Jupiter turbine layout.

The proposed layout of the Jupiter wind farm must be peer reviewed.

No consultant who has contributed to the Jupiter EIS will take responsibility for the layout.
At a community meeting on October 14, 2014, Ibrahim Eid from Epyc stated that
DNV GL was responsible for the layout (as they were for Biala)

Twice, DNV GL has said Epyc is responsible for the layout.
David Price from DNV GL in his presentation to the Jupiter CCC on December 13, 2016 was at pains to state that the turbine layout was supplied by the proponent, EPYC.
The Noise section of the EIS authored by DNV GL confirms this:

> "The WTG layout has been developed by the Proponent and was supplied to DNV GL by the Customer" (Epyc being the proponent and ERM being the customer)

You would think only one of them can be telling the truth. Most likely, DNV GL is, as Epyc employee Darko Goreski claimed responsibility for the turbine layout at another community meeting on October 16, 2014.
For a consultant with world wide expertise in wind farm layout and design, and the industry leading software, Windfarmer, which DNV GL describes thus:

> "DNV GL's *WindFarmer* is a state-of-the-art software tool for designing, optimizing and analysing your wind farm. It will help you quickly create a complete wind farm layout, optimized for the details of your site."

it is surprising they were not utilized in the optimization of the Jupiter layout.
Perhaps Windfarmer was used.

The Department should ask if Windfarmer was used at any stage, and if so, what were the results.
The Department should also ask the lead consultant ERM whether they support the Jupiter layout.
The Department should establish whether Mr Darko Goreski, or anyone else in EPYC has the skills and experience to determine appropriate turbine placement rather than the experts they were supposedly employing.

Could it be that the layout is unsupportable?
It would not be the first time that someone has questioned it.

In October 2014, an email was distributed to the local community on the topic as below:

> Wind Farm Design
> Comments from a novice.
>
> In early October, 2014, EPYC published its third community newsletter for the Jupiter Industrial Wind Farm (JIWF). Included in that newsletter was a preliminary turbine layout.
> The JIWF site is basically a North/South oriented rectangle. The gentle ridges also run North/South and the prevailing wind is from the West.
> What immediately strikes you is the clustered nature of the turbines, especially opposite the Barnet and Roseview subdivisions.
> Compare this, for instance to the layout of the Capital 1 and 2 windfarms. See Appendix A.
> Capital turbines are strung in rows perpendicular to the wind direction. (See Appendix B for a similar layout pattern for the Liverpool Range Wind Farm) Whilst the Capital turbines in a row are close together (approx 400 -500 metres) the rows are over a kilometer apart. There is a fundamental reason for this as explained in a 2013 article from the University of Adelaide.

Clustering these huge structures in rows makes practical and economic sense to access usable wind as well as for aesthetics and maintenance, but it does come with a major drawback.

Much like the wake of a boat, wind turbines create a wake in the air as they turn. In wind farms, most wind turbines operate in the wake of other turbines, which impacts their power output, dynamic loads, fatigue life due to turbulence in wakes and potentially noise levels. A research project led by Dr Maziar Arjomandi of the Institute for Mineral and Energy Resources at the University of Adelaide, is investigating the impact of these wake interactions. [1]

"If we know exactly how individual wind turbines are impacting on others, which in turn results in reduction of the performance and life span as well as noise generation, then we can optimise wind farm layout to minimise negative impacts and hence reduce the price of wind energy."

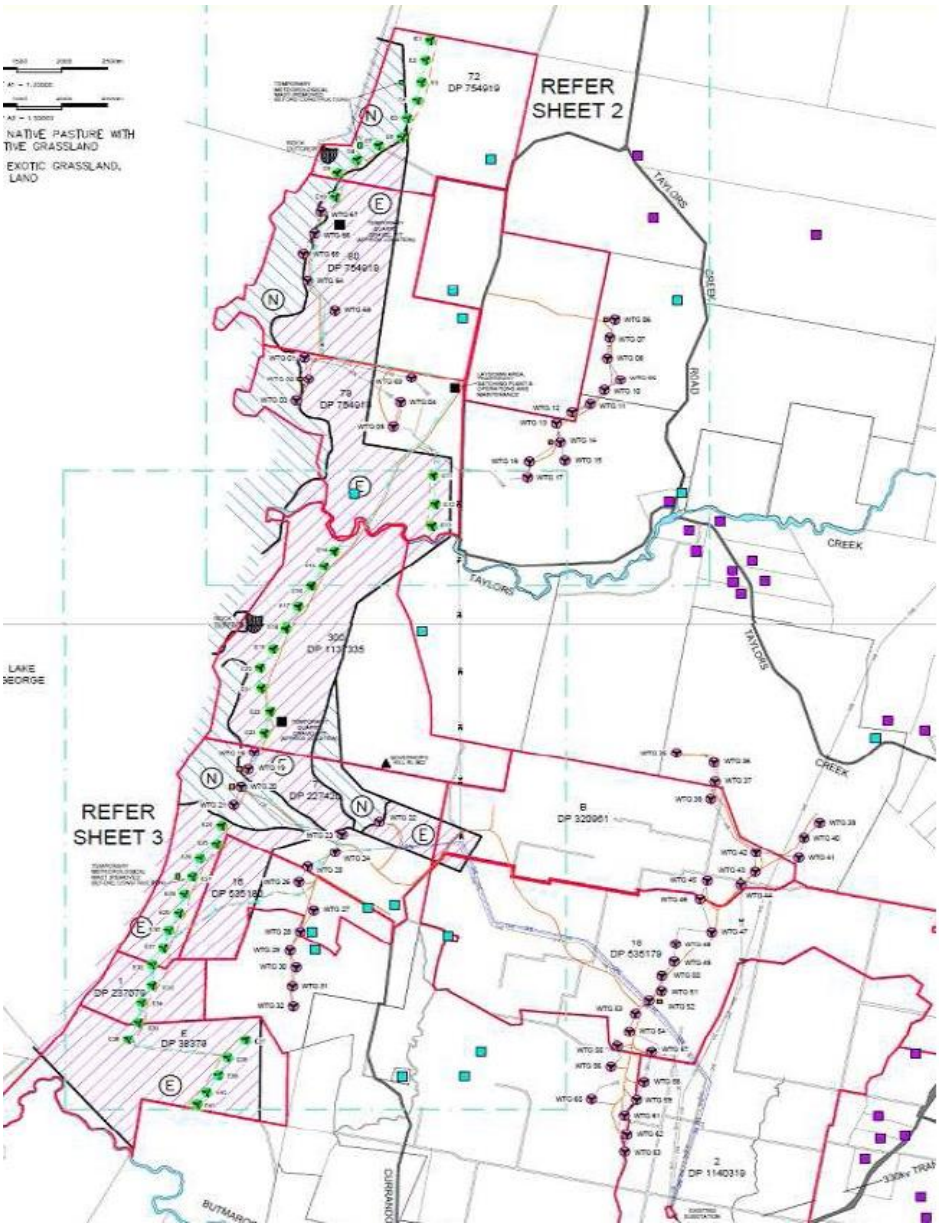
The team used multi-processor computers to simulate a high fidelity numerical model of the wake characteristics of a single turbine and compute the dynamics of the near-wake and the far-wake. The near-wake is a system of intense and stable rotating helical vortices and determines immediately behind the wind turbine until a distance of 5-7 rotor diameters behind the turbine. In contrast, the near-wake vortex becomes unstable in the far-wake and breaks down into two or three vortex structures which can travel up to 30-40 rotor diameters downstream. In practice, the distances between wind turbines in a wind farm are between 7 and 15 rotor diameters and this results in turbines operating in the wake of other turbines.
The simulation showed that the turbulence intensity of the wake can reach 10% for a turbine operating in a low-turbulence wind at 12 metres per second. This generates excessive dynamic loading on the turbine blade and reduces performance. The interaction between the blade and the vortex structure in the far-wake can also be responsible for the low frequency 'thumping' noise sometimes reported near wind farms. This noise is generated in a similar way to that of a helicopter where the main rotor vortex is chopped by the tail rotor.
Let us compare the Capital 1(operating) and 2 (approved) layouts to that for Jupiter in the current EPYC newsletter. Let us assume that 10 rotor diameters is an average practical distance between wind facing rows. For Capital 2, with a rotor diameter of 114 metres, this equates to 1.14 Kms, which is what the design shows.

For the Jupiter layout, there are no "rows" as such, but if we take the east-west string of 6 turbines closest to the Barnet subdivision, we find they are, on average less than 500 metres apart. Practical turbine placement would see that these turbines should be 10 x 126 Mts (published Jupiter turbine maximum diameter) = 1.26 Kms.

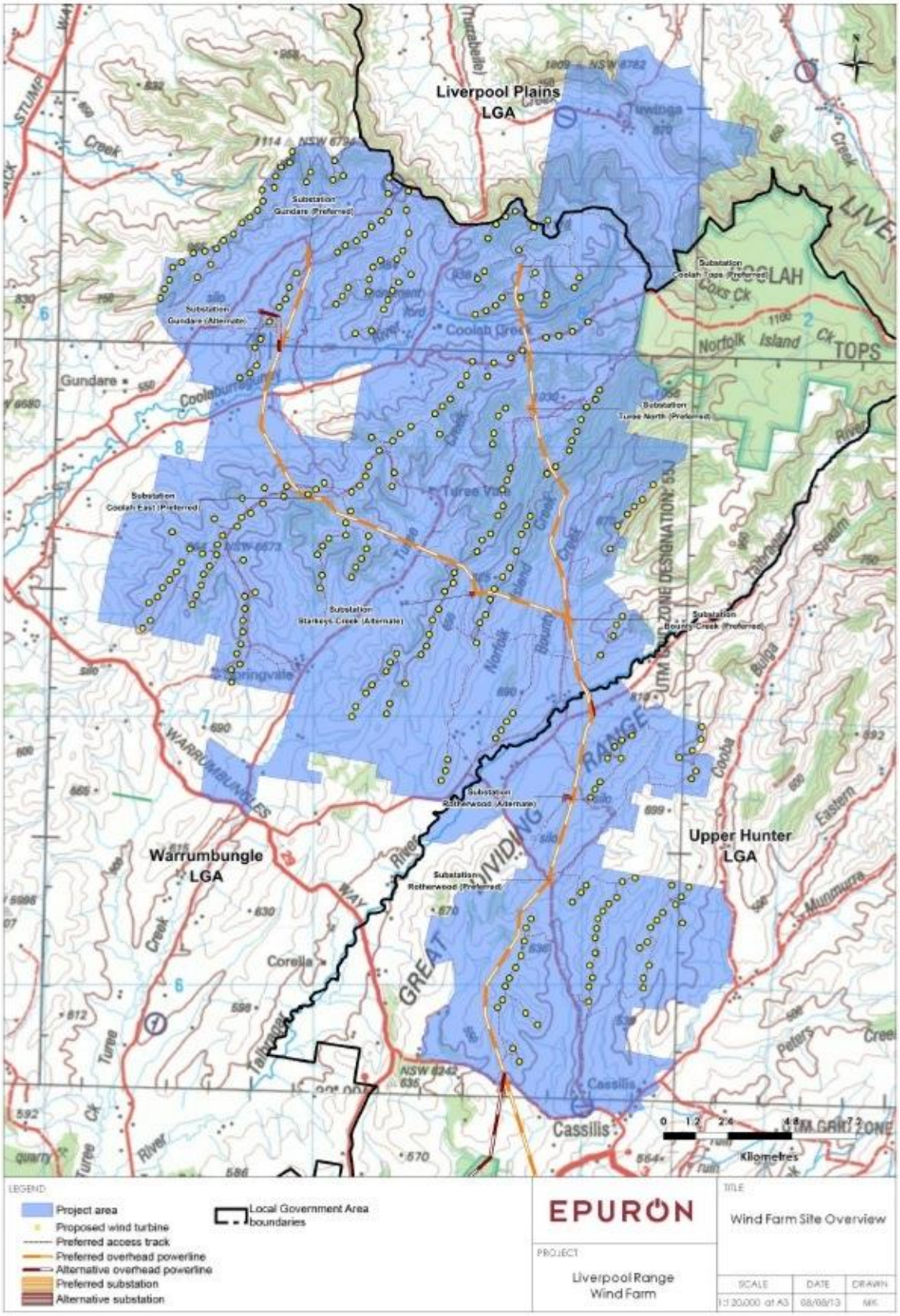
Can't be right, can it? Otherwise all wind farms would be built this way. (emphasis added)

[1] Mo JO, Arjomandi M, Choudhry A and Lee YH. Large eddy simulation of turbulent wake characteristics behind a wind turbine in a wind tunnel model. Journal of Wind Engineering & Industrial Aerodynamics (2012) 112: 11-24.

Appendix A. Capital 2 Wind Farm (Includes Capital 1)



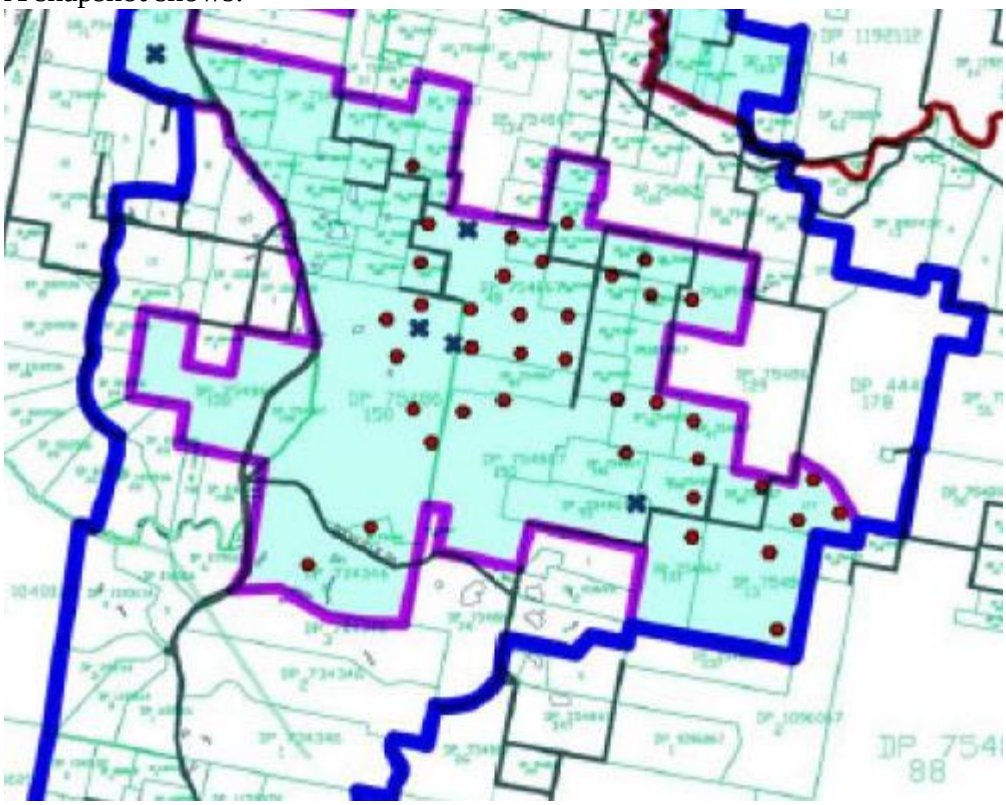
Appendix B – Liverpool Range Wind Farm Layout



This email, widely distributed locally, no doubt ended up with the developer and their consultants. However, the turbine layout today is basically the same, except…..
Let us turn to one of the paragraphs above:

> "For the Jupiter layout, there are no "rows" as such, but if we take the east-west string of 6 turbines closest to the Barnet subdivision, we find they are, on average less than 500 metres apart."

Some months later, EPYC published a revised turbine layout. Up till late 2015 it was still on their website.
A snapshot shows:



The "east-west string of 6 turbines closest to the Barnet subdivision" became a string of 4, the two "X"s next to each other representing turbines that had been removed.
Why were they removed? What were the technical reasons?
Surely it was not because a member of the community, a self described novice, called them on it.
The layout in the current EIS is also fundamentally unchanged. None of the 4 turbines have been moved to take advantage of the freed up space and thus improve efficiency.
Maybe Tract Consultants, who in the Paling Yards EIS had this to say,

> "Whilst the subject site has an area of 3,900 ha, less than 1% of the land is directly used for the turbines, access tracks and supporting infrastructure during the operation phase. It is not possible to reduce the area of the subject site as turbines must be placed at minimum distances apart in order to maintain operational efficiency. It is noted that because modern turbines are taller and wider and are generally spaced further apart than older, smaller turbines, the total number of turbines per hectare is lower.

might have the required skills to conduct a peer review.

The peer review should cover not just the physical relationship between turbines, but the relationship of the turbines to the topography and whether the PA is capable of supporting the proposed number of

turbines. The peer review should also examine the claimed efficiency of the Jupiter wind farm and whether that claimed efficiency can be attained by that layout. Epyc would surely share their wind data for this exercise.

Micrositing is not going to help.
With 63 residences/approved DAs within 2 kms of a turbine, and many more with residential rights, strong representations will be made to the Department that no turbine can be moved closer to any of these residences or properties.

If the turbine layout is not supportable, what is the point in approving this wind farm?