

Before a Board of Inquiry
MacKays to Peka Peka Expressway Proposal

under: the Resource Management Act 1991

in the matter of: Notice of requirement for designation and resource consent applications by the NZ Transport Agency for the MacKays to Peka Peka Expressway Proposal

applicant: **NZ Transport Agency**
Requiring Authority

Statement of evidence of **Keith Gibson** (Lighting) for the NZ Transport Agency

Dated: 4 September 2012

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STATEMENT OF EVIDENCE OF KEITH GIBSON FOR THE NZ TRANSPORT AGENCY

QUALIFICATIONS AND EXPERIENCE

- 1 My full name is Keith Murray Gibson.
- 2 I am employed by the engineering consulting firm, Beca Carter Hollings and Ferner Limited (*Beca*) as a Technical Director, Building Services and Chief Electrical Engineer, Auckland Building Services. I am employed in the Auckland office.
- 3 I am a Chartered Professional Engineer and a Member of the Institution of Professional Engineers of New Zealand and the Illuminating Engineering Society of Australia and New Zealand. I have a New Zealand certificate of Engineering (Electrical), obtained in 1973 and I am registered with the Electrical Workers Registration Board.
- 4 I am a specialist in lighting systems, their design and scheme certification as well as wired controls, the design of electrical, control systems, general building services systems and associated wired systems for public road and commercial developments.
- 5 I am regularly employed to provide technical evaluations, specialist construction monitoring and compliance certification.
- 6 I have acted as an expert witness on many occasions, in particular at least 35 resource consent hearings, presenting evidence on exterior lighting systems.
- 7 My evidence is given in support of the Notice of Requirement (*NoR*) and applications for resource consents lodged with the Environmental Protection Authority (*EPA*) by the NZ Transport Agency (*NZTA*) for the construction, maintenance and operation of the MacKays to Peka Peka Expressway Project (*the Project*).
- 8 I am familiar with the area that the Project covers and the State highway and local roading network in the vicinity of the Project.
- 9 I am the author of the Assessment of Lighting Effects Technical Report,¹ which formed part of the Assessment of Environmental Effects (*AEE*) lodged in support of the Project.
- 10 I have read the Code of Conduct for Expert Witnesses as contained in the Environment Court Consolidated Practice Note (2011) and I

¹ Technical Report 8 (AEE, Volume 3). Refer also to the Lighting, Marking and Signage drawings contained in Volume 5 of the AEE (as listed in Section 1.3 of Technical Report 8).

agree to comply with it as if this Inquiry were before the Environment Court. My qualifications as an expert are set out above. I confirm that the issues addressed in this brief of evidence are within my area of expertise. I have not omitted to consider any material facts known to me that might alter or detract from the opinions expressed.

SCOPE OF EVIDENCE

- 11 My evidence will deal with the following:
 - 11.1 Executive summary.
 - 11.2 My background and role.
 - 11.3 A description of the existing lighting environment.
 - 11.4 Methodology used for the Project lighting design and for the assessment of effects from the lighting.
 - 11.5 Assessment of effects from the lighting.
 - 11.6 Mitigation methods to address the lighting effects.
 - 11.7 Response to submissions.
 - 11.8 Conclusions.

EXECUTIVE SUMMARY

- 12 The proposed Expressway and cycleway/pedestrian lighting design has been developed to a concept stage enabling potential effects to be assessed. Detailed design work, to bring the lighting scheme's documentation up to construction requirements, will be in accordance with the lighting approach described in Technical Report 8, as confirmed in proposed designation condition DC.63.
- 13 The construction yard lighting arrangements described in my evidence are based on best illumination engineering practice and my estimate of the anticipated effects.
- 14 The lighting scheme for the Project incorporates the following types of lighting:
 - 14.1 Expressway road lighting;
 - 14.2 Road bridge structure lighting;
 - 14.3 On ramp/off ramp road lighting;

- 14.4 Cycleway/Pedestrian path lighting; and
- 14.5 Temporary construction yard lighting.
- 15 In Technical Report 8, the following standards or criteria relating to exterior lighting have been referred to and applied, where relevant:²
- 15.1 AS/NZS 1158:2010 Lighting for Roads and Public Spaces - Parts 0 to 6 (*the Lighting Standard*);
- 15.2 AS 4282:1997 Control of Obtrusive Effects of Lighting (*the Spill Light and Glare Standard*);
- 15.3 Kāpiti Coast District Plan requirements (*the District Plan*); and
- 15.4 Guidance from an overseas survey listed in the Spill Light and Glare Standard on the appropriate light levels at residential property windows to avoid complaints of abnormal brightness, within a bedroom, from exterior lighting.
- 16 All road lighting is subject to the Lighting Standard, which details the level of lighting to be applied and the design criteria for different types of road.³ The road lighting for this Project has been designed to a Category V3 standard on the Expressway and a Category V4 Standard on the on/off ramps and local roads.⁴
- 17 The Spill Light and Glare Standard is used to assess light spill and glare from exterior lighting to residential properties. Although the Lighting Standard states that the Spill Light and Glare Standard should *not* strictly apply to road lighting,⁵ I have used it to provide guidance on whether mitigation of road lighting spill light might be appropriate in particular locations.⁶

² Technical Report 8, Sections 2.1 and 2.2.

³ In the Lighting Standard, road types are rated on the anticipated traffic volume and likely speed of the vehicles.

⁴ A V3 road is one where it is expected that there will be vehicle traffic only, a high traffic volume and high travelling speeds. A V4 road is one where it is expected that there will be mixed traffic and pedestrian traffic, moderate traffic volume and moderate to low travelling speeds.

⁵ Clause 7.3.3 Spill Light and Clause 7.3.4 Glare of AS/NZS 1158.1.2:2010 (the Lighting Standard) address these issues with the wording "Sideways spill light into properties and the direct view of luminaires may become obtrusive to residents (see AS 4282). Category V lighting is generally exempt from the provisions of AS 4282 due to the high levels of lighting necessary and because the lighting provides the community at large with an effective night barrier crash counter measure. In sensitive areas, various measures may alleviate spill light problems e.g. placement of lighting points, use of shields in the house side of the luminaire visor or the use of cut-off luminaires".

⁶ Further, the Spill Light and Glare Standard states in its Foreword section "Public lighting has been excluded from this Standard because such lighting is provided to facilitate all-night safety and security for the public at large".

- 18 The Spill Light and Glare Standard is relevant and has been used to assess the light spill and glare from both construction lighting and the cycleway / pedestrian path lighting.
- 19 Although the Project is not required to comply with the District Plan, given that a designation is sought, I have considered the District Plan requirements as a sensible guide to determine the appropriate lighting within the Project area. I have applied the District Plan's obtrusive light controls to the temporary construction lighting, and to the cycleway/pedestrian path lighting.
- 20 The District Plan specifically excludes road lighting from the obtrusive light controls within three District Plan zones adjacent to the Project. The exempt zones are the Residential Zone, the Open Space Zone and the Ngarara Zone.⁷ The District Plan controls have been taken as applicable to road lighting in other zones adjacent to the Expressway as a means of assessing the lighting effects.⁸
- 21 A supplementary guidance tool used is consideration of the level of spill light at residential properties, in order to avoid complaints due to the interior brightness of rooms at night. This assessment is based on an overseas study, which concluded that concerns about interior room brightness would start when spill light, greater than 3 lux, was measured at the window of a residential property.⁹
- 22 Overall, the assessment undertaken demonstrates that the Project lighting scheme will meet the relevant requirements of the Lighting Standard, and will be appropriate for the environment. With mitigation in particular locations, the Project lighting scheme will also meet the requirements of the District Plan for obtrusive light control, as well as the 3 lux spill light level appropriate to allay any residents' concerns about the interior brightness of rooms at night.¹⁰

⁷ District Plan, permitted activity standards for exterior lighting in zone D1 - Residential (D.1.2.1), Open Space (D.6.2.1) and Ngarara Zone (D.11.2.1(v)).

⁸ Permitted activity standards for exterior lighting apply in zones D3 - Commercial/Retail (D.3.2.1), D4 - Paraparaumu Town Centre (D.4.2.1), and D5 - Industrial/Service (D.5.2.1). These standards apply to spill light criteria only. There is no reference within these standards on the control of glare.

⁹ Technical Report 8, Section 3.2. This information is based on an extract from the *Measurement and judgement of light emissions of artificial light sources - Short Report*, HARTMANN, SCHINKE, WEHMEYER AND WESKE produced for the Bavarian State Ministry of Development and Environment, 1984 and reproduced in the Appendix of the Spill Light and Glare Standard. While this study has not received formal recognition in New Zealand, it appears to be the only definitive study undertaken to try and relate room brightness to complaints, sleeplessness and degradation of health.

¹⁰ Subject to detailed design, mitigation will likely be required to achieve the District Plan 10 lux spill light level, as well as the 3 lux spill light level, for dwellings at 51 Milne Street, and Metlifecare Kapiti Limited's dwellings at Oxford Court.

- 23 I have reviewed submissions lodged on the Project relevant to my area of expertise. Nothing raised in those submissions causes me to depart from the conclusions reached in my technical assessment of the Project.

BACKGROUND AND ROLE

- 24 I was engaged to review the lighting scheme for compliance with the Lighting Standard, the Spill Light and Glare Standard, and the District Plan requirements and to provide an overall assessment of the effects of the lighting schemes on the surrounding environment. The potential obtrusive lighting effects that I considered were:

- 24.1 Spill light – This is stray light that is emitted by a lighting installation that falls outside the boundaries of the property on which the installation is sited;
- 24.2 Glare – This is the effect of a bright light source to the eye dependant on distance, light emitted and the background viewing luminance. The amount that glare affects an individual is not categorical and is broadly broken into acceptable, distracting or disabling levels;
- 24.3 Sky glow - This is the brightening of the sky that results from the reflection of downward directed light or by directed upward light; and
- 24.4 Headlight sweep - This is the 'flicker' produced across a window (or similar) by car headlights as the vehicle is turning.

- 25 The assessment required that I evaluate and comment on the proposed road, cycleway/pedestrian path, and construction yard lighting schemes for the Project.
- 26 As part of this review, I developed possible mitigation measures to reduce the effects of Project lighting onto the adjacent environment.
- 27 AGI32¹¹ software simulations have been used to model the anticipated effects of the Project lighting.

¹¹ AGI32 is software for use in lighting design and is the predominant design tool used by the New Zealand Lighting Industry.

DESCRIPTION OF THE EXISTING ENVIRONMENT

- 28 The proposed Expressway will be constructed within areas that contain little or no lighting at present, and areas where there is road lighting presently serving either existing local or main roads.¹²
- 29 Within the areas of existing lighting, there is a mix of road lighting types, situated on the following roads:
- 29.1 Poplar Avenue (at the intersection with State Highway 1);
 - 29.2 Raumati Road (where the proposed Expressway will cross over Raumati Road);
 - 29.3 Kāpiti Road (where the proposed Expressway interchange will occur);
 - 29.4 Mazengarb Road (where the proposed Expressway will cross over Mazengarb Road);
 - 29.5 Te Moana Road (where the proposed Expressway interchange is located).

METHODOLOGY

- 30 Technical Report 8 was prepared using the following methodology:
- 30.1 Evaluation of the concept design drawings;
 - 30.2 Review of the concept design report;
 - 30.3 Review of applicable exterior lighting control criteria, including the Lighting Standard, the Spill Light and Glare Standard, the District Plan requirements, and overseas guidance on the appropriate level of spill light that would avoid concerns about the interior brightness of rooms at night;
 - 30.4 Viewing of the areas of the proposed Alignment where new or replacement lighting is proposed;
 - 30.5 Computer modelling of the proposed lighting utilising AGI32 software and corresponding production of isolux line (light level) diagrams (indicating the anticipated extent and intensity of spill light levels) to enable an assessment of the effects; and

¹² In Technical Report 8, the existing lighting environment is discussed in relation to each Project sector – refer Sections 6.3 (Sector 1), 7.6 (Sector 2), 8.3 (Sector 3) and 9.3 (Sector 4).

- 30.6 Production of aerial site photograph plans with the lighting levels (isolux plots) overlaid, indicating the extent of the anticipated spill lighting.¹³
- 31 As noted earlier, Section 2 of Technical Report 8 sets out the relevant lighting standards and District Plan criteria applied. In summary, these are:
- 31.1 The Lighting Standard, which categorises the standard of road lighting required according to the type of road and environment to ensure safe vehicle movement and identification of objects and pedestrians;¹⁴
- 31.2 The Spill Light and Glare Standard, which assists in evaluating spill light and glare when viewed from specific locations such as residential properties.¹⁵ While the Spill Light and Glare Standard does not strictly apply to road lighting, it provides guidance when assessing spill light from road lighting, and is also relevant when assessing whether construction yard lighting, or the cycleway / walkway lighting is obtrusive to residents. (Both the Lighting Standard and the District Plan refer to the Spill Light and Glare Standard);
- 31.3 The District Plan, which refers to a permitted level of spill light for adjoining properties.¹⁶ It sets this level at 10 lux, when measured 1.5 metres within an adjoining residential or rural boundary.¹⁷ As noted earlier, I have considered the District Plan requirements as a guide to appropriate lighting within the Project area, while acknowledging that a designation would not be required to comply with those requirements; and
- 31.4 As a further guide, a light spill level of 3 lux for residential properties, derived as a suitable value from an overseas study, has been used to evaluate concerns about interior room brightness which may start when there is spill light greater than 3 lux at the window of a residential property.

¹³ This information is depicted by the CF-MV-700 to CV-MF-780 series of drawings. (Refer Volume 5: Plan Set Technical Report A3 Appendices).

¹⁴ The Lighting Standard does not specifically address headlight sweep.

¹⁵ The Spill Light and Glare Standard only discusses sky glow in a general sense, and does not specifically address headlight sweep.

¹⁶ The District Plan does not specifically address headlight sweep.

¹⁷ District Plan, permitted activity standards for exterior lighting apply in zone D1 - Residential (D.1.2.1), Open Space (D.6.2.1) and Ngarara Zone (D.11.2.1(v)), but they do not apply to road lighting. Permitted activity standards for exterior lighting (including for road lighting) apply in zones D3 - Commercial/Retail (D.3.2.1), D4 - Paraparaumu Town Centre (D.4.2.1), and D5 - Industrial/Service (D.5.2.1).

- 32 Section 4 of Technical Report 8 focuses more specifically on the different types of lighting infrastructure.
- 33 My assessment has considered the lighting effects of the Project during both its construction and operational phases in each sector.
- 34 For each sector, Technical Report 8 detailed:¹⁸
- 34.1 The proposed lighting scheme;
 - 34.2 The existing environment;
 - 34.3 The assessment of lighting effects; and
 - 34.4 Any recommended mitigation works.

ASSESSMENT OF EFFECTS OF THE PROPOSED LIGHTING

- 35 Technical Report 8 identifies and assesses potential lighting effects and comments on measures that can be implemented to avoid, remedy, or mitigate such effects.

Construction Effects

- 36 Lighting for temporary construction yards and construction activities has the potential to cause spill lighting and glare to nearby residents and to drivers of vehicles travelling on adjacent roads. All construction lighting must comply with the District Plan requirements and the technical parameters for the recommended maximum values of light listed in Table 2.1 of the Spill Light and Glare Standard.¹⁹
- 37 Installed lighting will be required for the temporary construction yards,²⁰ including floodlighting for construction activities. The construction lighting used for road or bridge construction activities usually consists of portable, battery powered trolley gantries. These are moved around to suit the work flow and can be easily positioned to avoid producing adverse effects to the immediate environs.

¹⁸ Refer to the detail contained in Section 6 (Sector 1), Section 7 (Sector 2), Section 8 (Sector 3) and section 9 (Sector 4).

¹⁹ AS 4282 (the Spill Light and Glare Standard) lists recommended levels of spill light and luminous intensity (glare). These values are listed in Table 2.1 and are chosen according to the surrounding environmental ambient light. In this case, the column denoted 'In commercial areas or at the boundary of commercial and residential areas' is considered the most appropriate.

²⁰ Approximately 11 construction yards will be required during the construction period, with the main construction yard proposed to be located at the Otaihanga Landfill site, off Otaihanga Road. Construction yards are also proposed to be located at Poplar Avenue, Raumati Road, Wharemauku Stream, Kapiti Road, Mazengarb Road, Otaihanga Road, Waikanae River, Te Moana Road, Ngarara Road, Smithfield Road, and Peka Peka Road (Refer AEE, Sections 8.4.1 and 8.4.1.1).

- 38 The design of the construction yard lighting is generally done at the start of the set-up of the construction yard. The Landscape Management Plan requires the design and layout to be reviewed and approved by an accredited illumination engineer prior to the lighting being installed.²¹ Through the use of good design practices and modern luminaires, it is my opinion that the construction yard lighting can meet the District Plan requirements and the technical parameters for the recommended maximum values of light listed in Table 2.1 of the Spill Light and Glare Standard.
- 39 Strict controls may be applied to construction yard lighting, including a 10 metre buffer zone between any equipment requiring light and a residential boundary.²² Floodlighting would be controlled by selecting the correct luminaire and the appropriate angle for aiming the luminaire, so as not cause to glare for residents in their homes, or for road users. In addition, the Contractor would monitor the lighting every 2 months during construction, or following a complaint from an adjacent resident.²³
- 40 In summary, for construction yard lighting, including floodlighting, the correct selection and positioning of the luminaires together with cloth screening will provide effective mitigation such that the obtrusive effects of this lighting will be substantially reduced.²⁴ In my opinion, the potential lighting effects from the construction phase of the Project will be minor.

Operational Effects

- 41 There are four main lighting effects that have the potential for varying degrees of intrusiveness to road users and to any residents adjacent to the proposed Expressway:²⁵
- 41.1 Spill lighting;
 - 41.2 Glare;
 - 41.3 Sky glow (upward light content)²⁶; and
 - 41.4 Headlight sweep.

²¹ Construction Environmental Management Plan Appendix T, Landscape Management Plan, Section 3.4.1. See also AEE, Chapter 31, Table 31.2.

²² Construction Environmental Management Plan Appendix T, Landscape Management Plan, Section 3.4.1 Construction Areas – buildings and lighting.

²³ Construction Environmental Management Plan, Section 3.6.9.

²⁴ Refer Technical Report 8, Section 3.5.

²⁵ Refer Technical Report 8, Sections 3.1 to 3.4 and Section 3.6.

²⁶ As explained later in my evidence, the limited numbers of luminaires involved and the restriction on upward content will prevent skyglow phenomena from this Project from occurring.

- 42 Lighting effects from the cycleway/pedestrian path would also have the potential for varying degrees of intrusiveness to adjacent residential properties. Due to the low lamp wattage and lack of upward light content, sky glow would not become a factor from these lights.
- 43 The majority of the proposed Expressway will not be illuminated as this is unnecessary for an Expressway in rural or semi-rural environments where there are no major intersections. This means that existing areas which presently have little or no lighting, and those areas which are located away from the proposed Expressway interchanges, will continue to not receive any lighting.
- 44 Drawing CV-MF-700,²⁷ shows in red rectangular boxes the approximate sections of the Expressway in which lighting is proposed.²⁸ The remaining sections of the Expressway shown on Drawing CV-MF-700 are not proposed to be lit.
- 45 The lighting in the locations identified on Drawing CV-MF-700 is shown in detail on drawings referenced as Drawings CV-MF-104 to CV-MF-132.²⁹ Attached as **Annexure A** to my evidence is Drawing CV-MF-108, which was omitted from the set of Drawings CV-MF-100 to CV-MF-132 included in the AEE.
- 46 The type of lighting, and the height of lighting poles proposed for installation at specific locations shown on Drawings CV-MF-104 to CV-MF-132, can be determined by using the key shown on Drawing CV-MF-100. This key illustrates that proposed lighting ranges from 70 Watt luminaires on 7 metre high poles (predominantly for use on sections of the cycleway) to 250 Watt luminaires on 12.5 metre high poles (for use on sections of the Expressway).
- 47 Lighting will be required for traffic and pedestrian safety at interchanges, along the proposed cycleway/walkway, and under bridges (where lighting is required for the safety of pedestrians).
- 48 The lighting in these locations needs to achieve an appropriate balance between illumination for road and pedestrian safety and the minimisation of light pollution to the immediate surrounds.

²⁷ Drawing CV-MF-700 is the index for the sheet set CV-MF-710 to 780.

²⁸ The series of Drawings CV-MF-700 to 780 show which portions of the Expressway will have lighting added and the evaluation of the isolux lighting limit lines. These Drawings, along with Drawings CV-MF-100 to 132, can be found in the AEE, Volume 5: Plan set, Lighting.

²⁹ The Poplar Avenue intersection is shown on Drawing CV-MF-104 and 105, the cycleway path lighting from Raumati Road to Kāpiti Road on Drawing CV-MF-108 to 110, the Kāpiti Road intersection lighting and cycleway path lighting to Mazengarb Road on Drawing CV-MF-110 to 114, the remaining road lighting sections are shown by the Te Moana Road intersection lighting on Drawing CV-MF-119, 120 and 122, the Peka Peka Road intersection on Drawing CV-MF-130 and State Highway 1 intersection on Drawing CV-MF-131.

Spill light and glare

- 49 The light modelling simulations have shown in Drawings CV-MF-710 to 780 the anticipated extent of the spill lighting. The District Plan permitted activity standard for lighting, which allows a maximum of 10 lux measured 1.5 metres inside the boundary of an adjoining rural or residential property, would only be exceeded at specific points along the Expressway and the cycleway / pedestrian path, as noted earlier in my evidence.
- 50 Applying the 3 lux guideline, the software analysis has identified the potential for adverse light spill and glare effects from the cycleway/pedestrian lighting at two small areas of residential properties at Milne Drive and Oxford Court.³⁰ These areas have been more specifically addressed in my response to the submitter's concerns (later in this evidence). The potential for adverse effects to these identified areas of properties has been eliminated, through changing the design and the proposal to provide a screening fence.
- 51 Overall, the potential for the Project to create adverse lighting effects through spill light and glare is considered low, given that all potential and actual effects can be effectively avoided, remedied and/or mitigated. The actual amount of light received to adjacent residential areas will vary considerably but the effects will not be significant, and, in the majority of cases, there will be little or no effect.

Sky glow

- 52 The effect of sky glow is the result of thousands of road light fittings combined with the existing general exterior lighting installed in residential and commercial properties within a city's extents. It is also apparent in the immediate locality of a large sports stadium where high intensity lighting is required for colour television broadcasting. The additional light contribution from this Project can be considered minor and will not add to the existing sky glow effect by any significant degree nor will it prevent viewing of the stars.
- 53 Skyglow is mitigated by minimising light content above the horizontal plane from the luminaires to a very low percentage. The direct light projected into the night sky from the lighting proposed for the Project will be minimised in accordance with the relevant Upward Waste Light Ratio required by the Lighting Standard.
- 54 In my opinion, the effects on sky glow from the Project will be insignificant, even when lighting is installed in areas where no lighting presently exists.

³⁰ In submissions, concerns about lighting in this area were raised by P and M Smith, 51 Milne Drive (0011) and Metlifecare Kapiti Limited (0608), whose retirement village includes the five houses at the end of Oxford Court.

Headlight sweep

- 55 The landscaping profiles, noise mitigation measures (such as noise walls) and planting for amenity effects, in combination with buffer distances, will obscure and minimise headlight sweep beyond the extent of the Project. In addition, I understand the focusing of headlights to ensure that they are directed downwards and away from the left hand side of the road is checked each time at the vehicles Warrant of Fitness test. While there may be headlights visible or partially visible in places along the Expressway, these are unlikely to be visually intrusive.
- 56 I therefore consider that the proposed lighting for the Project provides sufficient illumination for road and pedestrian/cyclist safety while minimising light pollution to the immediate surrounds to levels appropriate for residential use.

AVOIDANCE AND MITIGATION OF LIGHTING EFFECTS

- 57 Avoidance and mitigation of effects will be achieved along lit sections of the Project through adherence to the location and type of lighting specified in Drawing Set CV-MF-100 to CV-MF-132.³¹
- 58 This adherence will be required by proposed condition DC.1(a)(ii), augmented by the additional refinement achieved through the detailed design process guided by the principles set out in Technical Report 8.
- 59 At a summary level, the further refinements during the detailed design stage will be achieved through a selection or combination of the following measures:
- 59.1 Further refinement in the selection of luminaire light photometric characteristics during detailed design;
 - 59.2 Refinements to take advantage of the physical light blocking characteristics of the land profiles, road embankments, vegetation and trees, and integration of the landscaping features relative to specific dwellings;
 - 59.3 Further evaluation of the luminaire mounting heights and possibility of reducing the height of light poles; and
 - 59.4 Installing back shields to luminaires to block undesirable light spill.
- 60 It should be noted that the last mitigation measure above (installing back shields) significantly inhibits the functionality of road lighting and should only be used as a last resort.

³¹ Refer AEE, Volume 5, Plan Set: Lighting, Marking and Signage.

- 61 This restriction to installing shielding does not apply to the cycleway/pedestrian path or construction lighting.

RESPONSE TO SUBMISSIONS

- 62 I have read the submissions lodged on the Project that raise concerns about the potential adverse effects from the lighting associated with the Project. Most of the submissions that refer to lighting raise a general concern regarding lighting pollution, without any specifics.³² As noted earlier in my evidence, the lighting proposed for this Project needs to achieve an appropriate balance between illumination for road and pedestrian safety and the minimisation of light pollution to the immediate surrounds. I consider that the proposed lighting will achieve this balance.

- 63 A number of more specific issues have been raised by submitters and I address these below.

Lighting will directly affect their residences

- 64 A number of submitters have expressed concern about the lighting being in close vicinity to their properties and that the effects of the lighting will be detrimental to their night amenity. I address below the mitigation proposed for specific properties that I consider most likely to be adversely affected by the Project lighting. I consider the potential adverse effects on other properties will not be more than minor.
- 65 P and M Smith³³ reside at 51 Milne Drive which is one of the closest residences to the cycleway/pedestrian path and road lighting. Their concern is having street lighting within 20 metres of their house, particularly when sleeping at night. Their residence is located at the top left side of Drawing CV-MF-110.³⁴ The majority of the lighting effects on their residence are from the cycleway/pedestrian lighting. This property provides a typical example of where mitigation, in one of the forms identified in the "avoidance and mitigation" section of my evidence, would be applied during the detailed design phase to minimise the light spill towards that property. For example, mitigation could take the form of back shields, repositioning of the light poles, or fence shielding. As shown by Drawing CV-MF-730, the mitigation will reduce the light spill to an acceptable level.
- 66 C Watson³⁵ resides at 17 Greenwood Place, which is in close proximity to one of the Kāpiti Road on-ramps and associated lighting. His concern is the absence of any mitigation for the light

³² Including Cairncross (0180), Anderton and Abigail (0293), Mackay (0402), Patersen (0491).

³³ Submitter 0011.

³⁴ Refer AEE, Volume 5, Plan Set: Lighting, Marking and Signage.

³⁵ Submitter 0126.

that will fall onto his property, and he requests tinted double glazing to mitigate light and noise. This residence is located at the bottom right hand side of Drawing CV-MF-110. While it is possible that some light may fall within this property, the analysis shown by Drawing CV-MF-740 indicates this will be well below the 10 lux at 1.5m within his boundary. The poles have been placed to minimise direct light to this residence. Further, there appears to be existing trees between the property and the proposed road corridor. This situation provides a useful example of where additional landscaping would be considered during the detailed design stage to mitigate any significant remaining adverse effects of the lighting.

- 67 Other submitters³⁶ reside well away (100 metres or more) from the lighting proposed for sections of the Expressway and any adverse effects on these submitters will be minimal.
- 68 In the cases³⁷ of D and D Waterson (16 Rata Road) who are concerned about lighting levels disturbing their neighbourhood, and B Mountier (9 Fyfield Place) who is concerned about the constant night lighting in contrast to their property currently being subject to no light pollution, I note that these residences are over 100 metres away from the cycleway lighting and where no road lighting will be installed. I consider that any adverse effects on these submitters will be minimal.
- 69 In the case³⁸ of E Laing (169 Te Moana Road) there is no lighting proposed in the vicinity of her residence. While E Laing is concerned with light spill onto her property and illumination from the Expressway, I do not consider the Project lighting will produce any adverse effects for this resident.
- 70 Kāpiti Coast District Council (KCDC)³⁹ refers to lighting and the loss of amenity for residents in "*Conifer Grove, Milne Drive, Matai Road, Makarini Street*". Raumati South Residents' Association⁴⁰ refers to loss of amenity due to lighting for residents in Leinster Avenue and Matai Road. In terms of lighting, I cannot agree that this statement has substance. If the lighting is installed to meet KCDC's own obtrusive lighting controls, I do not consider that lighting would degrade amenity.
- 71 Metlifecare Kāpiti Limited⁴¹ has expressed concern about the lighting effects to their residents in a general sense from both the

³⁶ Including submitters Laird (0056), Sisarich (0328), Young (0590), Sullivan (0675).

³⁷ Submitters 0267 and 0327 respectively.

³⁸ Submitter 0337.

³⁹ Submitter 0682.

⁴⁰ Submitter 0707.

⁴¹ Submitter 0608.

construction lighting and the road/cycleway lighting and the potential effects on health and sleeping.

- 72 Within Metlifecare's Kāpiti Village, there are five houses on Oxford Court situated extremely close to the proposed cycleway/pedestrian path lighting. The Cheltenham Drive and Oxford Court area of Kāpiti Village is unlikely to be affected by the Expressway lighting, which is further away than the cycleway/pedestrian path lighting. This location of lighting is shown by Drawing CV-MF-114 and the proposed mitigation by Drawing CV-MF-741. In this situation, I consider that mitigation will be needed to reduce the light spill emitted into these properties from the cycleway/pedestrian lighting to an appropriate level. The exact mitigation will be determined at the detailed design stage with a physical fence between the path and the houses likely and close attention to either fitting back shields or relocating the light onto the back side of the fence.
- 73 In reference to Metlifecare's concerns on the effects of the construction lighting during the Kāpiti Road and Mazengarb Road bridge construction and the Kāpiti Road intersection, I have already stated that both the District Plan controls and appropriate controls listed in the Spill Light and Glare Standard will be applied to this lighting. Further, these construction areas are some distance away from Kāpiti Village and I would consider they will be unaffected by any temporary lighting.
- 74 The issue of unacceptable glare from the lighting mounted on 7m poles was also raised by Metlifecare. Even in the special case of the five houses in Oxford Court, the pole height of 7 m for the cycleway / path lighting is too low for glare to be a consideration, and as I have stated previously, mitigation techniques would be applied to eliminate this complaint.
- 75 It is unlikely that the residents in Kāpiti Village will be affected by spill light or glare from the road lighting. I have already addressed the special case of the five residences at Oxford Court. Drawings CV-MF-740 and 741 demonstrate that the spill light from the road lighting does not extend near the Kāpiti Village residents' properties.

Effects of lighting on health and sleeping patterns

- 76 A number of submitters are concerned that the lighting will have detrimental effects on their health or other residents' health,⁴² or sleeping patterns.⁴³ (I have also referred to this aspect of Metlifecare Kāpiti Limited's submission). **Dr Black** considers public health issues in his evidence. I consider the effects of spill lighting

⁴² Including submitters Aregger (0382), Cooke-Willis (0398), Easthope (0621), Beufort (0434) and Blem (0440).

⁴³ Including Pilaar (0726), Cherry (0492), Blem (0440), Sullivan (0675), Harris (0713) and Pugh (0495).

and glare are unlikely to be at a level that could be considered a nuisance or inconvenience to adjacent residents. In particular, I note that there is no lighting proposed in the vicinity of G Pilaar (171 Te Moana Road) and R Pugh (6 Nicholas Place).

Extent and location of lighting, including height

- 77 R Falconer⁴⁴ requested in his submission that the areas where there is no lighting be clearly identified, that there be no lighting in areas that do not otherwise require it, and confirmation that there is no lighting planned for the Expressway bridge over the Waikanae River.
- 78 The extent of the road and cycleway/pedestrian path lighting is detailed in the Drawings CV-MF-100 to 132 and the anticipated spill light effects in Drawings CV-MF-700 to 780 previously mentioned in my evidence. The construction lighting will be confined to the construction yards and work areas.
- 79 I can confirm that the lighting has been applied where it is appropriate and there are no areas where lighting has been applied that do not need it.
- 80 I can confirm there is no lighting intended for the Expressway bridge over the Waikanae River.
- 81 There has been some concern about the height of the lighting and a subsequent effect of "constant night lighting from a considerable height leaving no darkness".⁴⁵ M and J Harris raised a similar issue, in referring to the height above ground of the Expressway, with the potential for light spillage some distance across the neighbourhood.⁴⁶ K Pomare's submission refers to lighting elevated to 11 metres for the on ramps and off ramps which will be seen all over the area.⁴⁷
- 82 The pole heights chosen are standard NZTA heights, used throughout New Zealand. Higher pole heights for the road lighting allow lights to be spaced out further (but also mean that spill light travels further), while lower pole heights can be used for cycleway lighting as the lighting uniformity is not so critical for cycling and walking use. I consider the pole heights are appropriate and cannot be classed as excessive. In addition, luminaires have a sharp light cut-off characteristic and, outside of the immediate road corridors, there will be darkness.

⁴⁴ Submitter 0071.

⁴⁵ Submitter 0237.

⁴⁶ Submitter 0713.

⁴⁷ Submitter 0465.

Effects of lighting on night sky environment

- 83 The subject of the night sky environment being destroyed by the proposed lighting and the subsequent inability to view stars is of concern to a number of submitters.⁴⁸ As explained earlier in my evidence, 'skyglow' phenomena is a result of thousands of lights or lighting of great intensity such as required for large sporting stadiums. I do not consider that the Project lighting will add to the existing sky glow effect by any significant degree and nor will it prevent viewing of stars.

PROPOSED CONDITIONS

- 84 As noted above, proposed designation condition DC.1(a) requires that the lighting be implemented in accordance with the Drawing set CV-MF-100 to CV-MF-132 lodged with the Project. I support that requirement.
- 85 In addition, proposed designation condition DC.63 (which I also support) provides:

Lighting shall be designed and screened to minimise the amount of lighting overspill and illumination to residential areas, and shall demonstrate that:

- (a) All motorway lighting shall be designed in accordance with "Road Lighting Standard AS/NZS 1158"; and
- (b) All other lighting shall be designed in accordance with the relevant rules of the District Plan.

CONCLUSIONS

- 86 Given good design practice and the use of modern luminaires, spill lighting from the construction yards or activities should not cause any nuisance to surrounding residents or motorists.
- 87 The proposed road lighting and cycleway lighting schemes are appropriate for the local environment.
- 88 Specific areas where detailed design will provide further mitigation will also meet the obtrusive light and glare evaluation criteria in relation to proposed designation condition DC.63.
- 89 It is apparent that the lighting proposed will have limited effect on the immediate environs given the modelled value of illumination predicted on residential properties.

⁴⁸ Including submitters M Edbrooke (0488), R Wilson (0545), H Chambers (0668) and E Engman (0736).

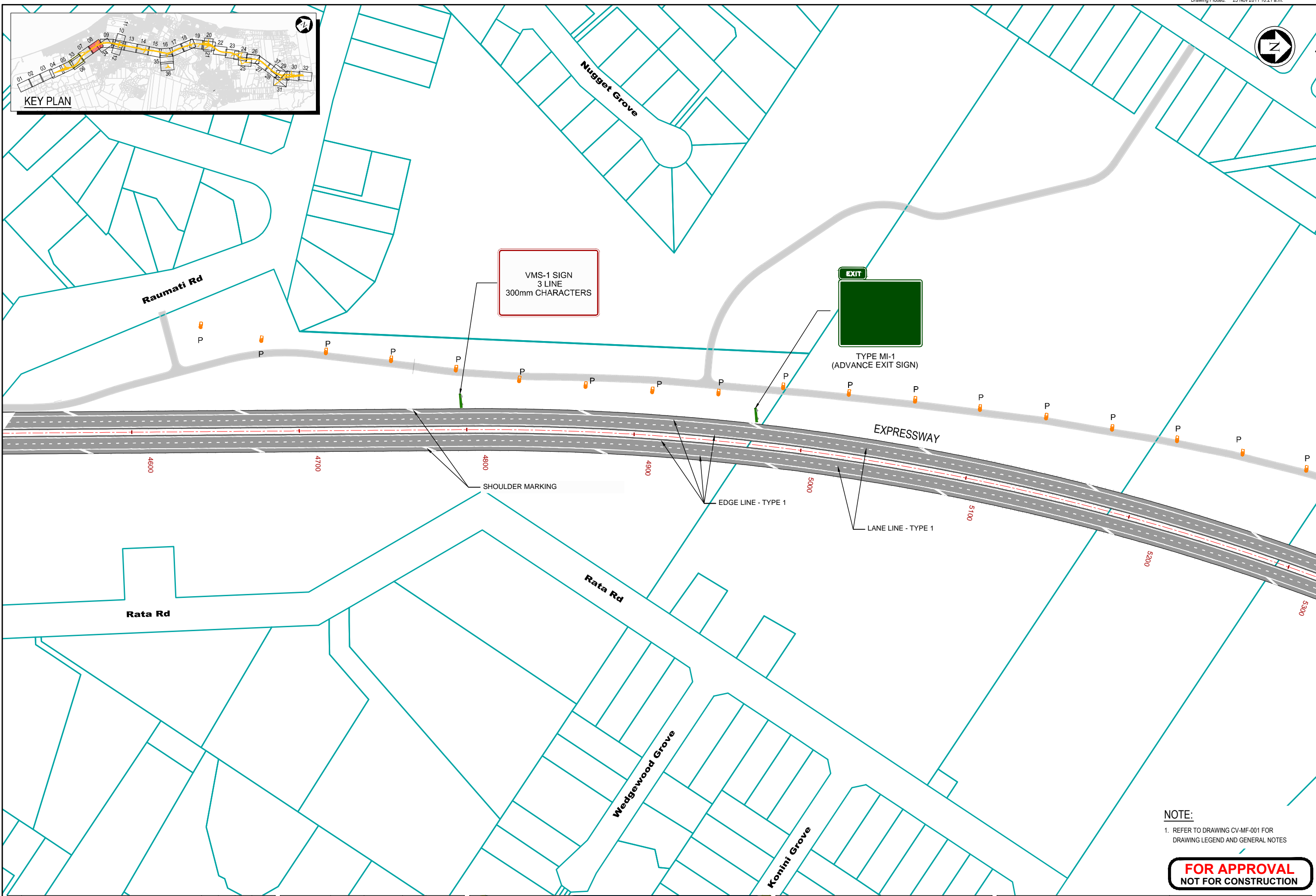
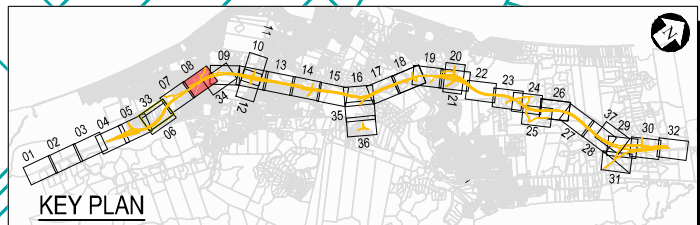
- 90 With the suggested mitigation measures in place, effects of light spill and glare to residents will not be at a level that could be considered a nuisance or inconvenience to the adjacent residents.
- 91 The current assessment should be considered as being conservative given that it has not modelled or assessed the potential for the physical blocking of the emitted light by the natural land profiles, solid fences, or vegetation and trees in specific locations.
- 92 The landscaping profiles, noise mitigation measures (such as noise walls) and planting for amenity effects in combination with designated corridor buffer distances will obscure and minimise headlight sweep.
- 93 It is therefore my opinion that the actual level of adverse effects from lighting is likely to be considerably less than the potential effects identified in the Assessment of Lighting Effects Technical Report.⁴⁹



Keith Gibson
4 September 2012

⁴⁹ Technical Report 8 (AEE, Volume 3).

ANNEXURE A: DRAWING CV-MF-108



NOTE:
1. REFER TO DRAWING CV-MF-001 FOR DRAWING LEGEND AND GENERAL NOTES

**FOR APPROVAL
NOT FOR CONSTRUCTION**

No.	Revision	By	Chk	Appd	Date
B	SCHEME ASSESSMENT	CRC	KH	NRN	18.11.11
A	FOR PRICING	WN	DGS	NRN	07.07.11

Original Scale (A1)	Design	Drawn	Checked	Approved For
1:1000	C. CALEF 07.07.11	W. NAIDU 07.07.11	N. NANCEWELL	
Reduced Scale (A3)	1:2000	R. BROWN 23.07.11	B. FLYNN 23.07.11	Date: 18.11.11

Project: SH1 MACKAYS TO PEKA PEKA EXPRESSWAY
RP 1012/0.00 TO 1023/5.00

Title: PROPOSED EXPRESSWAY LIGHTING, MARKING & SIGNAGE PLAN
SHEET 8 OF 37

Document Set: M2PP-SAR-DWG	Rev: B
Drawing No: CV-MF-108	

Document No. M2PP-SAR-DWG-CV-MF-108.DWG