Before the Hearings Panel
At Porirua City Council

Under	Clause 14, Schedule 1 of the Resource Management Act 1991
In the matter of	the Proposed Porirua District Plan
Between	**Various**
	Submitters
And	**Porirua City Council**
	Respondent

Statement of evidence of Glen Wright on behalf of Porirua City Council (Lighting Evidence)

Date: 30 September 2021

INTRODUCTION:

1 My full name is Glen Andrew Wright. I am employed as a Principal at Stephenson & Turner New Zealand Limited, in Wellington.

2 I have prepared this statement of evidence on behalf of the Porirua City Council (**Council**) in respect of technical related matters arising from the submissions and further submissions on the Proposed Porirua District Plan (**PDP**).

3 Specifically, this statement of evidence relates to the matters in the Light Chapter.

4 I am authorised to provide this evidence on behalf of the Council.

QUALIFICATIONS AND EXPERIENCE

5 I hold the qualifications of Registered Engineering Associate.

6 I have worked for Stephenson & Turner New Zealand Limited, an architecture and engineering consultancy for 30 years and have 35 years of experience in lighting.

7 I am a member of Engineering New Zealand and Associate Member of the Illuminating Engineering Society of Australia and New Zealand.

Code of conduct

8 I have read the Code of Conduct for Expert Witnesses set out in the Environment Court's Practice Note 2014. I have complied with the Code of Conduct in preparing my evidence and will continue to comply with it while giving oral evidence before the Environment Court. My qualifications as an expert are set out above. Except where I state I rely on the evidence of another person, I confirm that the issues addressed in this statement of evidence are within my area of expertise, and I have

not omitted to consider material facts known to me that might alter or detract from my expressed opinions.

SUMMARY

9 My name is Glen Wright.

10 I have been asked by the Council to provide lighting evidence in relation to the appeal on Chapter Light, which primarily relates to general district wide matters on artificial lighting.

11 My statement of evidence addresses submitter comments on the Light Chapter in the PDP.

INVOLVEMENT WITH THE PROPOSED PLAN

12 I have been involved in the PDP since early 2018 and provided the following services:

- An analysis of the effectiveness and appropriateness of current operative lighting standards in managing nuisance effects of light spill and glare.
- An evaluation of the lighting requirements of key institutions in Porirua.
- Recommendations for new lighting standards to manage light spill and glare for each of the proposed seven environmental zones.
- Recommendations for managing nuisance light overspill and glare effects at the interface between the City Centre zone, Local Business Centre zone and Industrial zones with more sensitive environments.

- Author of Report on Porirua City Council District Plan Lighting Provisions dated 12 November 2018.

- Author of Porirua City District Plan Lighting Provisions - Draft Lighting Section dated 12 November 2018

SCOPE OF EVIDENCE

13 My statement of evidence addresses matters raised by the following submitters:

13.1 Waka Kotahi NZ Transport Authority – Submission Number - 82;

13.2 Matthew Reading – Submission Number – 32.

14 My statement of evidence only addresses those submission points to which I have been directed by council officers.

SUBMISSIONS

LIGHT-S1 – General Standards – WAKA KOTAHI NZ TRANSPORT AUTHORITY

15 In submission from Waka Kotahi, they support requiring an assessment for outdoor lighting against 'AS/NZ 4282.2019 Control of the Obtrusive Effects of Outdoor Lighting' and the additional provisions included in this standard.

16 Waka Kotahi seeks the inclusion of an assessment to identify the underlying environmental zoning identified in Table 3.1 of 'AS/NZ 4282.2019 Control of the Obtrusive Effects of Outdoor Lighting' is required to ensure lighting and lighting levels are appropriate in each environmental zone.

Response

17 When drafting the lighting rules the decision was made to match the underlying environmental zones identified in Table 3.1 of AS/NZ 4282 to PDP zones and provide zones with corresponding lighting limit recommendations from AS/NZS 4282, this decision was based on the following objectives:

17.1 To provide lighting rules that did not necessitate the purchase of standard AS/NZS 4282 to determine the lighting limits that apply. Current price $110.

17.2 To provide a simple method for defining the lighting rules that apply to a site based on its DP zone. This ensures that the lighting rules are appropriate for the activities expected within the zone and to protect the level of amenity expected within the zone.

18 The lighting rules applicable to PDP zones were determined through an assessment to identify the underlying environmental zoning identified in Table 3.1 of AS/NZ 4282:2019 (refer below) and these zones were assigned to the PDP zones to determine the appropriate AS/NZ 4282:2019 recommendations on lighting limits.

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

Part AS/NZS 4282:2019 Table 3.1

19 The allocation of AS/NZS 4282:2019 environmental zones to PDP zones is shown in the Table 1 below.

Zone	A0 Intrinsically dark	A1 Dark	A2 Low district brightness	A3 Medium district brightness	A4 High district brightness
General Rural			✓		
Rural Lifestyle			✓		
Settlement			✓		
Future Urban			✓		
Residential				✓	
Open Space and Recreation				✓	
Maori Purpose				✓	
Neighbourhood Centre					✓
Local Centre					✓
Large Format Retail					✓
Mixed Use					✓
City Centre					✓
General Industrial					✓
Hospital					✓
Special Purpose (BRANZ)					✓

Table 1 – Allocation of Environmental Zones to PDP Zones

20 The allocation of lighting rules or permitted activity standards based on DP zones is common across the majority of DP's.

21 The allocation of lighting rules or permitted activity standards based on DP zones has been successfully implemented in Auckland Councils Auckland Unitary Plan (AUP) Section E24 Lighting. I have extensive experience in the application of AUP E24 for assessments of lighting environmental effects (AEE) of proposed outdoor lighting installations and as a lighting expert engaged by Auckland Councils Resource Consents and Monitoring Teams for resource consent applications and Environment Court hearings. This has included Environmental Court hearings for the America's Cup Village and Eden Park Concerts. The ability to readily establish the light sensitivity of a site and the appropriate obtrusive light limits for surrounding environments consisting of many differing zones made assessments of lighting effects clear without ambiguity or disagreement.

Recommendation

22 I do not recommend the adoption of the Waka Kotahi request to change to a requirement for the underlying environmental zoning to be determined through reference to AS/NZS4282 as this has already been done in the preparation of the PDP Light Chapter, it would have the potential to create ambiguity and disagreement.

LIGHT-S2 - Light Spill – WAKA KOTAHI NZ TRANSPORT AUTHORITY

23 In submission from Waka Kotahi, they support the intention of this standard that vertical lighting needs to be controlled.

24 Waka Kotahi considers the approach to identify maximum lighting levels within the General Rural, Rural Lifestyle, Settlement and Future Urban Zones. Within 'AS/NZ 4282.2019 Control of the Obtrusive Effects of Outdoor Lighting' lighting levels are dependent on the underlying environmental zone and are not able to be broadly applied as presented in this section.

25 Waka Kotahi seeks the addition of consideration for these environmental zones within this standard where artificial lighting faces the state highway.

26 Waka Kotahi believes sufficient consideration has not been given to the measurement of vertical illuminance when adjacent or facing state highways. Seeks the addition of measurement provisions where lighting is visible from a state highway and the adoption of limits on the vertical illuminance at the edge of the state highway carriageway.

27 Waka Kotahi have requested that the lux limit in rule LIGHT-S2.1a is changed from 10 lux to 5 lux.

Response

28 As previously outlined I do not support the adoption of the Waka Kotahi request to change to a requirement for the underlying environmental zoning to be determined through reference to AS/NZS4282 for the same reasons outlined earlier.

29 I do not support the adoption of the Waka Kotahi request for the addition of consideration for these environmental zones within this standard where artificial lighting faces the state highway. I believe the current zone rules provide adequate protection of state highway road users. Effects on State Highway road users are adequately control by the LIGHT-S3 - Glare lighting rules which are based on the recommendations of AS/NZS 4282:2019.

30 I do not support the adoption of the Waka Kotahi request for the addition of measurement provisions where lighting is visible from a state highway and the adoption of limits on the vertical illuminance at the edge of the state highway carriageway. I believe the current zone rules provide adequate protection of state highway road users. Effects on State Highway road users from vertical light I see as a safety benefit rather than a safety hazard. Furthermore, where the State Highway is provided with lighting any impact of vertical light at the edge of the State Highway carriageway will be further diminished.

31 A common situation is a petrol station or local shop with under canopy lighting, they typically provide vertical illuminance to the edge of a carriageway in excess of the Waka Kotahi requested limits, I'm not aware of any such situation that has caused me a distraction as a driver. With the increased traffic and pedestrian movements around these situations it is my opinion that vertical illuminance to the carriageway would be a safety benefit. I would be interested in any accident data and associated cause investigations that Waka Kotahi could provide to support their request.

32 I support the Waka Kotahi request that the lux limit in rule LIGHT-S2.1a is changed from 10 lux to 5 lux as this aligns with the final version of AS/NZS 4282:2019.

33 The lux limit in rule LIGHT-S2.3b should also be changed from 4 lux to 5 lux as this aligns with the final version of AS/NZS 4282:2019.

Recommendation

34 I do not recommend the adoption of the Waka Kotahi request to change to a requirement for the underlying environmental zoning to be determined through reference to AS/NZS4282 as this has already been done in the preparation of the PDP Light Chapter, it would have the potential to create ambiguity and disagreement.

35 I do not recommend the adoption of the Waka Kotahi request for the addition of measurement provisions where lighting is visible from a state highway and the adoption of limits on the vertical illuminance at the edge of the state highway carriageway as I believe such vertical illuminance can often contribute to improved safety for road users and pedestrians.

36 I recommend the following revisions to LIGHT-S2 Spill Light rules:

1a. 7.00am – 10.00pm ~~10~~ 5 Lux: and

3b. 10.00pm – 7.00am ~~4~~ 5 Lux: and

LIGHT-S3 – Glare - WAKA KOTAHI NZ TRANSPORT AUTHORITY

37 In submission from Waka Kotahi, they support the intention of this standard that glare needs to be controlled.

38 Does not support the approach to identify maximum lighting levels within the General Rural, Rural Lifestyle, Settlement and Future Urban Zones. Within 'AS/NZ 4282.2019 Control of the Obtrusive Effects of

Outdoor Lighting'' luminous intensity per luminaire levels are dependent on the underlying environmental zone and are not able to be broadly applied as presented in this section.

39 Waka Kotahi seeks the addition of consideration for these environmental zones within this standard where artificial lighting faces the state highway.

40 Waka Kotahi seeks the addition of the following requirement to rule Light-S3.1:

c. Where lighting is visible from a state highway limits are to be identified per Table 3.3 of AS/NZ 4282.2019 Control of the Obtrusive Effects of Outdoor Lighting.

Response

41 I do not support the adoption of the Waka Kotahi request for the addition of consideration for these environmental zones within this standard where artificial lighting faces the state highway. I believe the current zone rules provide adequate protection of state highway road users. Effects on State Highway road users are adequately control by the rules within LIGHT-S4 – Effects on road users and its Threshold Increment (TI) limits which address the actual effects of glare on a road user as it considers what sources of glare are actually occurring within the road users normal field of view and the level of adaption of the road users eyes which alters the level of glare sensation actually experienced.

Recommendation

42 I do not recommend the adoption of the Waka Kotahi request to change to a requirement for the underlying environmental zoning to be determined through reference to AS/NZS4282 as this has already been done in the preparation of the PDP Light Chapter, it would have the potential to create ambiguity and disagreement.

43 I do not recommend the adoption of Waka Kotahi request to add glare limits to state highways as Threshold Increment limits rules within LIGHT-S4 – Effects on road users are the appropriate limits for the control of glare with respect to road users.

LIGHT-S4 – Effects on road users - WAKA KOTAHI NZ TRANSPORT AUTHORITY

44 In submission from Waka Kotahi, they support the intention of this standard to mitigate the effects of artificial light on road users.

45 Waka Kotahi does not support the approach to identify maximum threshold increment within the General Rural, Rural Lifestyle, Settlement and Future Urban Zones. Within 'AS/NZ 4282.2019 Control of the Obtrusive Effects of Outdoor Lighting' the threshold increment and adaptation levels are dependent on the underlying environmental zone and are not able to be broadly applied as presented in this section.

46 Waka Kotahi seeks the addition of consideration for these environmental zones within this standard where artificial lighting faces the state highway.

47 The adaption luminance levels do not align with Table 3.2 of 'AS/NZ 4282.2019 Control of the Obtrusive Effects of Outdoor Lighting'. Waka Kotahi seeks for the adaption luminance levels to align with Table 3.2.

Response

48 I do not support the adoption of the Waka Kotahi request to change to a requirement for the underlying environmental zoning to be determined through reference to AS/NZS4282 for the same reasons outlined earlier.

49 I do not support the adoption of the Waka Kotahi request for the addition of consideration for these environmental zones within this standard where artificial lighting faces the state highway. I believe the current zone rules provide adequate protection of state highway road

users. Effects on State Highway road users are adequately control by the LIGHT-S3 - Glare lighting rules which are based on the recommendations of AS/NZS 4282:2019.

50 I agree with Waka Kotahi observation that the adaption luminance levels do not align with Table 3.2 of AS/NZ 4282.2019 and that they should be aligns. This was because the LIGHT Chapter was drafted before the release of the final version of AS/NZS 4282:2019.

51 We note that in the final version of AS/NZS 4282:2019 the threshold increment limit has changed from 15% to 20%. I recommend retaining the tighter limit of 15%, which I expect Waka Kotahi would concur with as it provides a higher level of protection to road users. It is my experience that 15% can be readily complied with through appropriate lighting design.

Recommendation

52 I do not recommend the adoption of the Waka Kotahi request to change to a requirement for the underlying environmental zoning to be determined through reference to AS/NZS4282 as this has already been done in the preparation of the PDP Light Chapter, it would have the potential to create ambiguity and disagreement.

53 I recommend the following revision to LIGHT-S4 rules:

1. Outdoor artificial lighting must not exceed a 15% threshold increment (based on adaption luminance of ~~1~~ 0.2 cd/m2) when calculated in the direction of travel within each traffic lane of any public road.

2. Outdoor artificial lighting must not exceed a 15% threshold increment limit (based on adaption luminance of ~~2~~ 1 cd/m2) when calculated in the direction of travel within each traffic lane of any public road.

3. Outdoor artificial lighting must not exceed a 15% threshold increment limit (based on adaption luminance of ~~10~~ 5 cd/m2) when calculated in the direction of travel within each traffic lane of any public road.

LIGHT-S5 - Skyglow – MATTHEW READING

54 In submission from Matthew Reading, he would like to see council implement a higher standard of compliance for both upward projected lighting, and the colour temperature of outdoor lighting. This will bring the policy closer to global best practice, but also to National best practice, as is being implemented by a growing number of Wairarapa Councils.

55 Mr Reading request that a higher standard of compliance for upward projected light should be targeted at 0% as this is still relatively easy to achieve with modern fixtures.

56 Any areas which are unable to achieve 0% upward lighting should either be on a timer to be off between 10pm-7am, or if even that is not achievable or desirable, should be on a motion activated circuit which illuminates on movement (Passive Infra-Red) and illuminates for a maximum of 5 minutes. This better aligns this policy with the goal of not adversely affecting views of the night -sky.

57 Mr Reading is also requesting that outdoor fixtures should utilise light sources that do not exceed a colour temperature of 3000K (warm white) as this will decrease the impact on sky glow and follows global best practice.

Response

58 We note that in the final version of AS/NZS 4282:2019 the upward light ratio limits have changed to lower values than those included in the LIGHT Chapter, if these lower values were adopted this would reduce

permitted levels close to 0%, with the changes limits in rule LIGHT-S5 Skyglow being:

1. Outdoor artificial lighting must not exceed an upward light ratio of ~~3~~ 1%.

2. Outdoor artificial lighting must not exceed an upward light ratio of ~~5~~ 2%.

3. Outdoor artificial lighting must not exceed an upward light ratio of ~~15~~ 3%.

59 I am familiar with the requested restrictions on upward light and light fixture light source colour temperature and the requirement for lighting controls where the upward light restriction cannot be achieved as these have been taken from the recent plan change implemented by South Wairarapa District Council (SWDC). I was the lighting expert engaged by SWDC to provide these new lighting provisions so that they could put in place lighting ordinance that meet the International Dark Sky Association to certify part of Wairarapa as an International Dark Sky Reserve (Wairarapa International Dark Sky Reserve).

60 The adoption of Mr Reading's request for change to 0% upward lighting can be expected to reduce skyglow over time and improve the quality of views of the night sky, but such adoption would place a burden on the community and council monitoring as it is a very restrictive measure with no light projection permitted above the horizontal. To be successfully implemented it would require the following:

60.1 Publicity to educate the community on what light fixtures are permitted and which aren't.

60.2 Agreement with local suppliers of light fixtures that they would only selling compliant light fixtures.

60.3 Additional lighting rule exemptions would be required to permit some uplighting activities to occur (as was implemented in the SWDC plan change). Exemptions would include:

60.3.1 Lighting controlled by motion-activated switches limiting the duration of illuminance to less than five (5) minutes after activation.

60.3.2 Only applies to outdoor light fixtures with a light output of 500 lumens or greater.

60.3.3 Lighting erected pursuant to civil aviation or maritime transport legislation

61 Similarly the adoption of Mr Reading's request for outdoor fixtures to utilise light sources that do not exceed a colour temperature of 3000K (warm white) can be expected to reduce skyglow over time and improve the quality of views of the night sky, such adoption would place a lessor burden on the community as compliant light fixtures are readily available at little or no cost premium. To be successfully implemented the same requirements outlined for 0% uplighting are recommended.

62 The adoption of 0% uplight and 3000K or less light fixture rules could be promoted as Council demonstrating environmental leadership, and caring about the quality of night time sky views but may require further public consultation and could see an increase in the volume of complaints made to Council Monitoring should members of the community actively report instances of non-compliance.

Recommendation

63 If Council are interested demonstrating environmental leadership, and the long term improvement of the quality of night time sky views then I

recommend the adoption of 0% uplight and 3000K or less light fixture rules along with the exemptions I have outlined.

64 In adoption of 0% uplight is not favoured by Council I recommend adoption of the final AS/NZS 4282:2019 upward light ratio limits, the following revision to LIGHT-S5 Skyglow rules is recommended:

1. Outdoor artificial lighting must not exceed an upward light ratio of ~~3~~ 1%.

2. Outdoor artificial lighting must not exceed an upward light ratio of ~~5~~ 2%.

3. Outdoor artificial lighting must not exceed an upward light ratio of ~~15~~ 3%.

Glen Wright
Principal
Stephenson & Turner New Zealand Limited

Date: 30 September 2021

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