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**Date:** 2 March 2017  
**Our reference:** 170691-AUME-L-03-B  
**Your reference:**

**Re: Response to submissions regarding potential television interference from the proposed Crookwell 2 Wind Farm**

Dear Shaq Mohajerani,

DNV GL (formerly Garrad Hassan Pacific Pty Ltd) has been commissioned by Union Fenosa Wind Australia Pty Ltd (UFWA) on behalf of Crookwell Development Pty Ltd to provide an assessment of the potential for the proposed Crookwell 2 Wind Farm to cause electromagnetic interference (EMI) to television reception in the vicinity of the wind farm. This assessment has been undertaken in response to a submission made by the Upper Lachlan Shire Council (ULSC) expressing concerns regarding the potential impacts of the wind farm on television reception in the Crookwell area.

DNV GL has previously assessed EMI-related issues, including potential impacts on television reception, arising from the development and operation of the Crookwell 2 Wind Farm (as reported in document 170691-AUME-R-02-B [1]), and further details of the assessment methodologies employed by DNV GL are described in the same report. It is noted that one turbine (turbine F9) has since been removed from the proposed layout for the Crookwell 2 Wind Farm, and a new host dwelling (ID R21a, 734183 m east, 6174526 m north, MGA zone 55 GDA94) has been constructed. These changes have been considered in the current assessment.

The main television transmitters used by residents in the vicinity of the proposed Crookwell 2 Wind Farm are the Crookwell transmitter at Wades Hill, the Goulburn transmitter at Mt Gray, and the Canberra transmitter at Black Mountain. However, it is also possible that residents to the north of the site may receive television signals from the Illawarra and Central Tablelands transmitters.

Based on the methodology described in [1], dwellings that have an increased potential to experience EMI to television reception caused by turbines at the Crookwell 2 Wind Farm have been identified. The results of this analysis are shown in Figure 1 to Figure 5, and the number of dwellings identified in the potential interference zone for each television transmitter is summarised in Table 1 on the following page. Signal coverage maps for each of the transmitters obtained from the Australian Government mySwitch website [2], and reproduced in Figure 1 to Figure 5, suggest that the majority of the area surrounding the wind farm site receives 'variable' television coverage. It is noted that interference is most likely to be experienced in areas where television reception is marginal, and that if the signal received at a dwelling from the transmitter is sufficiently weak, or if an antenna with insufficient directional discrimination is installed, interference may still occur outside of the identified interference zones.

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**Table 1 Number of dwellings located within potential interference zones for television transmitters in the vicinity of the Crookwell 2 Wind Farm site**

Digital television broadcast tower	Number of dwellings within potential interference zone
Crookwell (Wades Hill)	37 (including 12 stakeholder dwellings)
Goulburn (Mt Gray)	11 (including 5 stakeholder dwellings)
Canberra (Black Mountain)	30 (including 7 stakeholder dwellings)
Illawarra (Knights Hill)	20 (including 8 stakeholder dwellings)
Central Tablelands (Mt Canobolas)	35 (including 8 stakeholder dwellings)

If interference to television reception is experienced after a wind farm is commissioned, a range of mitigation options are available as described in [1]. These mitigation options include realigning, retuning, or relocating the television antenna at the affected residence, installation of a more directional or higher gain antenna, installation of cable or satellite television at the affected residence, or the installation of a television signal repeater to service the area. Crookwell Development Pty Ltd have advised DNV GL that they would be prepared to implement these measures in the event that television reception interference is encountered as a result of the operation of the Crookwell 2 Wind Farm.

DNV GL understands that the ULSC has recently installed and commenced operation of a television signal repeater for commercial network broadcasts at Wades Hill in Crookwell. Prior to the installation of the repeater, only public television broadcast signals were available from the Wades Hill site. The new Crookwell repeater receives commercial television broadcast signals from the transmitter at Mt Gray in Goulburn and retransmits those signals to residents in the Crookwell vicinity. Residents who rely on the signals from the Crookwell repeater previously received marginal commercial television reception from either the Goulburn or Canberra transmission towers, although DNV GL has been advised by the ULSC that the television reception experienced by these residents has been very good since the repeater commenced operating [3]. The locations of the Crookwell repeater and Goulburn transmitter in relation to the proposed Crookwell 2 Wind Farm are shown in Figure 6.

In communications with DNV GL, the ULSC has expressed concerns regarding the potential for the proposed Crookwell 2 Wind Farm to impact upon the performance of the Crookwell repeater [3]. The council has previously experienced cases where other wind farms have caused interference to existing television signals in the area and remediation efforts have taken considerable time to implement, during which time the affected residents had no or substandard television reception. The ULSC has therefore requested that Crookwell Development Pty Ltd act to mitigate any potential impacts to the Crookwell repeater before the proposed Crookwell 2 Wind Farm starts operation, to avoid a period during which residents have inadequate television reception due to interference caused by the wind farm.

In order to address these concerns, DNV GL recommends that Crookwell Development Pty Ltd considers engaging a dedicated radiocommunications engineer to assess the potential impact of the proposed Crookwell 2 Wind Farm on the Crookwell repeater. This assessment could involve evaluating in detail how the repeater functions, taking measurements of the existing strength of the signal from the Goulburn transmitter at the repeater location, and providing advice on whether the repeater signal is likely to be affected by the proposed wind farm. If the assessment concludes that the performance of the Crookwell repeater is likely to be affected by the Crookwell 2 Wind Farm, then remedial action could be carried out to ensure that the repeater continues to operate effectively. If the conclusion is that the

repeater will not be affected, then this information may provide sufficient assurance to negate the need for remedial action.

Crookwell Development Pty Ltd has advised DNV GL that they will commit to removing turbine F9 from the proposed turbine layout described in [1] (which is one of the turbines that has the potential to interfere with the signal between Mt Gray and Wades Hill), and to engaging a radiocommunications engineer prior to commencing operation of the Crookwell 2 Wind Farm as recommended above [4]. If the assessment finds that significant impact is expected at a large number of residences, Crookwell Development Pty Ltd will consult with the ULSC to identify alternative solutions and devise a plan for resolving any interference experienced after the wind farm begins operation in a reasonable timeframe, with consideration given to installing a new television repeater to either replace or complement the existing infrastructure at Crookwell and Goulburn. The remediation plan, if required, will be established before the wind farm is commissioned so that it can be implemented by Crookwell Development Pty Ltd as soon as any impact arising from the wind farm is encountered, hence minimising disruption and inconvenience to residents.

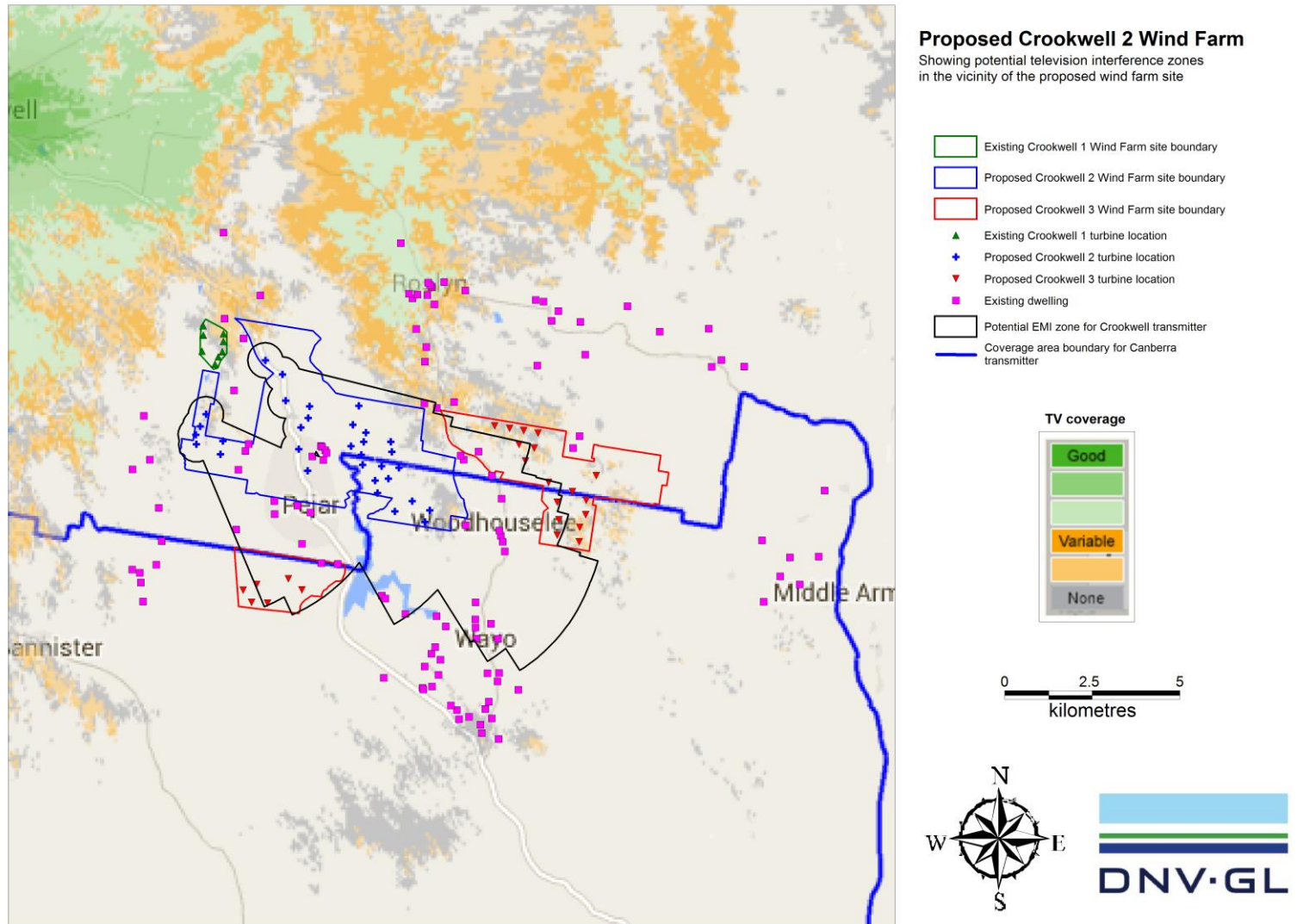
Therefore, Crookwell Development Pty Ltd has advised that they are prepared to accept a pre-operation condition stating that the wind farm proponent will engage an experienced radiocommunications consultant to assess the expected level of impact caused by possible interference from turbines at the Crookwell 2 Wind Farm to the quality of television reception provided by the recently commissioned Crookwell repeater; and, if the expected level of impact is considered significant, the proponent will prepare a remediation plan encompassing alternative solutions to resolve any issues, including the potential installation of a new television repeater, in consultation with the ULSC; and, if the impact experienced once the wind farm is fully operational is deemed significant, the proponent will implement the remediation plan as soon as is practicable.

Sincerely  
for DNV GL Australia  
  
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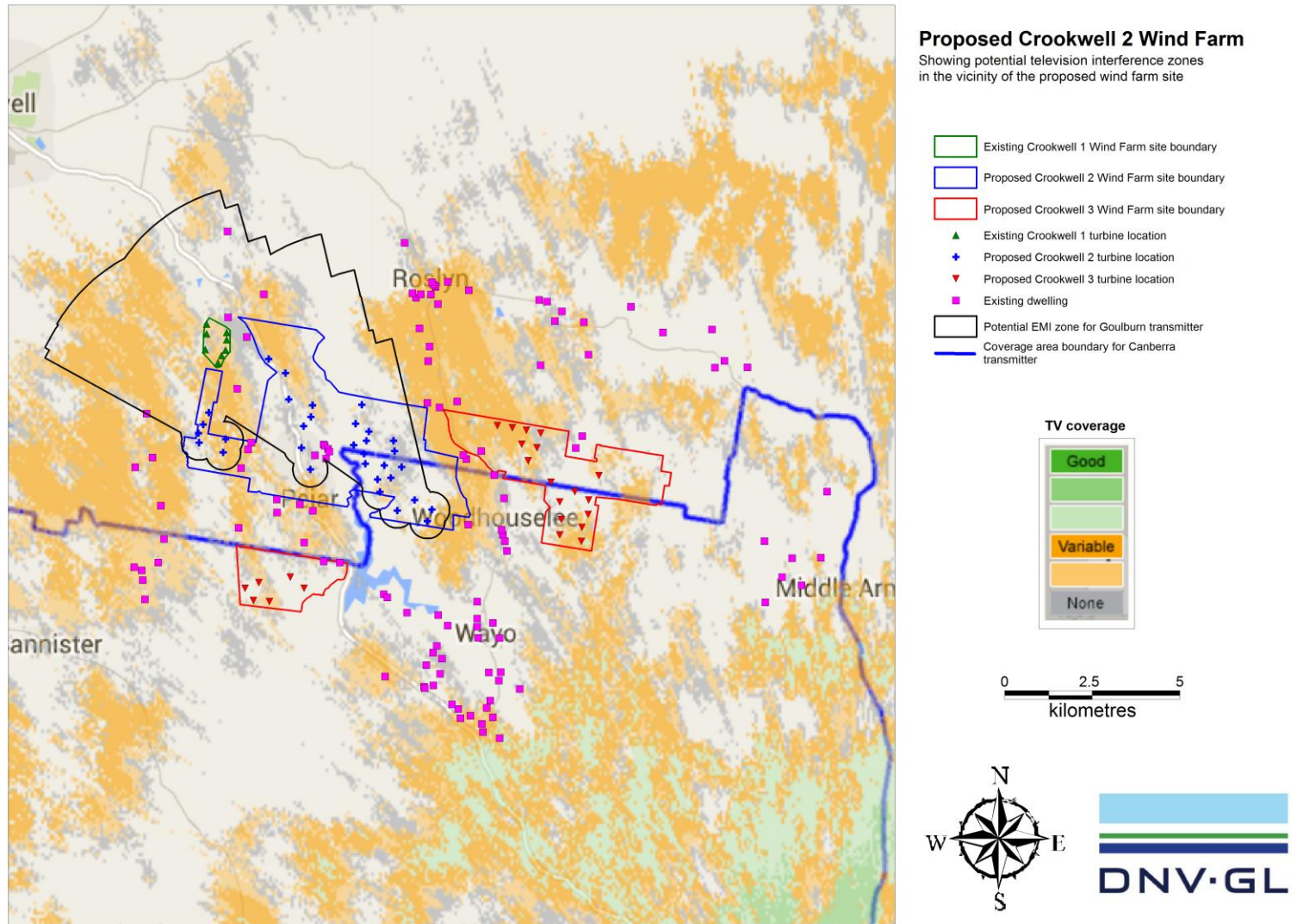
## **References**

- [1] Garrad Hassan Pacific Pty Ltd, "Crookwell 2 Wind Farm EMI Assessment", document no. 170691-AUME-R-02-B, 24 February 2016.
- [2] Australian Government, "mySwitch", [Online]. Available: <http://myswitch.digitalready.gov.au/>. [Accessed 13 November 2015].
- [3] Telephone conversation between T. Gilbert (DNV GL) and P. Newham (ULSC), 25 January 2017.
- [4] Email from S. Mohajerani (UFWA) and T. Gilbert (DNV GL), 20 February 2017.

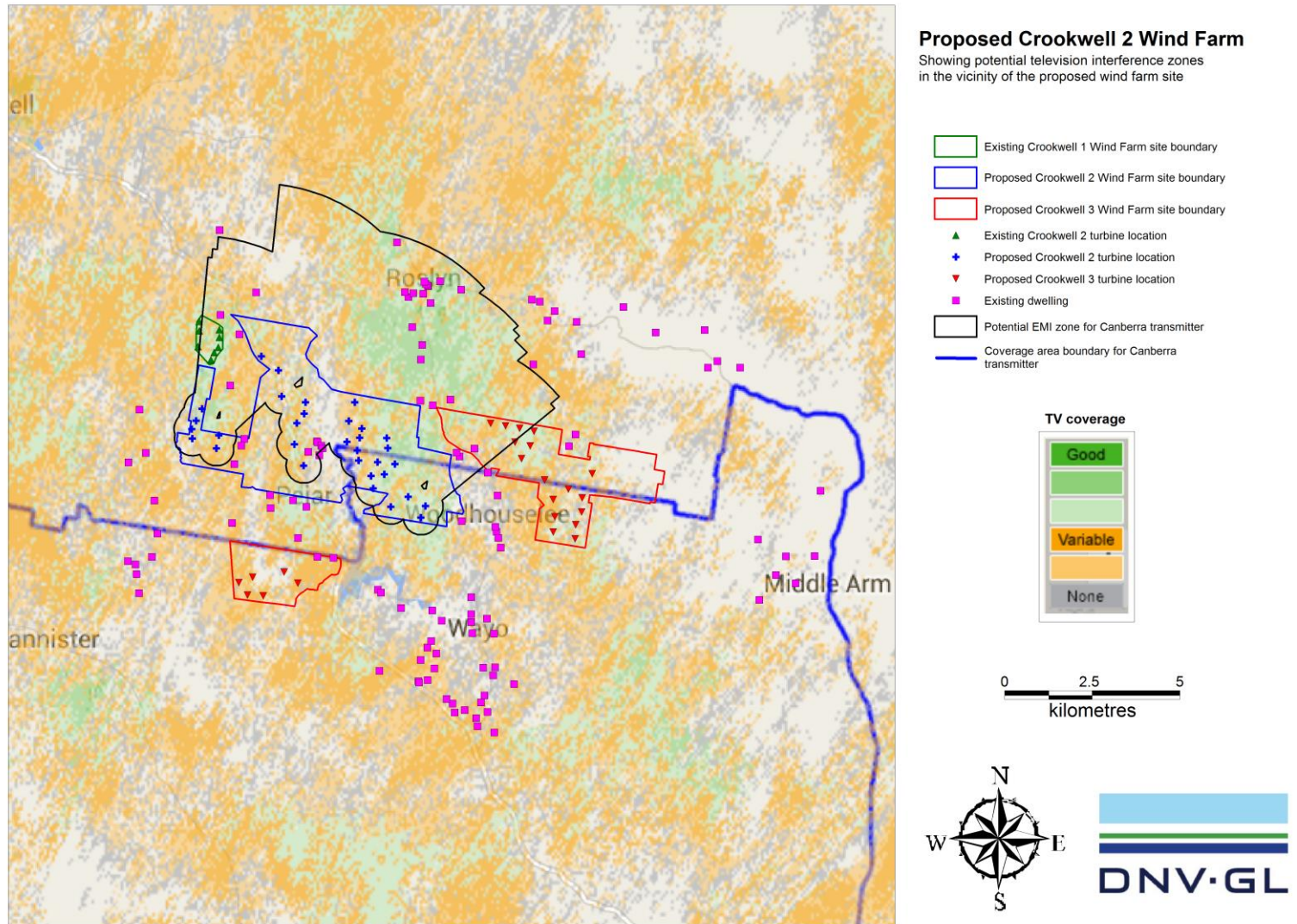


**Figure 1 Potential television EMI zones for the signal from the Crookwell transmitter**



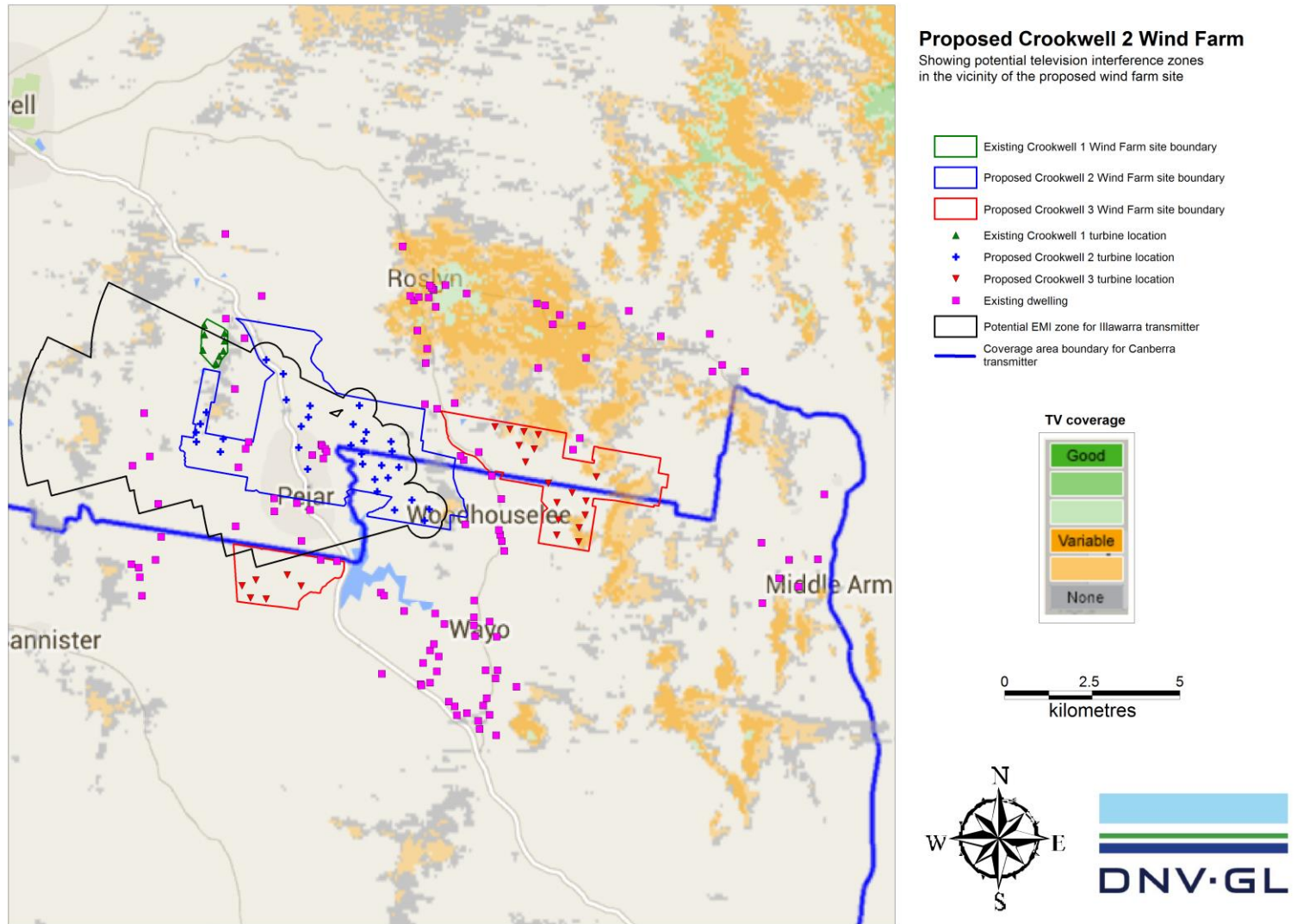


**Figure 2 Potential television EMI zones for the signal from the Goulburn transmitter**

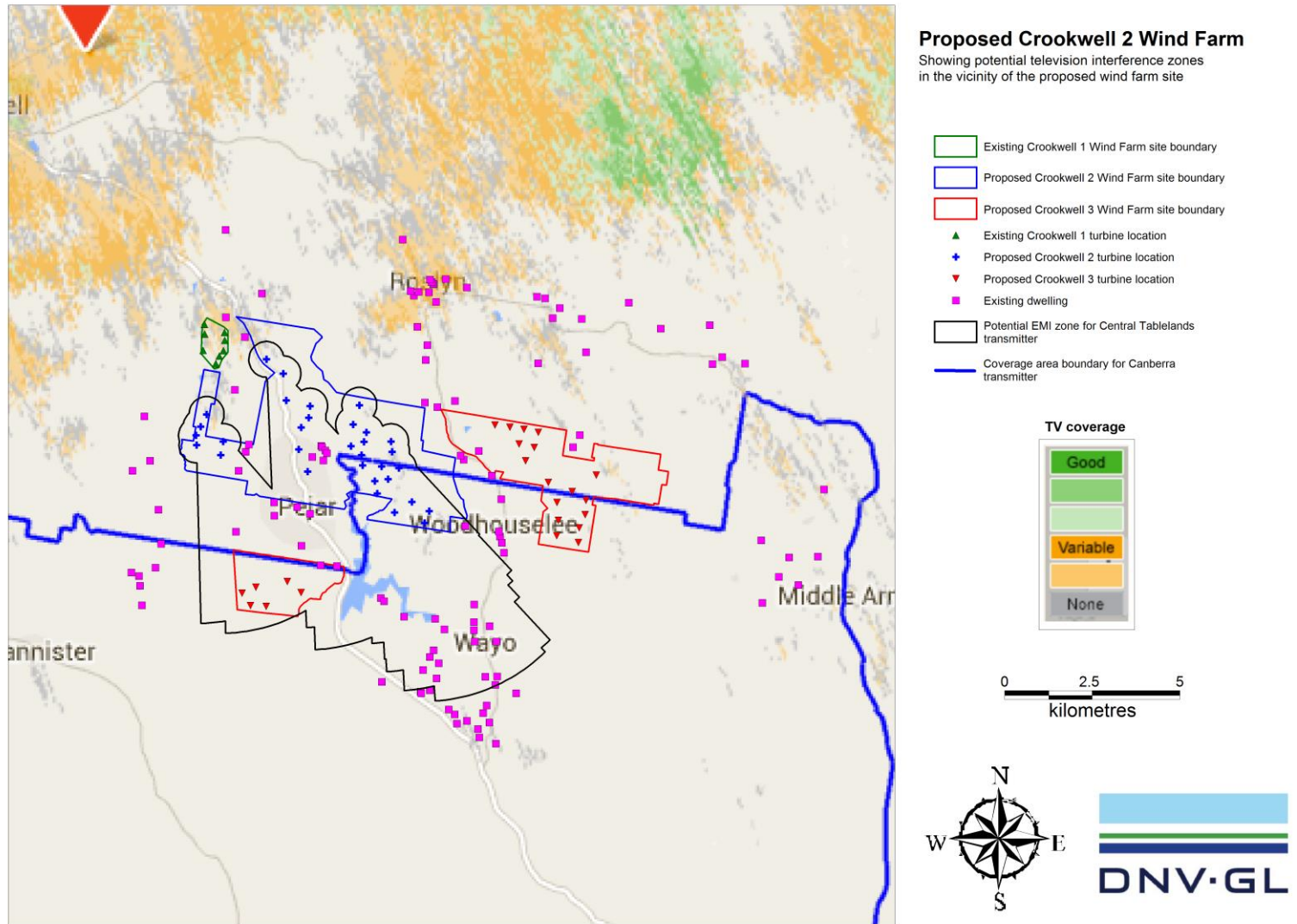


**Figure 3 Potential television EMI zones for the signal from the Canberra transmitter**



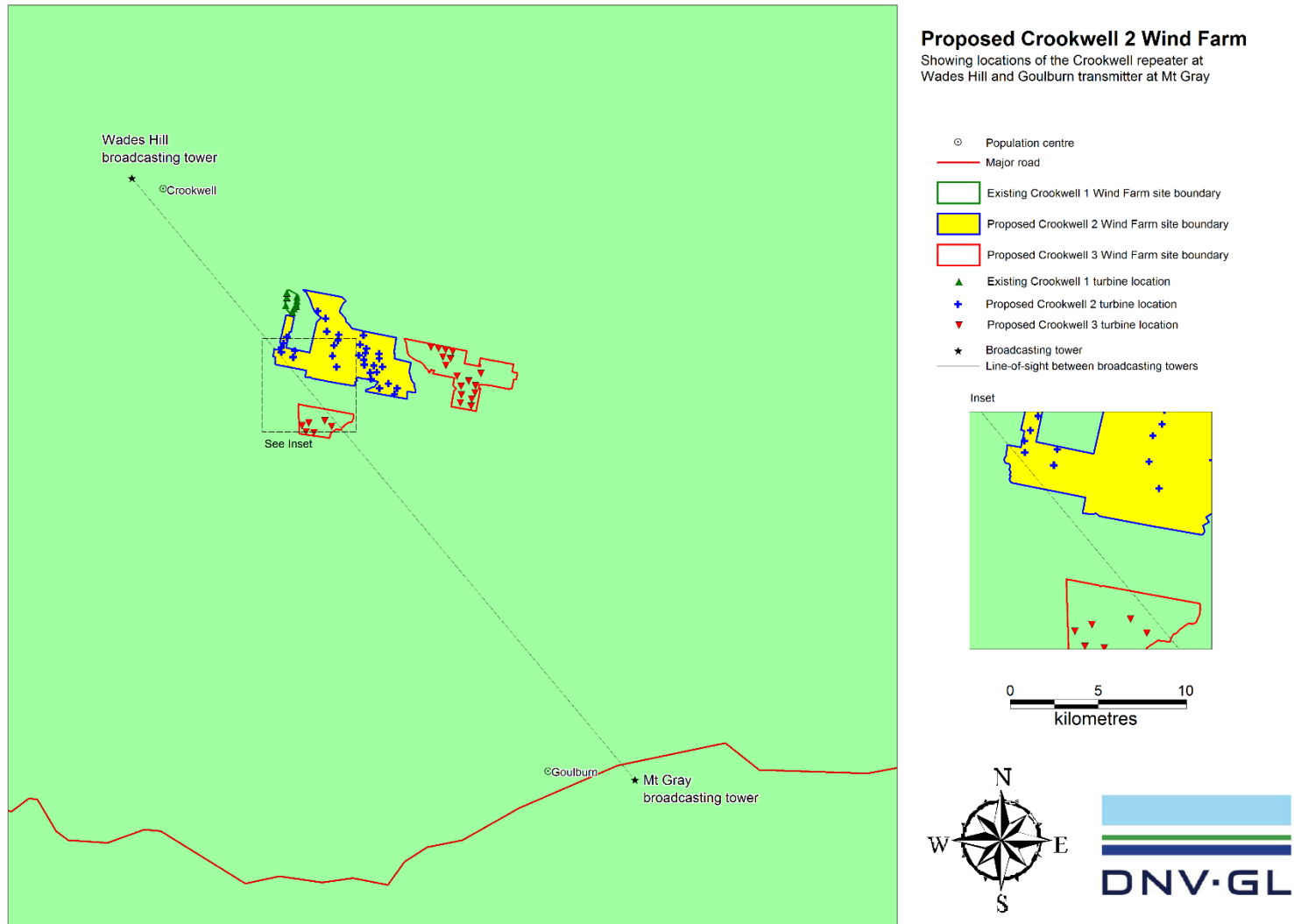


**Figure 4 Potential television EMI zones for the signal from the Illawarra transmitter**



**Figure 5 Potential television EMI zones for the signal from the Central Tablelands transmitter**





**Figure 6 Locations of the Crookwell repeater at Wades Hill and Goulburn transmitter at Mt Gray relative to the proposed Crookwell 2 Wind Farm**