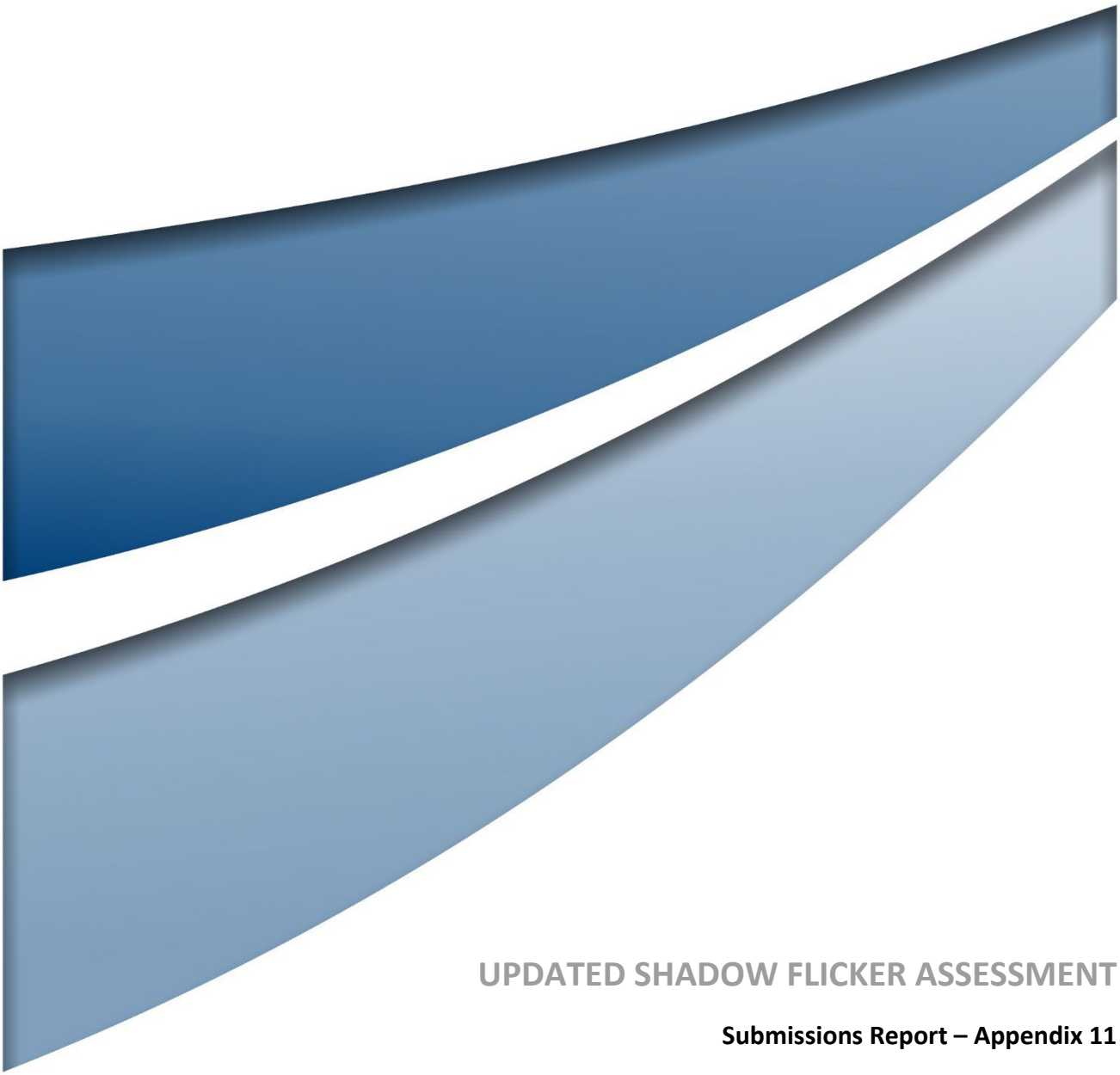

UPDATED SHADOW FLICKER ASSESSMENT

Submissions Report – Appendix 11

Amendment Report – Appendix 7

TILT RENEWABLES AUSTRALIA PTY LTD AS TRUSTEE FOR
LIVERPOOL RANGE WIND FARM PROJECT

LIVERPOOL RANGE WIND FARM

SHADOW FLICKER ASSESSMENT

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Liverpool Range Wind Farm
Shadow Flicker Assessment

Tilt Renewables Australia Pty Ltd as trustee for Liverpool Range Wind Farm Project

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REV	DATE	DETAILS
A	24/07/2020	Initial Issue
B	13/01/2021	Updated WTG Layout, dwellings and minor amendments based on client feedback.
C	28/04/2021	Updated with additional client comments.
D	21/07/2021	Updated layout and additional identified dwellings
E	13/12/2021	Minor amendments
F	8/02/2022	Updated layout and additional identified dwellings
G	30/03/2023	Updated layout and additional identified dwellings

	NAME:	DATE:
Prepared by:	S. Medway	30/03/2023
Reviewed/Approved by:	A. Shankar	30/03/2023

TABLE OF CONTENTS

ABBREVIATIONS

BoM	Bureau of Meteorology
d	Day
DNWFDG	Draft National Wind Farm Development Guidelines
hr	Hour
km	Kilometre
kW, MW, GW	Kilowatt, Megawatt, Gigawatt
LRWF	Liverpool Range Wind Farm
m	Metre
mAGL	Metres above ground level
mASL	Metres above sea level
min	Minute
m/s	Metres per second
MWh	Megawatt Hour
WSP	WSP Australia Pty Limited
WTG	Wind Turbine Generator

EXECUTIVE SUMMARY

Tilt Renewables Australia Pty Ltd as trustee for Liverpool Range Wind Farm Project (Tilt Renewables) has requested that WSP Australia Pty Limited (WSP) perform an independent assessment of the shadow flicker impacts for the proposed modifications to the approved Liverpool Range Wind Farm (LRWF) project. The LRWF project is located in New South Wales, approximately 120 km east of Dubbo.

The LRWF project was previously developed by Epuron Pty Ltd (Epuron) and was granted Development Consent in March 2018 for up to 267 Turbines with a maximum blade tip height of 165 m (the Approved Project) [1]. In March 2019, Tilt Renewables acquired the Liverpool Range Wind Farm (LRWF) project from Epuron. The LRWF project is formally owned by Liverpool Range Wind Farm Pty Ltd (the Proponent), a subsidiary of a portfolio of companies that are trading as Tilt Renewables.

In February 2022, WSP assessed the shadow flicker impacts of a revised project containing 220 turbines with a maximum blade tip of 250m [2]. This revision G of the report considers a further updated WTG layout consisting of 185 turbines [3] as well as a different WTG model with a maximum tip height of 215 m [4]. This is referred to throughout this report as the 'Modified Project'.

It should be noted that WSP has previously assessed the shadow flicker of the Approved Project [2]. This report details the scope, methodology, assumptions, and results of the shadow flicker assessment of the Modified Project and a comparative assessment of the potential shadow flicker impacts associated with both the Modified Project and the initial Approved Project. WSP has modelled the shadow flicker impacts for the Modified Project using the same methodology as was used previously for the Approved Project. This allows for a comparative assessment of shadow flicker impacts at the LRWF project.

WSP also notes that shadow flicker impacts of the Approved Project were previously provided by Epuron Pty Ltd as part of the Response to Submissions Report for the original Development Consent [5]. The Development consent requires that *'shadow flicker associated with wind turbines does not exceed 30 hours per year at any non-associated residence'*. In their assessment, Epuron concluded that no dwelling locations within the assessment distance (approximately 1,000 m) were modelled to receive shadow flicker as a result of the Approved Project. WSP's assessment of the Approved Project supported the results from the assessment conducted by Epuron.

Table ES.1 summarises the assumed Wind Turbine Generator (WTG) parameters assessed for both the Approved Project and Modified Project at the LRWF site.

Table ES.1 Approved and Modified WTG Configuration for the LRWF project

PROJECT	NUMBER OF WTGS	HUB HEIGHT [M]	LOWER TIP HEIGHT [M]	UPPER TIP HEIGHT [M]	MAX BLADE CHORD WIDTH [M]
Approved Project [6]	267	Approx. 100	35	165	4.00[1]
Modified Project [3]	185	129	43	215	4.32

(1) It is unclear what blade chord width assumption was used in the original assessment. WSP assumed a blade chord width of 4.0 m for the Approved Project; consistent with the blade dimensions of the Vestas V112 WTG previously proposed for the project [7]

Shadow flicker, modelled by WSP, has been conducted in accordance with the methodology detailed in the Environment Protection and Heritage Council *Draft National Wind Farm Development Guidelines July 2010* [8]. In accordance with these guidelines, WSP has modelled shadow flicker impacts for both theoretical worst-case scenario (which excludes a reduction in impacts due to cloud cover, WTG operation and orientation) and realistic case scenario (which includes a reduction in potential impacts due to cloud cover, WTG operation and orientation) on each dwelling at the LRWF project. In accordance with these guidelines, WSP has utilised an assessment distance of 1,145m. A summary of the modelling assumptions for each scenario is detailed in Table ES.2 below.

Table ES.2 Shadow flicker modelling assumptions

PARAMETER	THEORETICAL WORST SCENARIO CASE INPUT	REALISTIC CASE SCENARIO INPUT
Maximum distance for assessment of potential shadow flicker impacts	1,145 m based on the *Draft National Wind Farm Development Guidelines* recommendation of an assessment distance of 265 times the maximum blade chord length (265 x 4.32 m)[2]	
Cloud Coverage	No cloud cover (i.e. it is always sunny)	Average monthly sunshine hours per day Bureau of Meteorology (BoM) data has been used to estimate the diminished shadow flicker effects due to cloud coverage.
Vegetation/Structure/Outbuilding Screening	Nil considered	
WTG visibility	All the WTGs are visible except those screened by topography.	
WTG operation	WTGs have been assumed to be rotating at all times.	
WTG orientation	Blades of the WTG are always perpendicular to the direction of the line of sight from the location of interest to the sun.	WSP has acquired data from the long-term climatic reanalysis dataset ERA5 (refer to section 3.3.2), detailing the local wind speed and direction. A reduction factor based on WTG orientation has been determined by wind direction data within the selected long-term reanalysis dataset.
Time of modelling	Assessment year of 2035	
Timestep of modelling	10 minutes	
Grid size of modelling	25 m	
Assessment of shadow flicker	The shadow flicker impact values shall be reported as the highest level of annual shadow flicker within 50 m of each receptor, at an assessed height of 2 m (representing ground story windows) and 6 m (representing first floor windows).	

(2) The Approved Project was previously assessed assuming a maximum assessment distance of influence of 1,060 m. This corresponds to a maximum blade chord width of 4.0 m, for the previously proposed Vestas V112 WTG [5] [7]

WSP has not received data from an onsite wind monitoring campaign, therefore, the local long-term datasets could not be verified with onsite measurements to determine if the long-term datasets wind regime represented that of the LRWF project. Consequentially, WSP has not utilised local long-term datasets to model WTG operation, rather WSP has assumed that WTGs are always operating under both the theoretical worst and realistic case scenarios assessments. This is expected to result in additional minor conservatism to the realistic case scenario shadow flicker model for the LRWF project.

The modelling assumptions in Table ES.2, have been used to evaluate the shadow flicker impacts in this assessment of the Modified Project at LRWF. **Both the realistic case and theoretical worst-case scenario modelling indicates that no dwellings will be subjected to shadow flicker.**

1 INTRODUCTION

WSP Australia Pty Limited (WSP) has been engaged by Tilt Renewables Australia Pty Ltd as trustee for Liverpool Range Wind Farm Project (the Proponent) to assess the expected annual shadow flicker impacts surrounding the proposed Liverpool Range Wind Farm (LRWF) project. The LRWF project is located in New South Wales, approximately 120 km east of Dubbo, as shown in Figure 1.1.

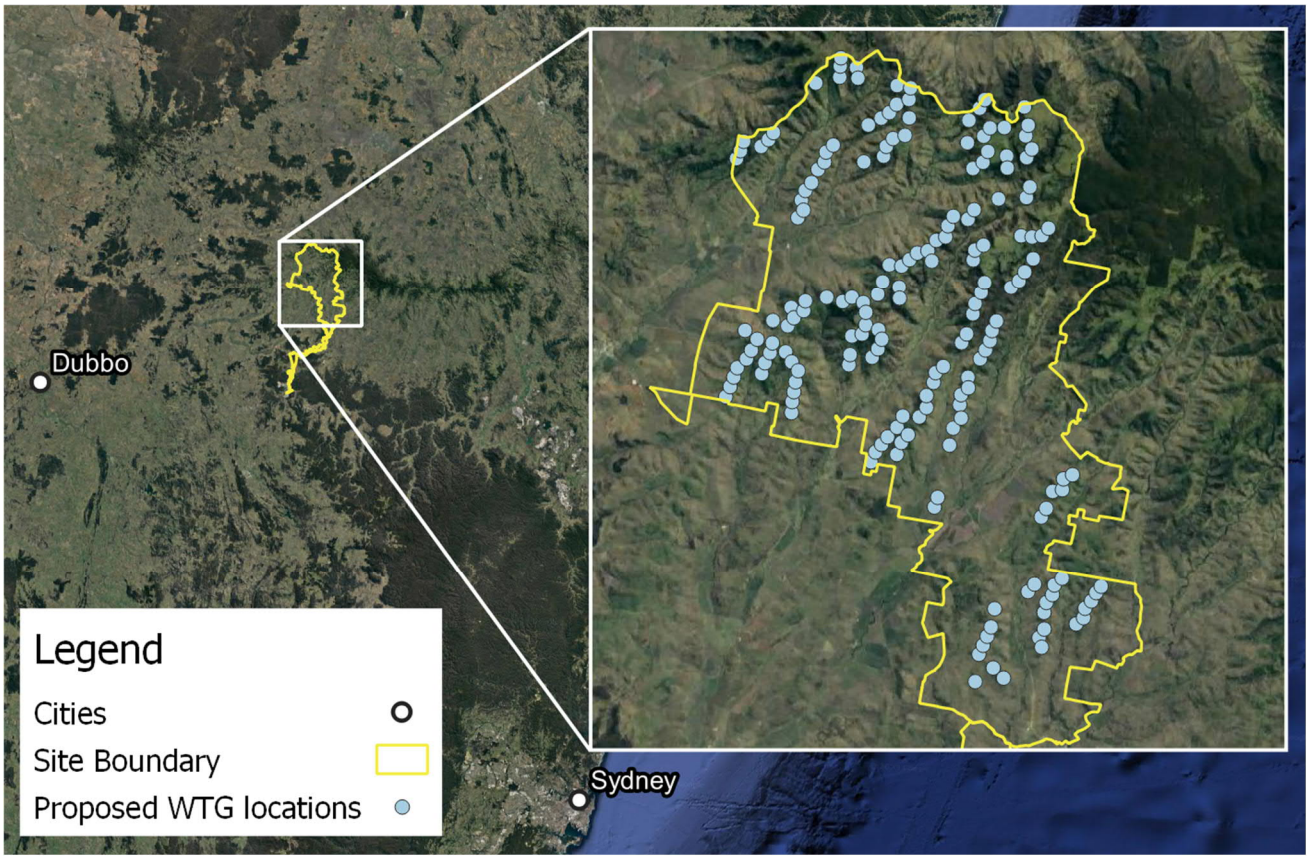

Figure 1.1 Location of the LRWF project, with site boundary shown [10]

The LRWF project was initially developed by Epuron Pty Ltd (Epuron) and was granted Development Consent (SSD 6696) in March 2018 for up to 267 Wind Turbine Generators (WTGs) with a maximum blade tip height of 165 m AGL (the Approved Project) [1]. In March 2019 Tilt Renewables acquired the LRWF project from Epuron.

Tilt Renewables Australia Pty Ltd as trustee for Liverpool Range Wind Farm Project (the Proponent) sought to modify the existing State Significant Development (SSD) approval (SSD 6696) for the Liverpool Range Wind Farm Project (the Project).

The Proponent is now seeking to decrease the maximum number of turbines to 185 (reduction of 82 from the Approved Project), with a maximum blade tip height of 215 mAGL.

The purpose of this report is to detail the shadow flicker impacts of the Modified Project. WSP has also included the shadow flicker impacts previously calculated for the Approved Project, as well as a comparative assessment between the two projects.

1.1 SUPPLIED INFORMATION

1.1.1 PROJECT SITE

The Proponent previously supplied WSP with Lidar contour elevation files (with a resolution of 1 m and 10 m) covering the region surrounding the LRWF project [10] [11]. WSP has converted this file to a digital elevation model for the purpose of completing the shadow flicker assessment.

1.1.2 WTG LAYOUT

The Proponent had previously supplied WSP with WTG layouts and dimensions for the Approved Project [6] [12]. An update on the WTG layout/dimensions was recently provided in order to assess the Modified Project [3] [4]. A summary of each project is compared in Table 1.1. A detailed list of coordinates for each WTG layout is outlined in Appendix A.

Table 1.1 Approved and Modified WTG Configuration for the LRWF project

PROJECT	NUMBER OF WTGS	HUB HEIGHT [M]	LOWER TIP HEIGHT [M]	UPPER TIP HEIGHT [M]	MAX BLADE CHORD WIDTH [M]
Approved Project [6]	267	Approx. 100	35	165	4.00[1]
Modified Project [3] [4]	185	129	43	215	4.32

[1]Note: WSP used a blade chord width of 4.0 m, consistent with the blade dimensions of the Vestas V112 WTG previously proposed for the project [7]

1.1.3 DWELLING LOCATIONS

For this assessment, WSP has been provided with an updated list of dwelling locations, consisting of 224 dwellings in total [13]. These have been classified as associated or non-associated dwellings.

Of the dwellings, 114 were found to be located within 5km of a proposed turbine. A detailed list of dwelling locations supplied by the Proponent is outlined in Appendix A.

2 PLANNING GUIDELINES

WSP has identified the following planning guidelines and approvals as relevant to the LRWF project development:

- NSW Government Planning & Environment *Wind Energy Framework December 2016* [14]
- NSW Government Planning & Environment *Wind Energy: Visual Assessment Bulletin December 2016* [15]
- Environment Protection and Heritage Council *Draft National Wind Farm Guidelines July 2010* [8]
- Development Consent SSD 6696: Liverpool Range Wind Farm [16]

The NSW Planning & Environment Wind Energy Visual Assessment Bulletin currently state that:

The shadow flicker caused by certain sun angles in relation to the rotation of wind turbine blades on dwellings will be limited to 30 hours per year, and may require mitigation measures such as amended siting and design of turbines to minimise the amount of shadow flicker

WSP note that Condition 4 (Schedule 3) of the Development Consent (SSD 6696) [16] states that:

The Applicant must ensure that shadow flicker associated with wind turbines does not exceed 30 hours per year at any non-associated residence.

Per the Development Consent [16], a non-associated residence is defined as:

Any residence on privately-owned land where the landowner has not reached a financial or in-kind agreement with the Applicant in relation to the development

WSP understands that several agreements are in place with landowners within the vicinity of the LRWF project, and these dwellings have therefore been designated as associated.

No further information or guidance on the assessment methodology is stated in either the NSW planning guidelines or the Development Consent. As such, WSP has referred to the *Draft National Wind Farm Development Guidelines* [8] for recommended assumptions and assessment methodology for this shadow flicker assessment.

The Draft Guidelines [8] recommends the impact of shadow flicker is assessed to a distance of 265 times maximum blade chord width. The maximum blade chord is the thickest part of the blade, typically close to where the blade is connected to the WTG hub. For this assessment, WSP has adopted the methodology set out in [8] and therefore has not modelled shadow flicker impacts beyond this distance.

The Draft Guidelines [8] also provide further guidance on the assessment methodology for shadow flicker impacts, which is detailed further in section 3 below. This includes modelling parameters, potential mitigation techniques, finalisation of wind farm design and micro-sitting, communication consultation recommendations, and post construction shadow flicker monitoring [8].

3 METHODOLOGY

WSP has applied the following methodology for assessment of the shadow flicker impact resulting from the LRWF project, both in this assessment of the Modified Project and the previous assessment of the Approved Project. Applying a uniform method to both the Approved Project and Modified Project allows for a comparative assessment that can highlight any differences in shadow flicker impacts resulting from the potential project amendments.

3.1 DESCRIPTION OF SHADOW FLICKER

Shadow flicker results from the fluctuating light levels caused by intermittent (moving or changing) shadows. If a particular location is in the shadow of a moving object, then there will be momentary reduction in light intensity as the shadow passes by at that particular location. This shadow flicker effect is most noticeable in an enclosed room that is lit predominantly by the sun, when the shadow falls across the window that is providing the light to the enclosed room.

Shadow flicker occurs in the context of a wind farm when the sun passes behind the blades of a WTG, casting an intermittent shadow. This effect is known to cause annoyance when the shadow is received at a dwelling over an extended period of time. In the Southern Hemisphere, shadow flicker usually occurs to the east and west of the turbines or to the south if there is a large elevation difference between the turbines and the observer location.

The potential occurrence and duration of shadow flicker at dwellings due to WTGs, is dependent on, but not limited to, the following factors:

- Direction and distance of the dwelling to nearby WTGs
- Sun position in the sky (line of sight is required from the sun, through the WTG blades, to the dwelling)
- Surface topography (topographic variation such as hills or vegetation such as trees may obstruct the line of sight from the WTG to the dwelling)
- Elevation of WTG and dwelling (when there is a large elevation differential between the WTGs and dwellings the potential for shadow flicker is higher)
- WTG rotor diameter and height
- WTG operation (the blades must be rotating for shadow flicker to occur)
- Wind direction (the area of the shadow cast by the WTG will depend on which direction the WTG is pointing, which in-turn is determined by wind direction)
- Weather (cloud cover, presence of mist, smoke or other particles may reduce the occurrence of shadow flicker)

A geometric model incorporating the location of dwellings and WTGs, WTG rotor diameter and height, sun path and the topographic variation over the site may be used to calculate the potential for occurrence of shadow flicker at dwellings. This model may be used to produce a theoretical worst case scenario shadow flicker duration at each dwelling. The theoretical worst case scenario model is discussed further in section 3.2.

The theoretical worst case scenario shadow flicker does not consider the operation of WTGs, wind direction (or yaw of the WTGs) or weather impacts such as cloud cover and therefore results in a conservative estimate of shadow flicker. WSP has estimated the likely reduction of shadow flicker occurrence and duration due to these effects using a realistic case model, which is discussed further in section 3.3.

Neither the theoretical worst-case scenario or realistic case scenario model consider intervening vegetation or structures in the landscape (e.g. outbuildings, dwelling configuration etc) that may reduce or remove shadow flicker impacts on dwellings at the LRWF project. This results in additional conservatism built into the shadow flicker model, and therefore the model is expected to produce shadow flicker that's extent and duration exceed those when the wind farm is in operation.

3.2 THEORETICAL WORST CASE SHADOW FLICKER

WSP has used Industry Standard software WindPRO v3.6 to assess the potential shadow flicker impacts associated with the Approved Project and Modified Project at identified dwellings out to the assessment distance in accordance with the Draft National Guidelines [8]. WindPRO is a product offering from EMD International A/S (EMD), the software allows the assessment of wind farms including wind analysis, energy assessments as well as the calculation of environmental impacts [17]. The model used for calculation of shadow flicker effects contains a geometric model of the sun's position in the sky for a given location and time of year (season). Also contained in the model is information relating to the size and location of all proposed WTG and existing dwelling locations, along with the topographic variation over the site. WindPRO processes this information to calculate the times for which the WTG rotors will cast shadows over the dwellings/locations of interest.

Shadow flicker is assumed to occur when the centre of the sun passes behind any part of a WTG rotor. For the purpose of the theoretical worst case scenario model, WTGs have been assumed to always be oriented towards the dwelling/location of interest and, during daylight hours, the WTG is never sheltered from the sun by cloud cover. This ensures the maximum potential shadow flicker duration is calculated for each dwelling. The model therefore has a level of conservatism built in and is likely to produce results that exceed actual shadow flicker duration and extent at the operational wind farm.

Flicker effects will be strongest close to the WTGs, as the shadows cast by rotating blades will be strongest. As the distance from the WTG increases, the shadows cast by the WTG blades will become less distinct, reducing the impact of the flicker. The Draft National Guidelines [8] state that negligible flicker occurs beyond 265 times the maximum chord length of the WTG blade. To model both the theoretical worst-case scenario and realistic case scenario shadow flicker impacts at the LRWF project, the Proponent has instructed WSP to assume a maximum blade chord width of 5.5 m, equating to a shadow flicker assessment distance of 1,458 m from each proposed WTG at the LRWF project.

Shadow flicker has been calculated at dwellings for a height of 2 m (representing ground floor windows) and 6 m (representing first floor windows). The model assumes that no vegetation, or structures in the landscape (e.g. outbuildings, dwelling configuration etc) are present that could potentially reduce shadow flicker on dwellings at the LRWF project.

Shadow flicker has been assessed both at the dwelling locations (within the assessment distance from each WTG), and for the maximum duration shadow flicker occurring within 50 m of each dwelling. This is in accordance with the methodology proposed in the Draft National Guidelines [8], and is intended to provide additional conservatism to the model, and ensure outdoor amenity around the dwelling is maintained.

The shadow flicker map was simulated with a temporal resolution of 10 minutes, line of sight resolution of 10 m, and grid resolution of 25 m. This approach is consistent with the recommended methodology of the Draft National Guidelines [8]. These results may be found in Appendix B.

Additionally, the Draft National Guidelines [8] state that the shadow flicker shall be modelled for a single year, 12 to 15 years following the date of development approval. WSP have selected 2035 to be in line with industry guidelines and aim to represent a typical operational year of the wind farm (i.e. without ramp up or ramp down impacts). This ensures the modelled geometric path of the sun, relative to the WTGs and dwellings is representative of the operational period of the wind farm.

The theoretical worst case scenario shadow flicker scenario does not consider the operation of WTGs, wind direction (or yaw of the turbines) or weather impacts such as cloud cover and therefore results in a conservative estimate of shadow flicker. The Draft National Guidelines [8] recommend theoretical worst case scenario modelling to highlight dwellings which have the potential receive shadow flicker above regulatory standards (30 hours per year) and thus enable further investigation or mitigation techniques to be implemented and ensure the relevant approvals can be met with confidence. A realistic case scenario shadow flicker assessment has been undertaken (detailed in section 3.3) which considers the afore mentioned factors. WSP notes that neither the theoretical worst case nor realistic case scenario consider screening

from vegetation, structures or outbuildings and as such, provide additional conservatism to the model. Actual shadow flicker impacts are likely to be further reduced for dwellings where such screening factors are present.

A brief summary of the theoretical worst case scenario shadow flicker model parameters is detailed in Table 3.1.

Table 3.1 Theoretical Worst Case Scenario Shadow Flicker Assessment Parameters

PARAMETER	**INPUT**
Maximum distance for influence	1,145 m based on the *Draft National Wind Farm Development Guidelines* recommendation of an assessment distance of 265 times the maximum blade chord length (265 x 4.32 m)[1] [8]
Cloud Coverage	No cloud cover (i.e it is always sunny)
Vegetation/Structure/Outbuilding Screening	Nil considered
WTG visibility	All the WTGs are visible except those screened by topography.
Time of modelling	Assessment year of 2035
Timestep of map modelling	10 minutes
Grid size of modelling	25 m
Assessment of shadow flicker	The shadow flicker impact values shall be reported as the highest level of annual shadow flicker within 50 m of each receptor, at an assessed height of 2 m (representing ground story windows) and 6 m (representing first floor windows).
WTG operation	WTGs have been assumed to be rotating at all times.
WTG orientation	Blades of the WTG are always perpendicular to the direction of the line of sight from the location of interest to the sun.

(1) The Approved Project was assessed using a maximum assessment distance of 1,060 m. This corresponds to a maximum blade chord width of 4.0 m, for the previously proposed Vestas V112 WTG [5] [7]

3.3 REALISTIC CASE SHADOW FLICKER

As detailed in section 3.2, the theoretical worst case scenario shadow flicker assessment does not consider the operation of WTGs, wind direction (or yaw of the turbines) or weather impacts such as cloud cover and therefore results in a conservative estimate of shadow flicker. WSP has applied reduction factors to the theoretical worst case scenario shadow flicker model, in an attempt to predict the actual shadow flicker experienced at dwellings surrounding the LRWF project. WSP notes that neither the theoretical worst case nor realistic case scenario consider screening from vegetation, structures or outbuildings and as such, provide additional conservatism to the model. Actual shadow flicker impacts are likely to be further reduced for dwellings where screening is present.

A brief summary of the realistic case scenario shadow flicker model parameters is detailed in Table 3.2. Further details of the reduction factors applied is outlined in section 0 and 3.3.2.

Table 3.2 Realistic Case Scenario Shadow Flicker Assessment Parameters

PARAMETER	**INPUT**
Maximum distance for influence	1,145 m based on the *Draft National Wind Farm Development Guidelines* recommendation of an assessment distance of 265 times the maximum blade chord length (265 x 4.32 m)[1] [8]
Cloud Coverage	Average monthly sunshine hours per day, Bureau of Meteorology (BoM) data has been used to estimate the diminished shadow flicker effects due to cloud coverage.
Vegetation/Structure/Outbuilding Screening	Nil considered
WTG visibility	All the WTGs are visible except those screened by topography.
Time of modelling	Assessment year of 2035
Timestep of map modelling	10 minutes
Grid size of modelling	25 m
Assessment of shadow flicker	The shadow flicker impact values shall be reported as the highest level of annual shadow flicker within 50 m of each receptor, at an assessed height of 2 m (representing ground story windows) and 6 m (representing first floor windows).
WTG operation	WTGs have been assumed to be rotating at all times.
WTG orientation	WSP has acquired data from a local long-term climatic reanalysis dataset (ERA5 [18]) detailing the local wind speed and direction (refer to section 3.3.2). A reduction factor based on WTG orientation has been determined by wind direction data from the selected long-term reanalysis dataset.

(1) The Approved Project was assessed using a maximum assessment distance of 1,060 m. This corresponds to a maximum blade chord width of 4.0 m, for the previously proposed Vestas V112 WTG [5] [7]

3.3.1 CLOUD COVER

During periods of cloud cover, the clouds create an obstacle for the sun to pass through and less sunlight reaches the Earth's surface. This may result in less WTGs being exposed to full sunlight and consequently lead to a reduction in shadow flicker emissions. As a result, the presence of cloud cover has the potential to mitigate (partly cloudy) or completely remove (full cloud cover) the effects of shadow flicker. In accordance with the Draft National Guidelines [8], WSP has analysed reference sunshine hour data to apply a cloud cover factor to the shadow flicker assessment for the realistic case scenario modelling [19] [20]. The theoretical worst case scenario modelling assumes the WTG is never sheltered from the sun by cloud cover.

Nearby Bureau of Meteorology (BoM) weather stations were surveyed for climate statistics. Two (2) weather stations were identified in the vicinity of the LRWF project that recorded daily sunshine hours, including Scone Airport located approximately 95 km to the east of the LRWF project and Wellington D&R Rural located approximately 120 km southwest of the LRWF project. The BoM measures sunshine hours via a Campbell-stokes sunshine recorder [21]. A map detailing the location of both weather stations with respect to the LRWF project is detailed in Figure 3.1.

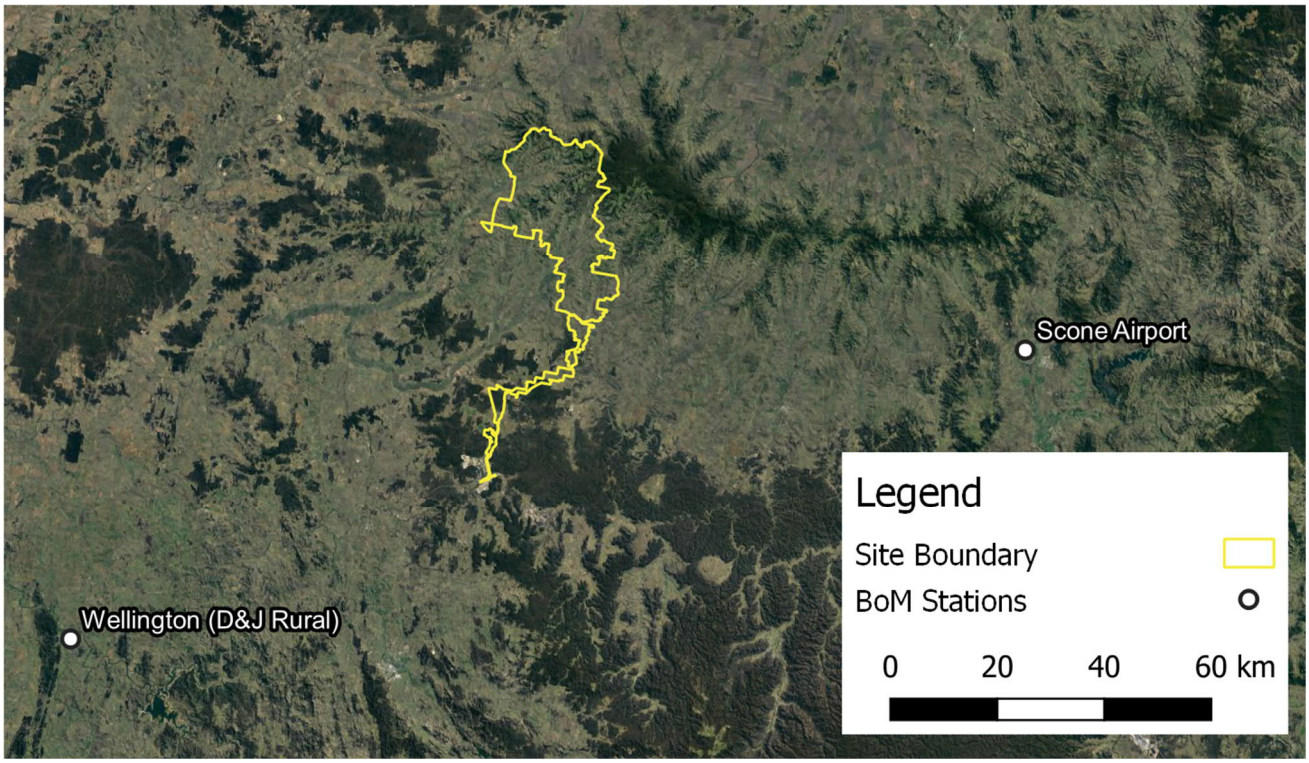

Figure 3.1 LRWF – Sunshine Hour BoM stations

The monthly mean sunshine hours for each station are detailed in Table 3.3. WSP assessed the nearby sites, and the Wellington (D&J Rural) BoM Station was selected as the most appropriate reference site due to its proximity to the LRWF project and the duration of recorded data [19]. The selection of Wellington (D&J Rural) will result in a conservative assessment due to the higher monthly mean daily sunshine hours recorded at this station.

Table 3.3 Monthly mean daily sunshine hours

STATION ID	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Scone Airport	8.4	7.8	7.3	7.1	6.0	5.0	6.0	7.3	7.7	8.2	8.2	8.5	7.3
Wellington (D&J Rural)	9.3	9.0	8.0	8.0	7.0	5.2	6.0	7.1	8.5	8.5	9.1	9.1	7.9

3.3.2 WTG OPERATIONAL HOURS & ORIENTATION

The theoretical worst case scenario shadow flicker assessment assumes the rotor of the WTG is always oriented perpendicular to the sun and dwelling and is modelled as a solid disk. In reality, WTGs are controlled such that during operation they are able to rotate to be always facing into the oncoming wind. As the direction the WTG is facing changes, so too does the geometry of the WTG with respect to the dwelling and the subsequent casted shadow. As the WTG rotates to form a line parallel to the sun and a dwelling, flicker effects become negligible. Shadow flicker impacts for a WTG oriented directly facing the sun is shown in Figure 3.2.

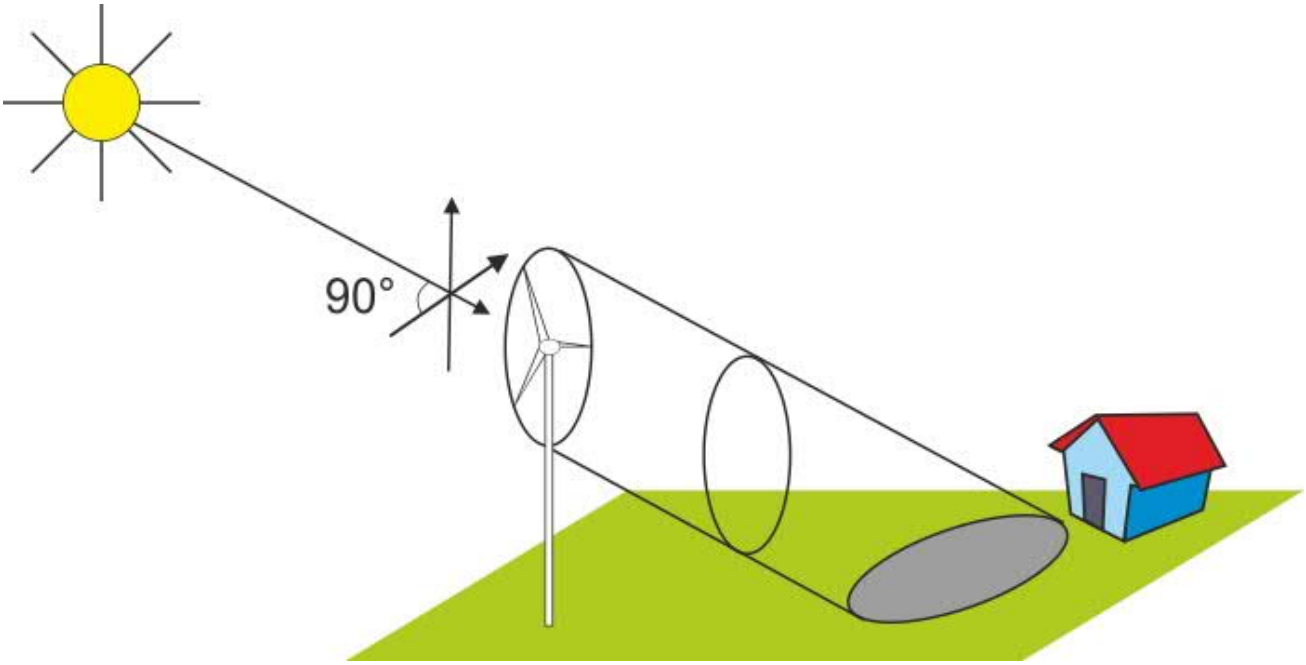

Figure 3.2 Shadow flicker example diagram [22]

The theoretical worst-case shadow flicker assessment also assumes that the WTGs are always operational. In reality, the WTGs may also not be rotating at various points in time due to low wind, maintenance, curtailment or other factors.

WSP has produced a wind direction frequency distribution to estimate the reduction in shadow flicker due to rotor orientation. WSP was not supplied with site measured wind data; however local long-term reanalysis and automatic weather station datasets from several sources has been analysed to produce a frequency distribution of wind direction for the LRWF project. Wind speed data of the reference data was not considered suitable to estimate operational hours of WTGs, and therefore WSP have assumed that WTGs are always operating under the realistic case assessment. This is expected to result in additional minor conservatism to the realistic case shadow flicker model for LRWF.

Figure 3.3 details the location of local climatic model reanalysis and automatic weather station datasets, whilst Figure 3.4 details the wind frequency rose from several reference data sources near the LRWF project.

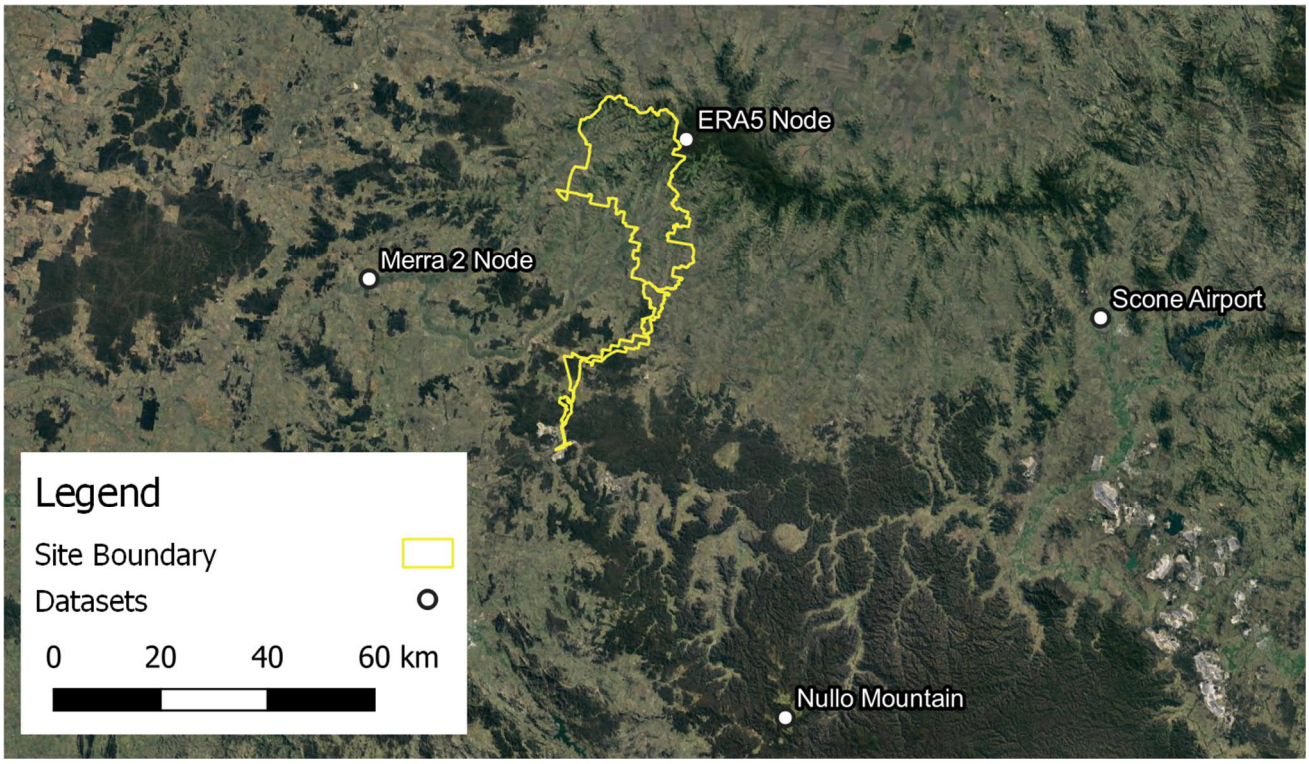

Figure 3.3 LRWF – Local climatic model reanalysis and automatic weather station datasets

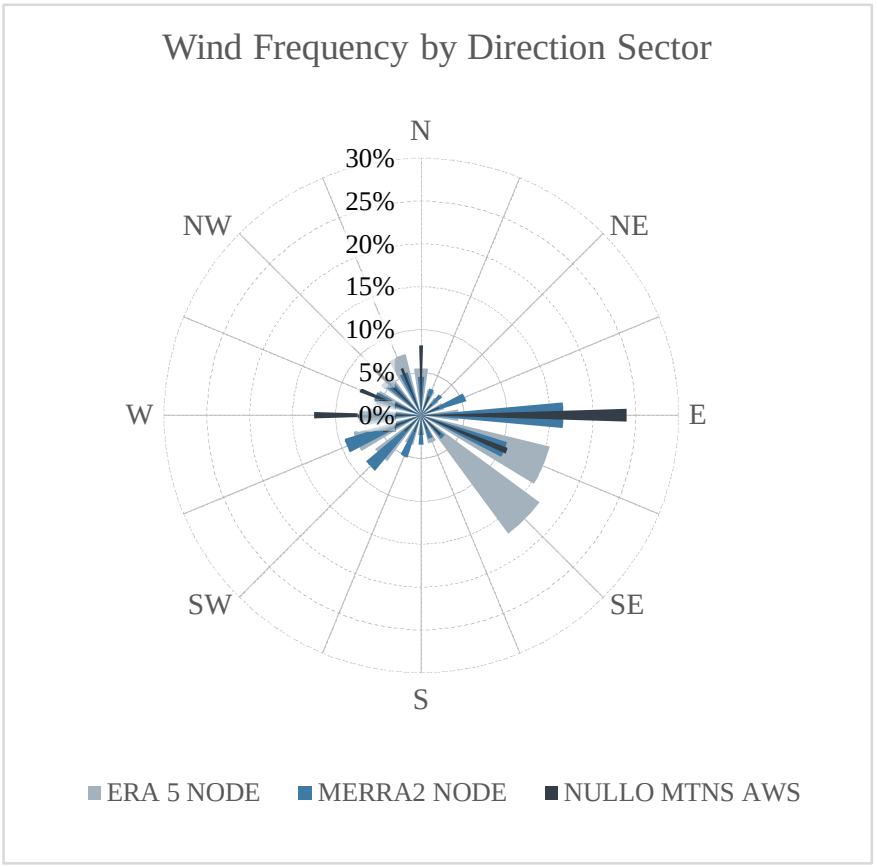

Figure 3.4 Wind Rose Diagrams – local climatic model reanalysis datasets

WSP has selected the ERA5 reference node as most appropriate for modelling WTG orientation at the LRWF project for the following reasons:

- Data for this reference source was available at 100 m AGL, this was then extrapolated to the hub height of 129m using a shear matrix
- Ground based measurements from the BoM weather stations recorded data at a height of 10 m AGL, and a significant distance from the proposed LRWF project.
- Based on WSP's previous project experience in the area, reference data from the ERA5 node appeared representative of the expected wind regime for the LRWF project.

ERA5 data is a mathematical climate reanalysis model that uses ground-based and satellite-based observations as inputs to numerical weather models. ERA5 is created by the European Centre for Medium-Range Weather Forecasts (ECMWF); an independent intergovernmental organisation supported by most of the nations in Europe. ERA5 is an hourly average dataset that covers the Earth on a 30 km grid and resolves the atmosphere using 137 levels from the surface up to eight of 80 km [23].

The wind direction frequency distribution has been applied to estimate the reduction in shadow flicker due to rotor orientation.

3.4 BLADE GLINT

Blade glint can be produced via the reflection of the sun's light from the surface of a WTG blade. Modern WTG blades are generally coated with non-reflective paint, to prevent the occurrence of blade glint. As such, no assessment of blade glint has been undertaken by WSP. However, it is recommended that the WTG supplier for the project is consulted to ensure all blades are coated with non-reflective paint. WSP understands that non-reflective paint shall be contractually required for supply of WTGs at the LRWF project [22].

4 RESULTS

WSP has completed a shadow flicker assessment in accordance with the methodology set out in the *Draft National Wind Farm Development Guidelines* [8], for all provided dwelling locations at the LRWF project. WSP has modelled the Modified Project configuration provided by the Proponent, consisting of 185 WTG's with a maximum blade tip height of 215 mAGL.

The Approved Project has been modelled by WSP (in a previous assessment), allowing for a comparative assessment of the potential shadow flicker impacts with the Modified Project. WSP notes that potential shadow flicker impacts of the Approved Project were also previously assessed by Epuron Pty Ltd as part of the *Response to Submissions Report* for the original Development Application [5]. Epuron stated that no shadow flicker impacts were expected at any non-associated or associated dwelling as a result of the Approved Project [24]. However, it is unclear if the methodology applied by Epuron was consistent with WSP's assessment of the Modified Project detailed in this report. For ease of comparison, WSP calculated shadow flicker impacts of the Approved Project using the same methodology applied to the Modified Project.

WSP considered both a realistic case and worst-case scenario when assessing the potential shadow flicker impacts at LRWF. Wind speed data of the reference data was not considered suitable to estimate operational hours of WTGs, and therefore WSP have assumed that WTGs are always operating under both the theoretical and realistic case scenario assessments. This is expected to result in additional minor conservatism to the realistic case scenario shadow flicker model for the LRWF project

The assessment of the Modified Project indicates that no shadow flicker is experienced within 50m of any of the dwellings, at 2 m or 6 m AGL for either scenario. In terms of the 267 WTG Approved Project, both Epuron and WSP's previous assessments indicate that no shadow flicker is experienced. Tabulated shadow flicker results for all three assessments can be found in Appendix B.

Figure 4.1 shows the resulting shadow flicker map for the realistic case scenario, with the maximum value taken from the 2m and 6m AGL assessments. Similarly, Figure 4.2 shows the worst case scenario, with the maximum value taken from the 2m and 6m AGL assessments.

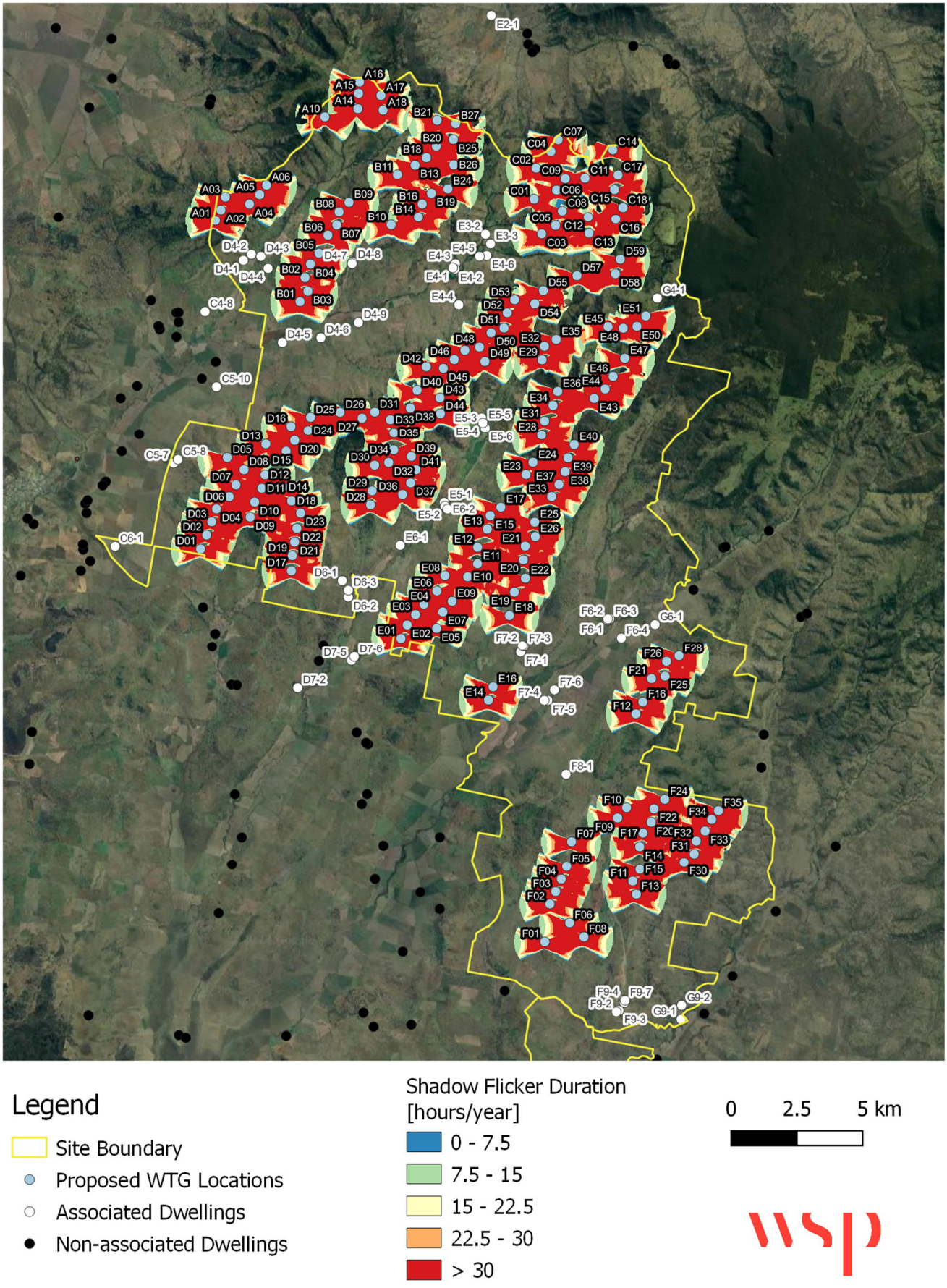

Figure 4.1 Realistic case scenario shadow flicker duration map, Modified Project, (maximum of 2 & 6 mAGL)

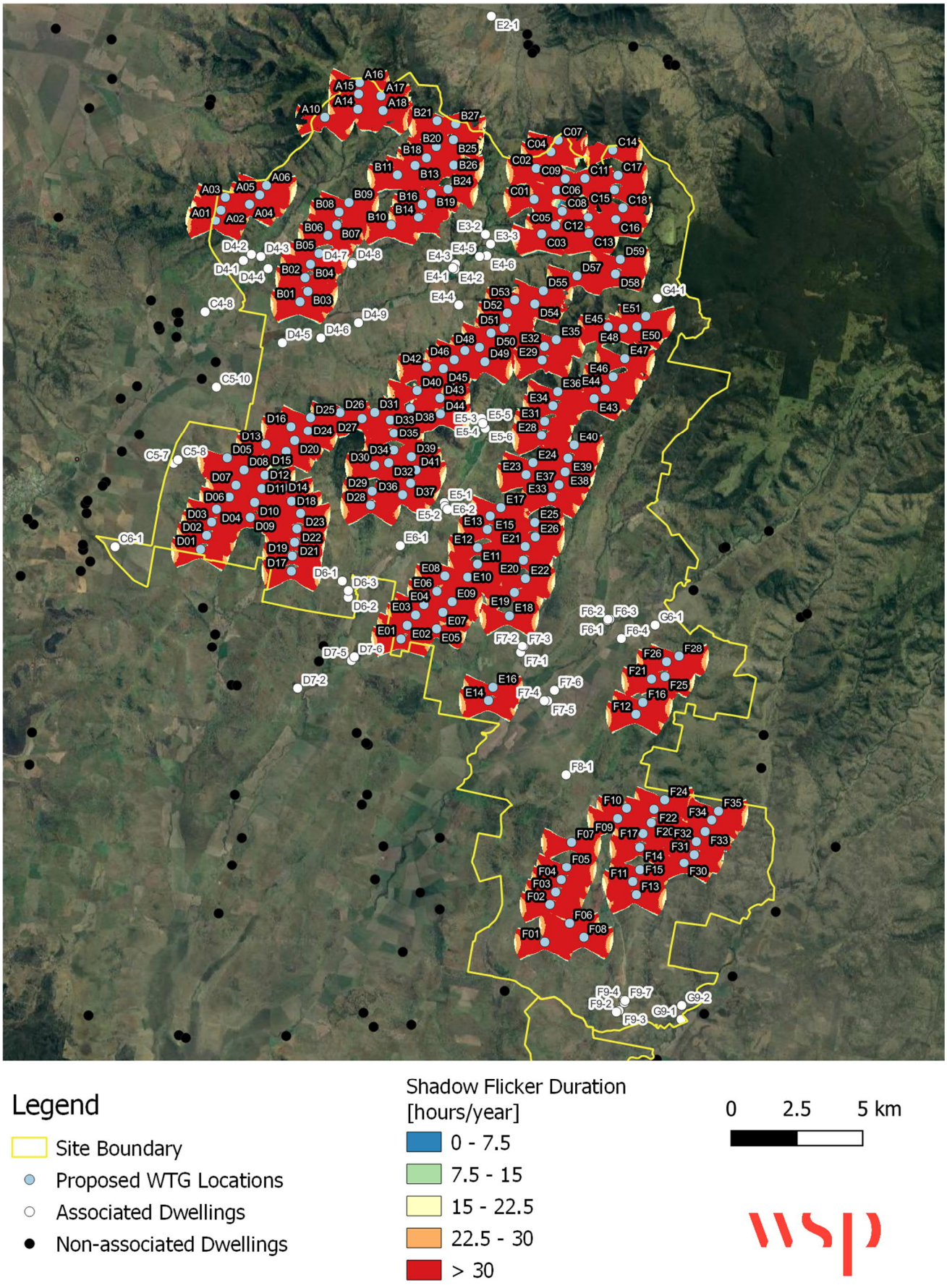

Figure 4.2 Worst case scenario shadow flicker duration map, Modified Project, (maximum of 2 & 6 mAGL)

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APPENDIX A

WIND FARM DETAILS

A1 DWELLING LOCATIONS

The Proponent has provided WSP with a list of 218 dwellings. WSP found that 114 dwellings are in close proximity to the LRWF Modified Project (within 5 km of a proposed WTG location). The close proximity dwellings are outlined in Table B.1 below. The Proponent has listed each dwelling as associated or non-associated, which relates to the requirements set out in the Development Consent.

Table B.1 Dwellings at Liverpool Range Wind Farm (GDA 1994 MGA Zone 55)

DWELLING ID	EASTING [M]	NORTHING [M]	STATUS
1	784030	6457169	Non-associated
2	772896	6462462	Non-associated
11	781559	6492082	Non-associated
12	781619	6491887	Non-associated
13	781847	6491866	Non-associated
B5-6	759412	6475153	Non-associated
B5-7	759494	6475274	Non-associated
B6-10	759459	6474801	Non-associated
B6-11	759597	6472970	Non-associated
B6-7	759236	6472605	Non-associated
B6-8	759315	6473604	Non-associated
B6-9	759330	6473411	Non-associated
C2-3	764134	6490350	Non-associated
C2-4	764191	6490559	Non-associated
C4-1	761908	6482895	Non-associated
C4-2	762190	6481915	Non-associated
C4-3	762238	6481795	Non-associated
C4-4	762874	6481513	Non-associated
C4-5	762878	6482423	Non-associated
C4-6	762958	6482067	Non-associated
C4-7	762958	6482433	Non-associated
C4-8	763965	6482463	Associated
C4-9	764371	6480560	Non-associated
C5-1	760070	6475843	Non-associated
C5-10	764398	6479612	Associated

DWELLING ID	EASTING [M]	NORTHING [M]	STATUS
C5-2	760190	6475987	Non-associated
C5-3	760755	6479176	Non-associated
C5-4	760800	6477141	Non-associated
C5-5	761379	6479642	Non-associated
C5-6	761460	6477801	Non-associated
C5-7	762771	6476691	Associated
C5-8	762934	6476829	Associated
C5-9	763840	6479921	Non-associated
C6-1	760542	6473529	Associated
C6-3	763886	6471207	Non-associated
C6-4	764351	6470201	Non-associated
C7-1	764232	6469712	Non-associated
C7-2	764972	6468258	Non-associated
D4-1	765422	6484412	Associated
D4-2	765727	6484644	Associated
D4-3	766088	6484562	Associated
D4-4	766362	6484106	Associated
D4-5	766906	6481291	Associated
D4-6	768370	6481475	Associated
D4-7	769558	6484285	Associated
D4-8	769576	6484342	Associated
D4-9	769800	6482050	Associated
D6-1	769184	6472228	Associated
D6-2	769411	6471608	Associated
D6-3	769414	6471866	Associated
D7-1	765177	6468242	Non-associated
D7-2	767488	6468138	Associated
D7-3	768296	6469155	Non-associated
D7-4	768469	6469763	Non-associated
D7-5	769535	6469184	Associated
D7-6	769644	6469327	Associated
D7-7	769734	6466440	Non-associated
E2-1	774854	6493728	Associated

DWELLING ID	EASTING [M]	NORTHING [M]	STATUS
E3-2	774634	6485402	Associated
E3-3	774826	6485037	Associated
E4-1	773390	6484129	Associated
E4-2	773466	6484080	Associated
E4-3	773492	6484278	Associated
E4-4	773616	6482725	Associated
E4-5	774406	6484563	Associated
E4-6	774681	6484593	Associated
E5-1	773065	6475200	Associated
E5-2	773092	6475057	Associated
E5-3	774485	6478428	Associated
E5-4	774532	6478237	Associated
E5-5	774556	6478244	Associated
E5-6	774620	6478043	Associated
E6-1	771386	6473570	Associated
E6-2	773187	6474948	Associated
E7-1	770093	6466051	Non-associated
E7-2	770164	6465993	Non-associated
E8-5	772152	6460352	Non-associated
E9-4	772890	6459717	Non-associated
F2-1	775382	6493341	Non-associated
F2-2	776225	6493044	Non-associated
F2-3	776258	6492638	Non-associated
F2-4	776417	6492338	Non-associated
F2-5	776525	6492461	Non-associated
F6-1	779283	6470731	Associated
F6-2	779289	6470778	Associated
F6-3	779360	6470786	Associated
F6-4	779804	6470050	Associated
F7-1	775970	6469502	Associated
F7-2	776035	6469752	Associated
F7-3	776084	6469736	Associated
F7-4	776870	6467660	Associated

DWELLING ID	EASTING [M]	NORTHING [M]	STATUS
F7-5	777002	6467659	Associated
F7-6	777255	6468058	Associated
F8-1	777698	6464852	Associated
F9-1	775364	6456611	Non-associated
F9-2	779611	6455812	Associated
F9-3	779714	6455866	Associated
F9-4	779892	6456264	Associated
F9-5	779898	6456207	Associated
F9-6	779913	6456165	Associated
F9-7	779942	6456248	Associated
G2-1	780254	6492574	Non-associated
G4-1	781170	6482977	Associated
G6-1	781085	6470560	Associated
G6-2	782545	6471883	Non-associated
G6-3	783765	6473517	Non-associated
G6-4	783684	6473479	Non-associated
G9-1	782075	6455530	Associated
G9-2	782098	6456061	Associated
H6-2	786626	6470853	Non-associated
H7-1	785125	6465108	Non-associated
H7-2	785215	6466360	Non-associated
H8-1	787952	6462116	Non-associated
H9-1	785676	6459623	Non-associated

A2 APPROVED PROJECT WTG LAYOUT

Table A.2 Liverpool Range Wind Farm (Approved Layout) – WTG Coordinates - (UTM WGS84, zone 55)

WTG ID	EASTING [M]	NORTHING [M]	GROUND ELEVATION [M]
T1	770076	6478547	890
T2	767027	6475684	882
T3	768975	6478651	888
T4	772155	6488316	1000
T5	767868	6483146	780
T6	768340	6484770	780
T7	771399	6478445	889
T8	769364	6486587	800
T9	769077	6486050	799
T10	767611	6482866	770
T11	768942	6485623	780
T12	773462	6488920	980
T13	772771	6489554	1002
T14	767233	6472810	756
T15	772795	6488857	980
T16	771107	6477789	883
T17	774999	6468488	649
T18	772999	6479156	880
T19	767804	6483810	790
T20	773216	6480602	924
T21	772026	6485906	940
T22	767419	6474100	781
T23	763851	6473510	816
T24	768879	6478264	880
T25	771935	6479013	898
T26	776474	6482738	920
T27	765079	6475815	851
T28	772056	6479383	897
T29	771536	6484335	800
T30	772939	6480332	920
T31	770565	6476714	910
T32	771718	6478669	888

WTG ID	EASTING [M]	NORTHING [M]	GROUND ELEVATION [M]
T33	770391	6478774	900
T34	775357	6481910	906
T35	772920	6478645	890
T36	765379	6476318	914
T37	774416	6481096	910
T38	773621	6480883	917
T39	771190	6476835	916
T40	770314	6476427	901
T41	766284	6477441	870
T42	767243	6482687	711
T43	772073	6486348	960
T44	770232	6474872	770
T45	768004	6488944	940
T46	770127	6476095	863
T47	772028	6476797	920
T48	774823	6481724	902
T49	767644	6477650	879
T50	770307	6475342	799
T51	771407	6475263	805
T52	765461	6474258	788
T53	767282	6473264	772
T54	768151	6478599	883
T55	767356	6473655	780
T56	765853	6476132	933
T57	772491	6487064	972
T58	771566	6475625	845
T59	771956	6476318	912
T60	765798	6474962	891
T61	763858	6474324	842
T62	775463	6482426	910
T63	765881	6475371	890
T64	765620	6474610	840
T65	766415	6476470	950
T66	764609	6475171	850
T67	772438	6479983	892

WTG ID	EASTING [M]	NORTHING [M]	GROUND ELEVATION [M]
T68	763962	6473880	825
T70	774691	6480596	920
T71	765862	6486760	920
T72	766603	6476812	913
T73	764167	6474538	846
T74	764362	6474877	870
T75	767320	6478205	866
T76	764872	6475454	850
T77	767255	6475257	852
T78	770713	6490145	1049
T79	768108	6477995	890
T80	767421	6474554	839
T81	766101	6475679	930
T82	767303	6477485	878
T83	771052	6490298	1032
T84	764734	6486809	940
T85	776415	6485184	880
T86	765167	6486951	918
T87	769362	6491125	1069
T88	769873	6490338	1040
T89	766168	6487021	960
T90	766300	6476108	947
T91	765539	6487263	919
T93	768112	6489669	961
T94	771777	6475943	880
T95	767350	6488417	879
T96	775685	6482767	900
T97	768103	6489262	940
T98	768508	6489806	1020
T99	768706	6485319	777
T100	764455	6486093	880
T101	766282	6487376	949
T102	764893	6476853	856
T103	767808	6474713	840
T104	769725	6489975	1036

WTG ID	EASTING [M]	NORTHING [M]	GROUND ELEVATION [M]
T105	764607	6486446	902
T106	767665	6488646	940
T107	772837	6490014	1003
T108	778650	6484175	911
T109	768577	6490200	1040
T110	767073	6488036	872
T111	768871	6490566	1040
T112	773523	6489630	1040
T113	765671	6486432	900
T114	772199	6486798	980
T115	772938	6485936	960
T116	764348	6485719	858
T117	770861	6487435	846
T118	771150	6487642	899
T119	773069	6486701	960
T120	770653	6490762	1059
T121	766621	6487807	878
T122	773174	6486241	960
T123	769206	6490778	1060
T124	771597	6487787	920
T125	773094	6487107	979
T126	767127	6472425	732
T127	771289	6486039	860
T128	772768	6485595	898
T129	772611	6485236	860
T130	771190	6477293	917
T131	767143	6477146	869
T132	771893	6488024	980
T133	771061	6485729	880
T134	773313	6487417	978
T135	770832	6485440	815
T136	772157	6480467	910
T137	773547	6488078	940
T138	772519	6488535	1000
T139	772157	6484436	840

WTG ID	EASTING [M]	NORTHING [M]	GROUND ELEVATION [M]
T140	768013	6484128	763
T141	769784	6478362	889
T142	777496	6488887	1037
T143	776175	6473575	780
T144	774913	6468081	660
T145	776707	6488311	951
T146	777922	6477194	871
T147	777178	6488662	1004
T148	777032	6478516	920
T149	776875	6481267	930
T150	776086	6476221	830
T151	774422	6473676	780
T152	779960	6481127	979
T153	772835	6470561	750
T154	776102	6486364	920
T155	777272	6487078	965
T156	777646	6487456	1040
T157	779625	6480335	950
T158	778687	6479123	905
T159	777770	6483715	920
T160	777048	6477913	920
T161	778673	6485773	1024
T162	780169	6481590	1007
T163	779511	6479984	950
T164	776728	6474835	820
T165	777151	6481564	928
T166	779894	6486420	1080
T167	777199	6478879	920
T168	781220	6473510	851
T169	774874	6474745	810
T170	771949	6470953	760
T171	781047	6476314	780
T172	777331	6483435	939
T173	772707	6470195	732
T174	779706	6486038	1020

WTG ID	EASTING [M]	NORTHING [M]	GROUND ELEVATION [M]
T175	772167	6471265	770
T176	777019	6485678	980
T178	776059	6472837	760
T181	779135	6484253	940
T183	774309	6473134	780
T184	779012	6479376	917
T185	777534	6476242	830
T186	780685	6473296	832
T187	780657	6482236	1010
T188	777294	6475612	820
T189	779634	6484412	1000
T190	776773	6485385	960
T191	771559	6470459	734
T192	779809	6480692	946
T193	776408	6473879	780
T195	777023	6475273	830
T196	773075	6472419	780
T197	780212	6484775	1000
T198	774197	6472718	770
T199	775203	6475050	770
T201	771426	6470084	727
T202	776572	6474450	810
T203	772689	6471761	793
T205	777743	6476858	890
T206	773994	6472394	780
T207	777322	6479313	909
T208	776709	6483257	930
T209	776663	6480221	896
T210	776274	6476641	867
T211	776583	6476889	844
T212	776352	6486655	902
T214	781526	6473871	850
T215	776862	6477556	908
T217	775234	6475426	780
T218	774655	6474088	789

WTG ID	EASTING [M]	NORTHING [M]	GROUND ELEVATION [M]
T219	772837	6472109	780
T220	778247	6486603	1080
T221	776704	6480627	930
T222	778065	6477548	847
T223	776807	6486928	925
T225	773408	6471305	779
T226	776484	6487872	920
T227	778566	6485399	1019
T229	774748	6467705	660
T230	777710	6485668	1004
T231	783351	6463802	660
T232	781972	6464061	679
T233	781493	6463939	670
T235	781295	6463343	660
T237	776846	6459250	628
T238	780148	6463809	637
T239	784397	6469259	763
T240	783972	6463721	660
T241	780247	6459465	610
T242	781209	6468977	767
T243	777890	6459054	640
T244	783615	6468558	770
T246	780253	6460030	600
T247	784048	6468807	780
T248	780312	6467072	740
T249	784438	6469691	772
T250	783736	6462401	650
T251	781448	6468539	760
T252	780477	6467375	740
T253	780934	6468523	757
T254	782790	6462499	650
T255	781848	6469371	760
T256	783709	6463358	669
T257	777904	6462206	630
T258	782430	6461682	650

WTG ID	EASTING [M]	NORTHING [M]	GROUND ELEVATION [M]
T259	782552	6462222	650
T260	780490	6461838	634
T261	780675	6467650	740
T262	777849	6461730	627
T263	780542	6462189	640
T264	783485	6463093	660
T265	778103	6462544	620
T266	782137	6461473	639
T267	779629	6463172	640
T268	783015	6462789	650
T269	780383	6460362	630
T270	780584	6462549	640
T271	779953	6463534	640
T272	780486	6461281	640
T274	778329	6458606	640
T275	780769	6462832	646
T276	777290	6460358	649
T278	781481	6469214	780
T280	780277	6460830	639
T281	777031	6459541	640
T282	777514	6460741	640
T283	781000	6463107	659
T284	777725	6461179	630
T285	777133	6460050	650
T287	780494	6481880	1009

A3 MODIFIED PROJECT WTG LAYOUT

Table A.3 Liverpool Range Wind Farm (Modified Layout) – WTG Coordinates - (GDA 1994 MGA Zone 55)

WTG ID [3]	EASTING [M]	NORTHING [M]	ELEVATION [M]
A01	764361	6485938	883
A02	764567	6486348	916
A03	764737	6486841	945
A04	765657	6486573	909
A05	766043	6486932	922
A06	766305	6487294	965
A10	768522	6489885	1038
A14	769779	6490193	1059
A15	769806	6490773	1069
A16	769842	6491205	1067
A17	770657	6490699	1065
A18	770736	6490142	1057
B01	767579	6482849	762
B02	767770	6483761	796
B03	767877	6483242	780
B04	767975	6484271	759
B05	768299	6484683	782
B06	768638	6485368	781
B07	768977	6485759	792
B08	769063	6486277	797
B09	769440	6486643	809
B10	771045	6485766	883
B11	771283	6487693	913
B13	771955	6488052	986
B14	772082	6486065	972
B16	772225	6486575	978
B18	772386	6488340	998
B19	772575	6486982	983
B20	772763	6488774	990

WTG ID [3]	EASTING [M]	NORTHING [M]	ELEVATION [M]
B21	772793	6489755	1021
B24	773206	6487152	989
B25	773412	6489030	998
B26	773427	6488066	944
B27	773499	6489633	1047
C01	776481	6486764	899
C02	776560	6487941	927
C03	776772	6485421	967
C04	777121	6488572	984
C05	777297	6485744	999
C06	777335	6487108	974
C07	777395	6489020	1075
C08	777554	6486309	1013
C09	777667	6487543	1044
C11	778417	6487559	1085
C12	778539	6486068	1055
C13	778573	6485445	1027
C14	779475	6488638	1053
C15	779541	6487124	1086
C16	779588	6485990	1027
C17	779674	6487677	1086
C18	779864	6486437	1091
D01	763795	6473432	818
D02	764026	6473963	830
D03	764217	6474467	846
D04	764400	6474954	877
D05	764810	6476905	857
D06	764885	6475416	851
D07	765140	6475867	858
D08	765447	6476443	900
D09	765682	6474644	842
D10	765851	6475212	884
D11	766123	6475736	933

WTG ID [3]	EASTING [M]	NORTHING [M]	ELEVATION [M]
D12	766246	6476249	949
D13	766276	6477421	872
D14	766941	6475782	885
D15	767048	6477144	874
D16	767234	6478105	881
D17	767251	6472606	752
D18	767258	6475258	854
D19	767282	6473182	775
D20	767373	6477563	883
D21	767371	6473700	783
D22	767458	6474215	791
D23	767600	6474797	854
D24	767887	6477940	879
D25	767979	6478454	886
D26	769097	6478643	891
D27	769937	6478420	894
D28	770260	6475109	778
D29	770322	6475638	812
D30	770416	6476612	914
D31	770420	6478652	900
D32	770952	6476714	908
D33	771014	6478364	890
D34	771142	6477198	923
D35	771149	6477851	884
D36	771480	6475501	835
D37	771784	6475940	883
D38	771775	6478808	893
D39	771813	6476947	929
D40	772031	6479483	896
D41	771987	6476442	921
D42	772383	6480376	915
D43	772898	6479197	884
D44	772920	6478596	895

WTG ID [3]	EASTING [M]	NORTHING [M]	ELEVATION [M]
D45	773030	6480314	922
D46	773445	6480651	924
D47	773849	6480999	924
D48	774404	6481119	921
D49	774609	6480574	919
D50	774845	6481663	910
D51	775338	6481846	918
D52	775461	6482422	911
D53	775744	6482920	907
D54	776509	6482765	921
D55	776835	6483266	933
D57	778113	6483831	942
D58	779577	6483903	968
D59	779761	6484456	1020
E01	771417	6470034	731
E02	771655	6470550	748
E03	771974	6470943	767
E04	772291	6471337	772
E05	772773	6470419	759
E06	772784	6471841	782
E07	773012	6471045	755
E08	773091	6472425	788
E09	773366	6471447	782
E10	773956	6472379	785
E11	774330	6472873	776
E12	774332	6473498	786
E13	774703	6474188	797
E14	774745	6467673	664
E15	774811	6474695	806
E16	774919	6468177	663
E17	775217	6475018	778
E18	775544	6470908	702
E19	775734	6471797	712

WTG ID [3]	EASTING [M]	NORTHING [M]	ELEVATION [M]
E20	776074	6473020	769
E21	776145	6473541	779
E22	776153	6472322	719
E23	776176	6476263	835
E24	776440	6476721	848
E25	776509	6474452	802
E26	776529	6473904	786
E28	776767	6477771	921
E29	776787	6480639	933
E31	776883	6478314	925
E32	776873	6481153	933
E33	777149	6475421	828
E34	777202	6478905	925
E35	777324	6481410	931
E36	777382	6479441	911
E37	777429	6475883	800
E38	777662	6476370	837
E39	777771	6476893	890
E40	778007	6477395	862
E43	778768	6479174	910
E44	779185	6479530	902
E45	779296	6481899	1021
E46	779489	6480007	957
E47	779933	6480695	955
E48	779874	6481838	1003
E50	780394	6481909	1010
E51	780734	6482300	1012
F01	776890	6458475	590
F02	777082	6459907	656
F03	777301	6460379	651
F04	777517	6460853	631
F05	777721	6461338	641
F06	777834	6459190	642

WTG ID [3]	EASTING [M]	NORTHING [M]	ELEVATION [M]
F07	777908	6462294	636
F08	778378	6458658	641
F09	779662	6463197	648
F10	780001	6463590	644
F11	780236	6460778	643
F12	780355	6467150	745
F13	780373	6460279	629
F14	780500	6462103	649
F15	780510	6461229	644
F16	780619	6467599	749
F17	780623	6462625	650
F20	780940	6463036	657
F21	780951	6468488	762
F22	781044	6463546	667
F24	781450	6463905	670
F25	781464	6468579	764
F26	781521	6469143	784
F28	781996	6469360	762
F30	782187	6461499	642
F31	782573	6461823	649
F32	782653	6462321	656
F33	782988	6462704	656
F34	783238	6463141	662
F35	783497	6463476	668

APPENDIX B

SHADOW FLICKER RESULTS – DWELLING LOCATIONS WITHIN 5KM OF WTG'S

Table B.1 The LRWF project Theoretical Worst Case Scenario shadow flicker results (point analysis results)

DWELLING ID	ASSOCIATED DWELLING	EASTING	NORTHING	APPROVED PROJECT – EPURON ASSESSMENT		APPROVED PROJECT – WSP ASSESSMENT		MODIFIED PROJECT – WSP ASSESSMENT	
				HOURS PER YEAR [2 m]	HOURS PER YEAR [6 m]	HOURS PER YEAR [2 m]	HOURS PER YEAR [6 m]	HOURS PER YEAR [2 m]	HOURS PER YEAR [6 m]
	(Y/N)	EASTING [m]	NORTHING [m]	HH:MM	HH:MM	HH:MM	HH:MM	HH:MM	HH:MM
1	N	784030	6457169	00:00	00:00	00:00	00:00	00:00	00:00
2	N	772896	6462462	00:00	00:00	00:00	00:00	00:00	00:00
11	N	781559	6492082	00:00	00:00	00:00	00:00	00:00	00:00
12	N	781619	6491887	00:00	00:00	00:00	00:00	00:00	00:00
13	N	781847	6491866	00:00	00:00	00:00	00:00	00:00	00:00
B5-6	N	759412	6475153	00:00	00:00	00:00	00:00	00:00	00:00
B5-7	N	759494	6475274	00:00	00:00	00:00	00:00	00:00	00:00
B6-10	N	759459	6474801	00:00	00:00	00:00	00:00	00:00	00:00
B6-11	N	759597	6472970	00:00	00:00	00:00	00:00	00:00	00:00
B6-7	N	759236	6472605	00:00	00:00	00:00	00:00	00:00	00:00
B6-8	N	759315	6473604	00:00	00:00	00:00	00:00	00:00	00:00
B6-9	N	759330	6473411	00:00	00:00	00:00	00:00	00:00	00:00
C2-3	N	764134	6490350	00:00	00:00	00:00	00:00	00:00	00:00
C2-4	N	764191	6490559	00:00	00:00	00:00	00:00	00:00	00:00
C4-1	N	761908	6482895	00:00	00:00	00:00	00:00	00:00	00:00
C4-2	N	762190	6481915	00:00	00:00	00:00	00:00	00:00	00:00

DWELLING ID	ASSOCIATED DWELLING	EASTING	NORTHING	APPROVED PROJECT – EPURON ASSESSMENT		APPROVED PROJECT – WSP ASSESSMENT		MODIFIED PROJECT – WSP ASSESSMENT	
				HOURS PER YEAR [2 m]	HOURS PER YEAR [6 m]	HOURS PER YEAR [2 m]	HOURS PER YEAR [6 m]	HOURS PER YEAR [2 m]	HOURS PER YEAR [6 m]
	(Y/N)	EASTING [m]	NORTHING [m]	HH:MM	HH:MM	HH:MM	HH:MM	HH:MM	HH:MM
C4-3	N	762238	6481795	00:00	00:00	00:00	00:00	00:00	00:00
C4-4	N	762874	6481513	00:00	00:00	00:00	00:00	00:00	00:00
C4-5	N	762878	6482423	00:00	00:00	00:00	00:00	00:00	00:00
C4-6	N	762958	6482067	00:00	00:00	00:00	00:00	00:00	00:00
C4-7	N	762958	6482433	00:00	00:00	00:00	00:00	00:00	00:00
C4-8	Y	763965	6482463	00:00	00:00	00:00	00:00	00:00	00:00
C4-9	N	764371	6480560	00:00	00:00	00:00	00:00	00:00	00:00
C5-1	N	760070	6475843	00:00	00:00	00:00	00:00	00:00	00:00
C5-10	Y	764398	6479612	00:00	00:00	00:00	00:00	00:00	00:00
C5-2	N	760190	6475987	00:00	00:00	00:00	00:00	00:00	00:00
C5-3	N	760755	6479176	00:00	00:00	00:00	00:00	00:00	00:00
C5-4	N	760800	6477141	00:00	00:00	00:00	00:00	00:00	00:00
C5-5	N	761379	6479642	00:00	00:00	00:00	00:00	00:00	00:00
C5-6	N	761460	6477801	00:00	00:00	00:00	00:00	00:00	00:00
C5-7	Y	762771	6476691	00:00	00:00	00:00	00:00	00:00	00:00
C5-8	Y	762934	6476829	00:00	00:00	00:00	00:00	00:00	00:00
C5-9	N	763840	6479921	00:00	00:00	00:00	00:00	00:00	00:00

DWELLING ID	ASSOCIATED DWELLING	EASTING	NORTHING	APPROVED PROJECT – EPURON ASSESSMENT		APPROVED PROJECT – WSP ASSESSMENT		MODIFIED PROJECT – WSP ASSESSMENT	
				HOURS PER YEAR [2 m]	HOURS PER YEAR [6 m]	HOURS PER YEAR [2 m]	HOURS PER YEAR [6 m]	HOURS PER YEAR [2 m]	HOURS PER YEAR [6 m]
	(Y/N)	EASTING [m]	NORTHING [m]	HH:MM	HH:MM	HH:MM	HH:MM	HH:MM	HH:MM
C6-1	Y	760542	6473529	00:00	00:00	00:00	00:00	00:00	00:00
C6-3	N	763886	6471207	00:00	00:00	00:00	00:00	00:00	00:00
C6-4	N	764351	6470201	00:00	00:00	00:00	00:00	00:00	00:00
C7-1	N	764232	6469712	00:00	00:00	00:00	00:00	00:00	00:00
C7-2	N	764972	6468258	00:00	00:00	00:00	00:00	00:00	00:00
D4-1	Y	765422	6484412	00:00	00:00	00:00	00:00	00:00	00:00
D4-2	Y	765727	6484644	00:00	00:00	00:00	00:00	00:00	00:00
D4-3	Y	766088	6484562	00:00	00:00	00:00	00:00	00:00	00:00
D4-4	Y	766362	6484106	00:00	00:00	00:00	00:00	00:00	00:00
D4-5	Y	766906	6481291	00:00	00:00	00:00	00:00	00:00	00:00
D4-6	Y	768370	6481475	00:00	00:00	00:00	00:00	00:00	00:00
D4-7	Y	769558	6484285	00:00	00:00	00:00	00:00	00:00	00:00
D4-8	Y	769576	6484342	00:00	00:00	00:00	00:00	00:00	00:00
D4-9	Y	769800	6482050	00:00	00:00	00:00	00:00	00:00	00:00
D6-1	Y	769184	6472228	00:00	00:00	00:00	00:00	00:00	00:00
D6-2	Y	769411	6471608	00:00	00:00	00:00	00:00	00:00	00:00
D6-3	Y	769414	6471866	00:00	00:00	00:00	00:00	00:00	00:00

DWELLING ID	ASSOCIATED DWELLING	EASTING	NORTHING	APPROVED PROJECT – EPURON ASSESSMENT		APPROVED PROJECT – WSP ASSESSMENT		MODIFIED PROJECT – WSP ASSESSMENT	
				HOURS PER YEAR [2 m]	HOURS PER YEAR [6 m]	HOURS PER YEAR [2 m]	HOURS PER YEAR [6 m]	HOURS PER YEAR [2 m]	HOURS PER YEAR [6 m]
	(Y/N)	EASTING [m]	NORTHING [m]	HH:MM	HH:MM	HH:MM	HH:MM	HH:MM	HH:MM
D7-1	N	765177	6468242	00:00	00:00	00:00	00:00	00:00	00:00
D7-2	Y	767488	6468138	00:00	00:00	00:00	00:00	00:00	00:00
D7-3	N	768296	6469155	00:00	00:00	00:00	00:00	00:00	00:00
D7-4	N	768469	6469763	00:00	00:00	00:00	00:00	00:00	00:00
D7-5	Y	769535	6469184	00:00	00:00	00:00	00:00	00:00	00:00
D7-6	Y	769644	6469327	00:00	00:00	00:00	00:00	00:00	00:00
D7-7	N	769734	6466440	00:00	00:00	00:00	00:00	00:00	00:00
E2-1	Y	774854	6493728	00:00	00:00	00:00	00:00	00:00	00:00
E3-2	Y	774634	6485402	00:00	00:00	00:00	00:00	00:00	00:00
E3-3	Y	774826	6485037	00:00	00:00	00:00	00:00	00:00	00:00
E4-1	Y	773390	6484129	00:00	00:00	00:00	00:00	00:00	00:00
E4-2	Y	773466	6484080	00:00	00:00	00:00	00:00	00:00	00:00
E4-3	Y	773492	6484278	00:00	00:00	00:00	00:00	00:00	00:00
E4-4	Y	773616	6482725	00:00	00:00	00:00	00:00	00:00	00:00
E4-5	Y	774406	6484563	00:00	00:00	00:00	00:00	00:00	00:00
E4-6	Y	774681	6484593	00:00	00:00	00:00	00:00	00:00	00:00
E5-1	Y	773065	6475200	00:00	00:00	00:00	00:00	00:00	00:00

DWELLING ID	ASSOCIATED DWELLING	EASTING	NORTHING	APPROVED PROJECT – EPURON ASSESSMENT		APPROVED PROJECT – WSP ASSESSMENT		MODIFIED PROJECT – WSP ASSESSMENT	
				HOURS PER YEAR [2 m]	HOURS PER YEAR [6 m]	HOURS PER YEAR [2 m]	HOURS PER YEAR [6 m]	HOURS PER YEAR [2 m]	HOURS PER YEAR [6 m]
	(Y/N)	EASTING [m]	NORTHING [m]	HH:MM	HH:MM	HH:MM	HH:MM	HH:MM	HH:MM
E5-2	Y	773092	6475057	00:00	00:00	00:00	00:00	00:00	00:00
E5-3	Y	774485	6478428	00:00	00:00	00:00	00:00	00:00	00:00
E5-4	Y	774532	6478237	00:00	00:00	00:00	00:00	00:00	00:00
E5-5	Y	774556	6478244	00:00	00:00	00:00	00:00	00:00	00:00
E5-6	Y	774620	6478043	00:00	00:00	00:00	00:00	00:00	00:00
E6-1	Y	771386	6473570	00:00	00:00	00:00	00:00	00:00	00:00
E6-2	Y	773187	6474948	00:00	00:00	00:00	00:00	00:00	00:00
E7-1	N	770093	6466051	00:00	00:00	00:00	00:00	00:00	00:00
E7-2	N	770164	6465993	00:00	00:00	00:00	00:00	00:00	00:00
E8-5	N	772152	6460352	00:00	00:00	00:00	00:00	00:00	00:00
E9-4	N	772890	6459717	00:00	00:00	00:00	00:00	00:00	00:00
F2-1	N	775382	6493341	00:00	00:00	00:00	00:00	00:00	00:00
F2-2	N	776225	6493044	00:00	00:00	00:00	00:00	00:00	00:00
F2-3	N	776258	6492638	00:00	00:00	00:00	00:00	00:00	00:00
F2-4	N	776417	6492338	00:00	00:00	00:00	00:00	00:00	00:00
F2-5	N	776525	6492461	00:00	00:00	00:00	00:00	00:00	00:00
F6-1	Y	779283	6470731	00:00	00:00	00:00	00:00	00:00	00:00

DWELLING ID	ASSOCIATED DWELLING	EASTING	NORTHING	APPROVED PROJECT – EPURON ASSESSMENT		APPROVED PROJECT – WSP ASSESSMENT		MODIFIED PROJECT – WSP ASSESSMENT	
				HOURS PER YEAR [2 m]	HOURS PER YEAR [6 m]	HOURS PER YEAR [2 m]	HOURS PER YEAR [6 m]	HOURS PER YEAR [2 m]	HOURS PER YEAR [6 m]
	(Y/N)	EASTING [m]	NORTHING [m]	HH:MM	HH:MM	HH:MM	HH:MM	HH:MM	HH:MM
F6-2	Y	779289	6470778	00:00	00:00	00:00	00:00	00:00	00:00
F6-3	Y	779360	6470786	00:00	00:00	00:00	00:00	00:00	00:00
F6-4	Y	779804	6470050	00:00	00:00	00:00	00:00	00:00	00:00
F7-1	Y	775970	6469502	00:00	00:00	00:00	00:00	00:00	00:00
F7-2	Y	776035	6469752	00:00	00:00	00:00	00:00	00:00	00:00
F7-3	Y	776084	6469736	00:00	00:00	00:00	00:00	00:00	00:00
F7-4	Y	776870	6467660	00:00	00:00	00:00	00:00	00:00	00:00
F7-5	Y	777002	6467659	00:00	00:00	00:00	00:00	00:00	00:00
F7-6	Y	777255	6468058	00:00	00:00	00:00	00:00	00:00	00:00
F8-1	Y	777698	6464852	00:00	00:00	00:00	00:00	00:00	00:00
F9-1	N	775364	6456611	00:00	00:00	00:00	00:00	00:00	00:00
F9-2	Y	779611	6455812	00:00	00:00	00:00	00:00	00:00	00:00
F9-3	Y	779714	6455866	00:00	00:00	00:00	00:00	00:00	00:00
F9-4	Y	779892	6456264	00:00	00:00	00:00	00:00	00:00	00:00
F9-5	Y	779898	6456207	00:00	00:00	00:00	00:00	00:00	00:00
F9-6	Y	779913	6456165	00:00	00:00	00:00	00:00	00:00	00:00
F9-7	Y	779942	6456248	00:00	00:00	00:00	00:00	00:00	00:00

DWELLING ID	ASSOCIATED DWELLING	EASTING	NORTHING	APPROVED PROJECT – EPURON ASSESSMENT		APPROVED PROJECT – WSP ASSESSMENT		MODIFIED PROJECT – WSP ASSESSMENT	
				HOURS PER YEAR [2 m]	HOURS PER YEAR [6 m]	HOURS PER YEAR [2 m]	HOURS PER YEAR [6 m]	HOURS PER YEAR [2 m]	HOURS PER YEAR [6 m]
	(Y/N)	EASTING [m]	NORTHING [m]	HH:MM	HH:MM	HH:MM	HH:MM	HH:MM	HH:MM
G2-1	N	780254	6492574	00:00	00:00	00:00	00:00	00:00	00:00
G4-1	Y	781170	6482977	00:00	00:00	00:00	00:00	00:00	00:00
G6-1	Y	781085	6470560	00:00	00:00	00:00	00:00	00:00	00:00
G6-2	N	782545	6471883	00:00	00:00	00:00	00:00	00:00	00:00
G6-3	N	783765	6473517	00:00	00:00	00:00	00:00	00:00	00:00
G6-4	N	783684	6473479	00:00	00:00	00:00	00:00	00:00	00:00
G9-1	Y	782075	6455530	00:00	00:00	00:00	00:00	00:00	00:00
G9-2	Y	782098	6456061	00:00	00:00	00:00	00:00	00:00	00:00
H6-2	N	786626	6470853	00:00	00:00	00:00	00:00	00:00	00:00
H7-1	N	785125	6465108	00:00	00:00	00:00	00:00	00:00	00:00
H7-2	N	785215	6466360	00:00	00:00	00:00	00:00	00:00	00:00
H8-1	N	787952	6462116	00:00	00:00	00:00	00:00	00:00	00:00
H9-1	N	785676	6459623	00:00	00:00	00:00	00:00	00:00	00:00

Table B.2 The LRWF project Realistic Case Scenario Shadow Flicker Results (point analysis results)

DWELLING ID	ASSOCIATED DWELLING	EASTING	NORTHING	APPROVED PROJECT – EPURON ASSESSMENT		APPROVED PROJECT – WSP ASSESSMENT		MODIFIED PROJECT – WSP ASSESSMENT	
				HOURS PER YEAR [2 m]	HOURS PER YEAR [6 m]	HOURS PER YEAR [2 m]	HOURS PER YEAR [6 m]	HOURS PER YEAR [2 m]	HOURS PER YEAR [6 m]
	(Y/N)	EASTING [m]	NORTHING [m]	HH:MM	HH:MM	HH:MM	HH:MM	HH:MM	HH:MM
1	N	784030	6457169	00:00	00:00	00:00	00:00	00:00	00:00
2	N	772896	6462462	00:00	00:00	00:00	00:00	00:00	00:00
11	N	781559	6492082	00:00	00:00	00:00	00:00	00:00	00:00
12	N	781619	6491887	00:00	00:00	00:00	00:00	00:00	00:00
13	N	781847	6491866	00:00	00:00	00:00	00:00	00:00	00:00
B5-6	N	759412	6475153	00:00	00:00	00:00	00:00	00:00	00:00
B5-7	N	759494	6475274	00:00	00:00	00:00	00:00	00:00	00:00
B6-10	N	759459	6474801	00:00	00:00	00:00	00:00	00:00	00:00
B6-11	N	759597	6472970	00:00	00:00	00:00	00:00	00:00	00:00
B6-7	N	759236	6472605	00:00	00:00	00:00	00:00	00:00	00:00
B6-8	N	759315	6473604	00:00	00:00	00:00	00:00	00:00	00:00
B6-9	N	759330	6473411	00:00	00:00	00:00	00:00	00:00	00:00
C2-3	N	764134	6490350	00:00	00:00	00:00	00:00	00:00	00:00
C2-4	N	764191	6490559	00:00	00:00	00:00	00:00	00:00	00:00
C4-1	N	761908	6482895	00:00	00:00	00:00	00:00	00:00	00:00
C4-2	N	762190	6481915	00:00	00:00	00:00	00:00	00:00	00:00

DWELLING ID	ASSOCIATED DWELLING	EASTING	NORTHING	APPROVED PROJECT – EPURON ASSESSMENT		APPROVED PROJECT – WSP ASSESSMENT		MODIFIED PROJECT – WSP ASSESSMENT	
				HOURS PER YEAR [2 m]	HOURS PER YEAR [6 m]	HOURS PER YEAR [2 m]	HOURS PER YEAR [6 m]	HOURS PER YEAR [2 m]	HOURS PER YEAR [6 m]
	(Y/N)	EASTING [m]	NORTHING [m]	HH:MM	HH:MM	HH:MM	HH:MM	HH:MM	HH:MM
C4-3	N	762238	6481795	00:00	00:00	00:00	00:00	00:00	00:00
C4-4	N	762874	6481513	00:00	00:00	00:00	00:00	00:00	00:00
C4-5	N	762878	6482423	00:00	00:00	00:00	00:00	00:00	00:00
C4-6	N	762958	6482067	00:00	00:00	00:00	00:00	00:00	00:00
C4-7	N	762958	6482433	00:00	00:00	00:00	00:00	00:00	00:00
C4-8	Y	763965	6482463	00:00	00:00	00:00	00:00	00:00	00:00
C4-9	N	764371	6480560	00:00	00:00	00:00	00:00	00:00	00:00
C5-1	N	760070	6475843	00:00	00:00	00:00	00:00	00:00	00:00
C5-10	Y	764398	6479612	00:00	00:00	00:00	00:00	00:00	00:00
C5-2	N	760190	6475987	00:00	00:00	00:00	00:00	00:00	00:00
C5-3	N	760755	6479176	00:00	00:00	00:00	00:00	00:00	00:00
C5-4	N	760800	6477141	00:00	00:00	00:00	00:00	00:00	00:00
C5-5	N	761379	6479642	00:00	00:00	00:00	00:00	00:00	00:00
C5-6	N	761460	6477801	00:00	00:00	00:00	00:00	00:00	00:00
C5-7	Y	762771	6476691	00:00	00:00	00:00	00:00	00:00	00:00
C5-8	Y	762934	6476829	00:00	00:00	00:00	00:00	00:00	00:00
C5-9	N	763840	6479921	00:00	00:00	00:00	00:00	00:00	00:00

DWELLING ID	ASSOCIATED DWELLING	EASTING	NORTHING	APPROVED PROJECT – EPURON ASSESSMENT		APPROVED PROJECT – WSP ASSESSMENT		MODIFIED PROJECT – WSP ASSESSMENT	
				HOURS PER YEAR [2 m]	HOURS PER YEAR [6 m]	HOURS PER YEAR [2 m]	HOURS PER YEAR [6 m]	HOURS PER YEAR [2 m]	HOURS PER YEAR [6 m]
	(Y/N)	EASTING [m]	NORTHING [m]	HH:MM	HH:MM	HH:MM	HH:MM	HH:MM	HH:MM
C6-1	Y	760542	6473529	00:00	00:00	00:00	00:00	00:00	00:00
C6-3	N	763886	6471207	00:00	00:00	00:00	00:00	00:00	00:00
C6-4	N	764351	6470201	00:00	00:00	00:00	00:00	00:00	00:00
C7-1	N	764232	6469712	00:00	00:00	00:00	00:00	00:00	00:00
C7-2	N	764972	6468258	00:00	00:00	00:00	00:00	00:00	00:00
D4-1	Y	765422	6484412	00:00	00:00	00:00	00:00	00:00	00:00
D4-2	Y	765727	6484644	00:00	00:00	00:00	00:00	00:00	00:00
D4-3	Y	766088	6484562	00:00	00:00	00:00	00:00	00:00	00:00
D4-4	Y	766362	6484106	00:00	00:00	00:00	00:00	00:00	00:00
D4-5	Y	766906	6481291	00:00	00:00	00:00	00:00	00:00	00:00
D4-6	Y	768370	6481475	00:00	00:00	00:00	00:00	00:00	00:00
D4-7	Y	769558	6484285	00:00	00:00	00:00	00:00	00:00	00:00
D4-8	Y	769576	6484342	00:00	00:00	00:00	00:00	00:00	00:00
D4-9	Y	769800	6482050	00:00	00:00	00:00	00:00	00:00	00:00
D6-1	Y	769184	6472228	00:00	00:00	00:00	00:00	00:00	00:00
D6-2	Y	769411	6471608	00:00	00:00	00:00	00:00	00:00	00:00
D6-3	Y	769414	6471866	00:00	00:00	00:00	00:00	00:00	00:00

DWELLING ID	ASSOCIATED DWELLING	EASTING	NORTHING	APPROVED PROJECT – EPURON ASSESSMENT		APPROVED PROJECT – WSP ASSESSMENT		MODIFIED PROJECT – WSP ASSESSMENT	
				HOURS PER YEAR [2 m]	HOURS PER YEAR [6 m]	HOURS PER YEAR [2 m]	HOURS PER YEAR [6 m]	HOURS PER YEAR [2 m]	HOURS PER YEAR [6 m]
	(Y/N)	EASTING [m]	NORTHING [m]	HH:MM	HH:MM	HH:MM	HH:MM	HH:MM	HH:MM
D7-1	N	765177	6468242	00:00	00:00	00:00	00:00	00:00	00:00
D7-2	Y	767488	6468138	00:00	00:00	00:00	00:00	00:00	00:00
D7-3	N	768296	6469155	00:00	00:00	00:00	00:00	00:00	00:00
D7-4	N	768469	6469763	00:00	00:00	00:00	00:00	00:00	00:00
D7-5	Y	769535	6469184	00:00	00:00	00:00	00:00	00:00	00:00
D7-6	Y	769644	6469327	00:00	00:00	00:00	00:00	00:00	00:00
D7-7	N	769734	6466440	00:00	00:00	00:00	00:00	00:00	00:00
E2-1	Y	774854	6493728	00:00	00:00	00:00	00:00	00:00	00:00
E3-2	Y	774634	6485402	00:00	00:00	00:00	00:00	00:00	00:00
E3-3	Y	774826	6485037	00:00	00:00	00:00	00:00	00:00	00:00
E4-1	Y	773390	6484129	00:00	00:00	00:00	00:00	00:00	00:00
E4-2	Y	773466	6484080	00:00	00:00	00:00	00:00	00:00	00:00
E4-3	Y	773492	6484278	00:00	00:00	00:00	00:00	00:00	00:00
E4-4	Y	773616	6482725	00:00	00:00	00:00	00:00	00:00	00:00
E4-5	Y	774406	6484563	00:00	00:00	00:00	00:00	00:00	00:00
E4-6	Y	774681	6484593	00:00	00:00	00:00	00:00	00:00	00:00
E5-1	Y	773065	6475200	00:00	00:00	00:00	00:00	00:00	00:00

DWELLING ID	ASSOCIATED DWELLING	EASTING	NORTHING	APPROVED PROJECT – EPURON ASSESSMENT		APPROVED PROJECT – WSP ASSESSMENT		MODIFIED PROJECT – WSP ASSESSMENT	
				HOURS PER YEAR [2 m]	HOURS PER YEAR [6 m]	HOURS PER YEAR [2 m]	HOURS PER YEAR [6 m]	HOURS PER YEAR [2 m]	HOURS PER YEAR [6 m]
	(Y/N)	EASTING [m]	NORTHING [m]	HH:MM	HH:MM	HH:MM	HH:MM	HH:MM	HH:MM
E5-2	Y	773092	6475057	00:00	00:00	00:00	00:00	00:00	00:00
E5-3	Y	774485	6478428	00:00	00:00	00:00	00:00	00:00	00:00
E5-4	Y	774532	6478237	00:00	00:00	00:00	00:00	00:00	00:00
E5-5	Y	774556	6478244	00:00	00:00	00:00	00:00	00:00	00:00
E5-6	Y	774620	6478043	00:00	00:00	00:00	00:00	00:00	00:00
E6-1	Y	771386	6473570	00:00	00:00	00:00	00:00	00:00	00:00
E6-2	Y	773187	6474948	00:00	00:00	00:00	00:00	00:00	00:00
E7-1	N	770093	6466051	00:00	00:00	00:00	00:00	00:00	00:00
E7-2	N	770164	6465993	00:00	00:00	00:00	00:00	00:00	00:00
E8-5	N	772152	6460352	00:00	00:00	00:00	00:00	00:00	00:00
E9-4	N	772890	6459717	00:00	00:00	00:00	00:00	00:00	00:00
F2-1	N	775382	6493341	00:00	00:00	00:00	00:00	00:00	00:00
F2-2	N	776225	6493044	00:00	00:00	00:00	00:00	00:00	00:00
F2-3	N	776258	6492638	00:00	00:00	00:00	00:00	00:00	00:00
F2-4	N	776417	6492338	00:00	00:00	00:00	00:00	00:00	00:00
F2-5	N	776525	6492461	00:00	00:00	00:00	00:00	00:00	00:00
F6-1	Y	779283	6470731	00:00	00:00	00:00	00:00	00:00	00:00

DWELLING ID	ASSOCIATED DWELLING	EASTING	NORTHING	APPROVED PROJECT – EPURON ASSESSMENT		APPROVED PROJECT – WSP ASSESSMENT		MODIFIED PROJECT – WSP ASSESSMENT	
				HOURS PER YEAR [2 m]	HOURS PER YEAR [6 m]	HOURS PER YEAR [2 m]	HOURS PER YEAR [6 m]	HOURS PER YEAR [2 m]	HOURS PER YEAR [6 m]
	(Y/N)	EASTING [m]	NORTHING [m]	HH:MM	HH:MM	HH:MM	HH:MM	HH:MM	HH:MM
F6-2	Y	779289	6470778	00:00	00:00	00:00	00:00	00:00	00:00
F6-3	Y	779360	6470786	00:00	00:00	00:00	00:00	00:00	00:00
F6-4	Y	779804	6470050	00:00	00:00	00:00	00:00	00:00	00:00
F7-1	Y	775970	6469502	00:00	00:00	00:00	00:00	00:00	00:00
F7-2	Y	776035	6469752	00:00	00:00	00:00	00:00	00:00	00:00
F7-3	Y	776084	6469736	00:00	00:00	00:00	00:00	00:00	00:00
F7-4	Y	776870	6467660	00:00	00:00	00:00	00:00	00:00	00:00
F7-5	Y	777002	6467659	00:00	00:00	00:00	00:00	00:00	00:00
F7-6	Y	777255	6468058	00:00	00:00	00:00	00:00	00:00	00:00
F8-1	Y	777698	6464852	00:00	00:00	00:00	00:00	00:00	00:00
F9-1	N	775364	6456611	00:00	00:00	00:00	00:00	00:00	00:00
F9-2	Y	779611	6455812	00:00	00:00	00:00	00:00	00:00	00:00
F9-3	Y	779714	6455866	00:00	00:00	00:00	00:00	00:00	00:00
F9-4	Y	779892	6456264	00:00	00:00	00:00	00:00	00:00	00:00
F9-5	Y	779898	6456207	00:00	00:00	00:00	00:00	00:00	00:00
F9-6	Y	779913	6456165	00:00	00:00	00:00	00:00	00:00	00:00
F9-7	Y	779942	6456248	00:00	00:00	00:00	00:00	00:00	00:00

DWELLING ID	ASSOCIATED DWELLING	EASTING	NORTHING	APPROVED PROJECT – EPURON ASSESSMENT		APPROVED PROJECT – WSP ASSESSMENT		MODIFIED PROJECT – WSP ASSESSMENT	
				HOURS PER YEAR [2 m]	HOURS PER YEAR [6 m]	HOURS PER YEAR [2 m]	HOURS PER YEAR [6 m]	HOURS PER YEAR [2 m]	HOURS PER YEAR [6 m]
	(Y/N)	EASTING [m]	NORTHING [m]	HH:MM	HH:MM	HH:MM	HH:MM	HH:MM	HH:MM
G2-1	N	780254	6492574	00:00	00:00	00:00	00:00	00:00	00:00
G4-1	Y	781170	6482977	00:00	00:00	00:00	00:00	00:00	00:00
G6-1	Y	781085	6470560	00:00	00:00	00:00	00:00	00:00	00:00
G6-2	N	782545	6471883	00:00	00:00	00:00	00:00	00:00	00:00
G6-3	N	783765	6473517	00:00	00:00	00:00	00:00	00:00	00:00
G6-4	N	783684	6473479	00:00	00:00	00:00	00:00	00:00	00:00
G9-1	Y	782075	6455530	00:00	00:00	00:00	00:00	00:00	00:00
G9-2	Y	782098	6456061	00:00	00:00	00:00	00:00	00:00	00:00
H6-2	N	786626	6470853	00:00	00:00	00:00	00:00	00:00	00:00
H7-1	N	785125	6465108	00:00	00:00	00:00	00:00	00:00	00:00
H7-2	N	785215	6466360	00:00	00:00	00:00	00:00	00:00	00:00
H8-1	N	787952	6462116	00:00	00:00	00:00	00:00	00:00	00:00
H9-1	N	785676	6459623	00:00	00:00	00:00	00:00	00:00	00:00