_Seg3	Obtrusive - Cd	N.A.	246	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Te Ngaio Rd - No 242_Cd_Seg4	Obtrusive - Cd	N.A.	0	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Te Ngaio Rd - No 242_Cd_Seg5	Obtrusive - Cd	N.A.	234	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Te Ngaio Rd - No 245_Cd_Seg1	Obtrusive - Cd	N.A.	69	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Te Ngaio Rd - No 245_Cd_Seg2	Obtrusive - Cd	N.A.	73	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Te Ngaio Rd - No 245_Cd_Seg3	Obtrusive - Cd	N.A.	70	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Te Ngaio Rd - No 245_Cd_Seg4	Obtrusive - Cd	N.A.	88	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)
Te Ngaio Rd - No 245_Cd_Seg5	Obtrusive - Cd	N.A.	96	Maximum Luminous Intensity of 1,000 cd (Zone A2 curfew hours)

SPILL LIGHT NOTES

1. ACCORDING TO AS/NZS 4282:2019 (CONTROL OF THE OBTRUSIVE EFFECTS OF OUTDOOR LIGHTING) THE FREIGHT HUB IS WITHIN ZONE A2 (SPARSELY INHABITED RURAL / SEMI-RURAL AREAS WITH LOW DISTRICT BRIGHTNESS) WHERE THE GLARE (MAXIMUM LUMINOUS INTENSITY PER LUMINAIRE - cd) (ON THE FRONT FACES OF RESIDENTIAL BUILDINGS CONTAINING WINDOWS) IS NOT PERMITTED TO EXCEED 1,000 cd DURING CURFEW HOURS (BETWEEN 11pm AND 6am). DURING NON-CURFEW HOURS THIS LIMIT INCREASES TO 7,500 cd.
2. ONLY THE CLOSEST RESIDENTIAL BUILDINGS SURROUNDING THE PROPOSED RAIL FREIGHT HUB SITE WERE CONSIDERED AND THE CALCULATION RESULTS INDICATE THAT THE AMOUNT OF GLARE DOES NOT EXCEED THE MAXIMUM LIMIT (1,000 cd) SPECIFIED FOR ENVIRONMENTAL ZONE A2. THE EXISTING TREES AND VEGETATION (BETWEEN THE PROPERTIES AND RAIL FREIGHT HUB) WERE NOT TAKEN INTO ACCOUNT THEREFORE THE ACTUAL GLARE (WITHIN THE RESIDENTIAL PROPERTIES) SHOULD BE LOWER THAN THE CURRENT RESULTS INDICATE.

REV: B

KiwiRail
Backbone of integrated transport networks

Stantec

Job No: 310003007

KIWIRAIL HUB
SITE 3-G2 LIGHTING
GLARE CALCULATION RESULTS

Drawn By: IAN CAMPBELL
Scale: AS SHOWN
FIG: 211

C:\pwworkdir\ap_projects01\d0117046\310003007-FIG-211-SITE 3-G2 Glare Calculation Results.dwg