ANC Annual Conference 2010

Wind Turbine Noise Workshop

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Issues

- ETSU-R-97
- B/G Noise
- ‘Wind Shear’
- Noise Prediction Methodology
- Amplitude Modulation
- Infrasound, LF Noise and Vibration
- ‘Health’ Issues
- Audibility and Complaints
- Noise Assessment and Noise Limits

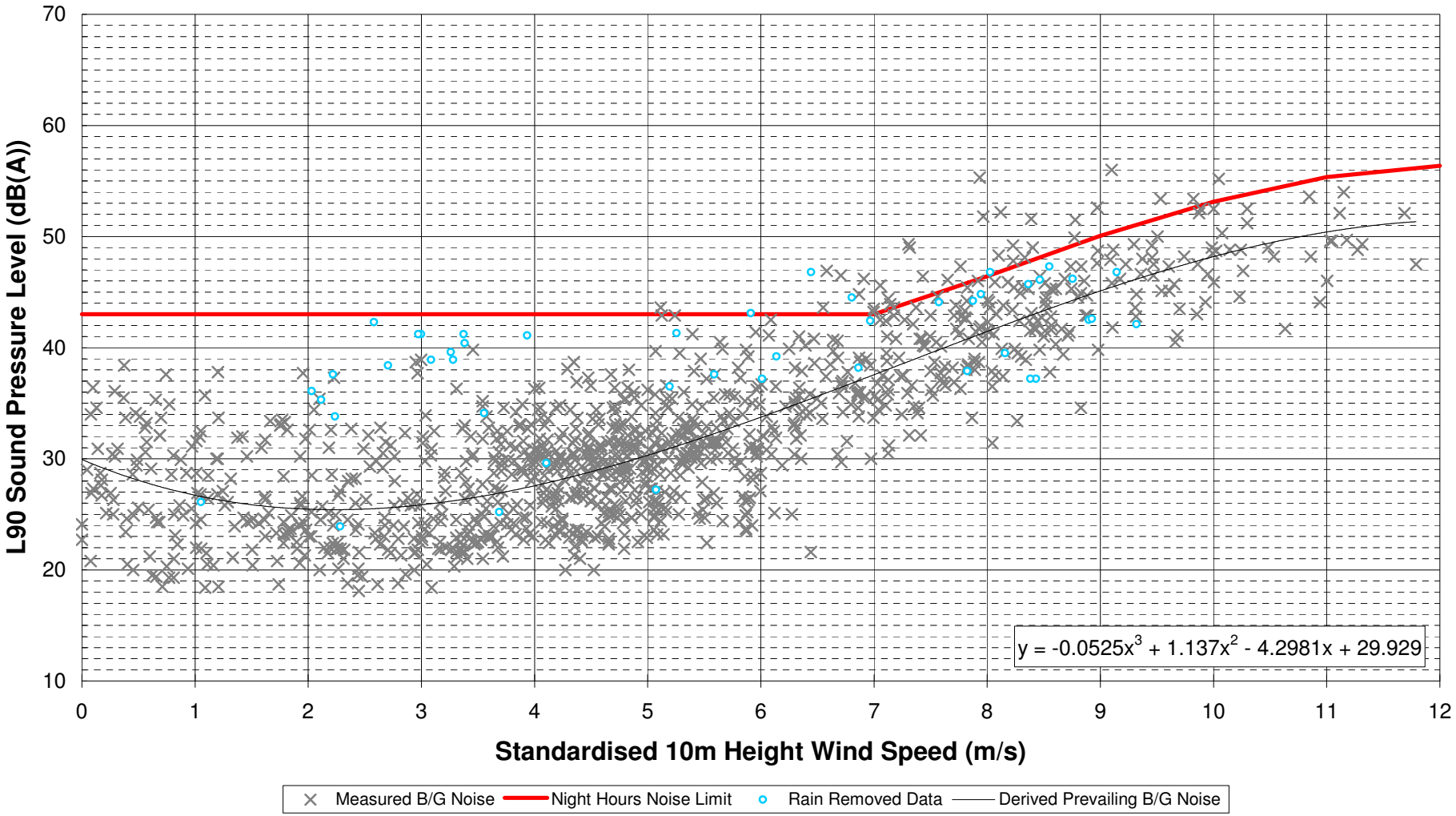
ETSU-R-97


ETSU–R–97
The Assessment
& Rating of
NOISE
From Wind Farms
Sound Pressure Level
Average 10 Minute Wind Speed at 10 Metres Height
Prevailing Background Noise Level
Night-time Criteria
ETSU
for the
dti

ETSU-R-97

- Correlation of b/g noise with wind speed.
- Definition of prevailing b/g noise.
- Limits to apply when b/g noise is low
  - 35-40 dB LA90 during the day
  - 43 dB LA90 at night
  - 45 dB LA90 at ‘involved’ properties

W/F Noise Assessment
Prevailing Background Noise, Derived Noise Limits and Predicted Turbine Noise
Night Hours (2300-0700)



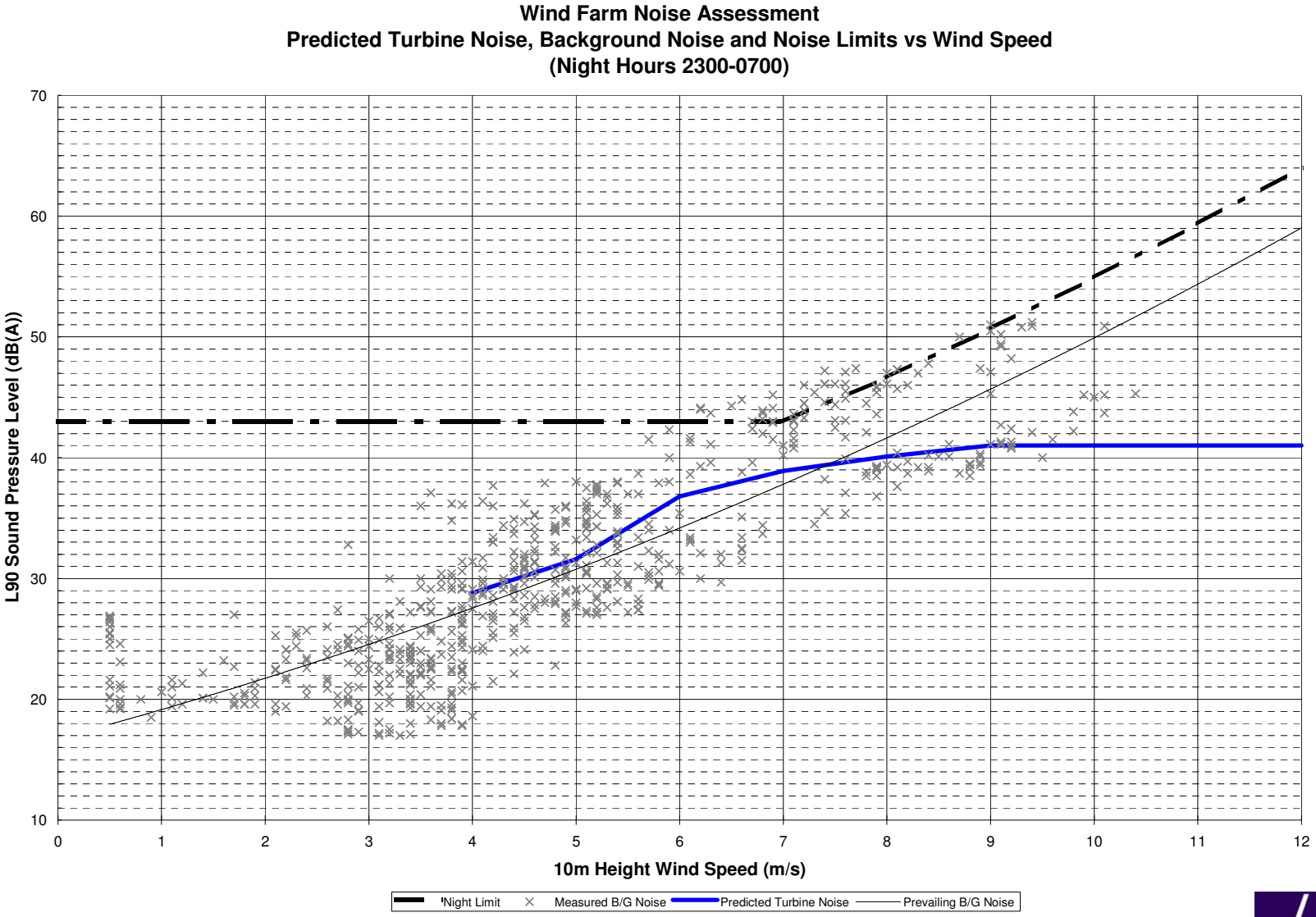
B/G Noise Measurements

- Location of instrumentation
- Effects of season
- Access / Can't measure everywhere
- Effects of wind direction
- Direct effects of wind
- Rainfall
- Other extraneous data (What is extraneous?)
- Traffic flow, birds, scatter (and effects on R^2)
- Wind shear (and more scatter)

Wind Shear

- Wind turbine noise ref. 10m height
  - but not really…!
- Problems occur if b/g ref. 10m height
  - as referred to by ETSU…!

Effects of Wind Shear with 10m Height Measurements



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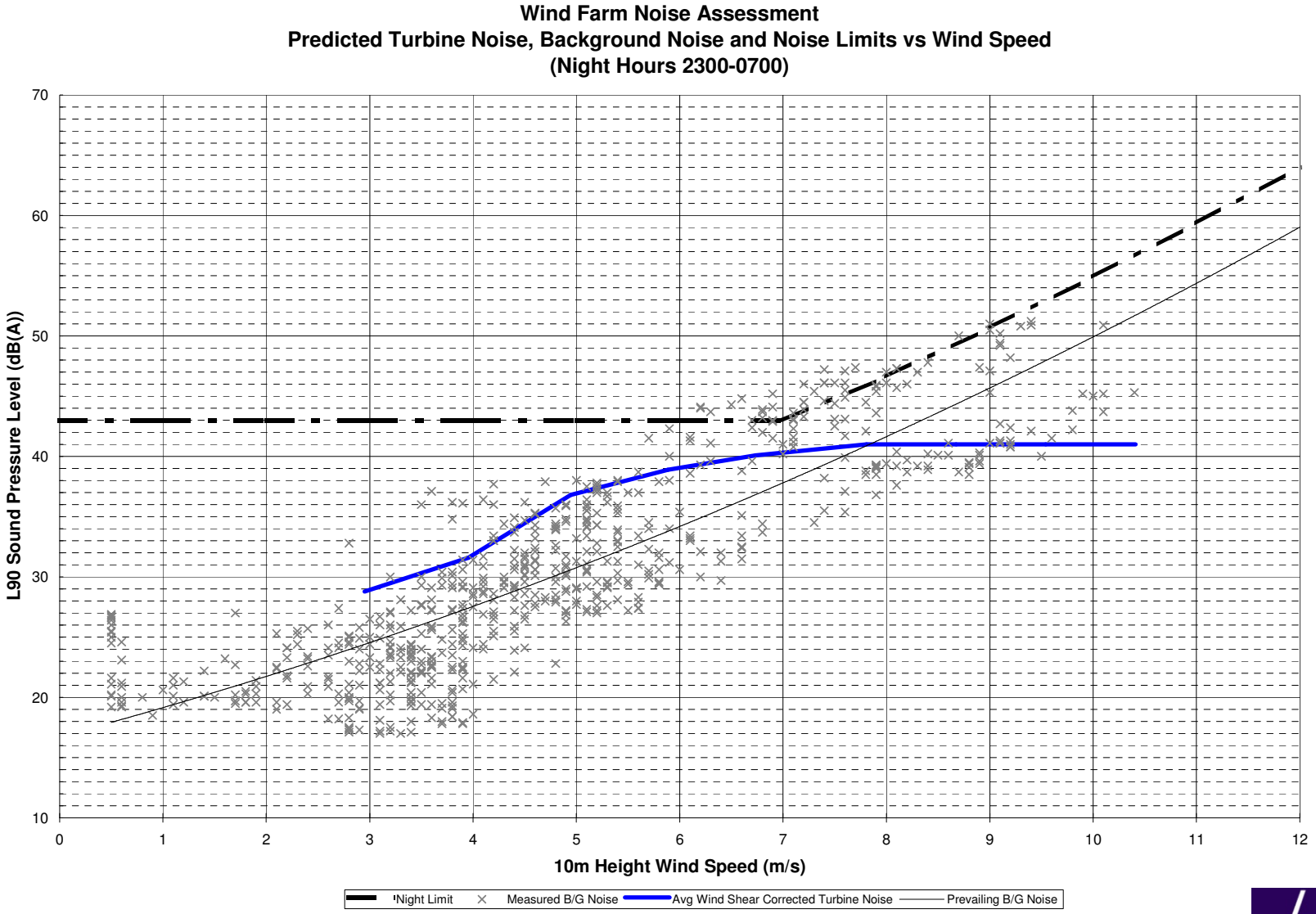

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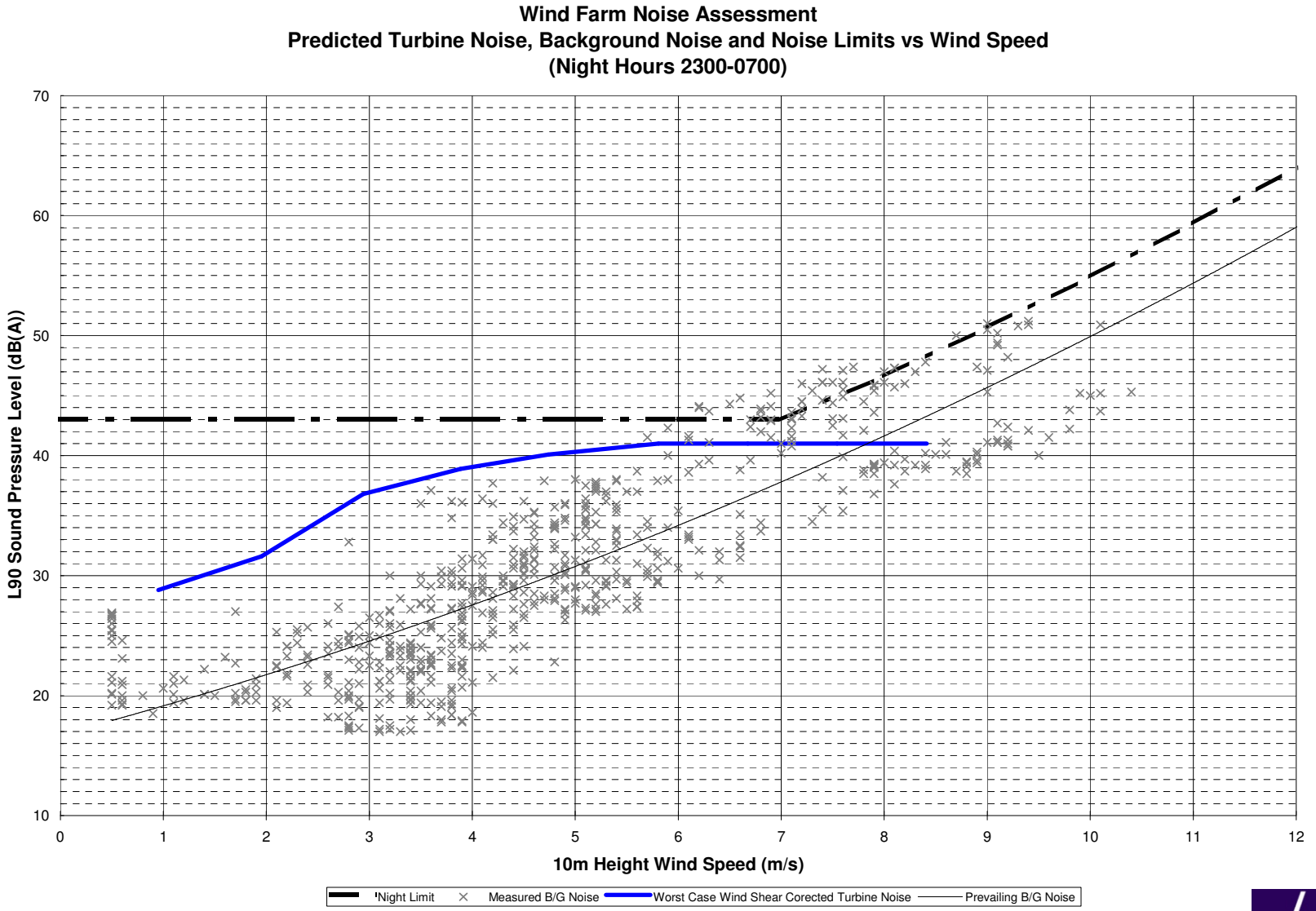

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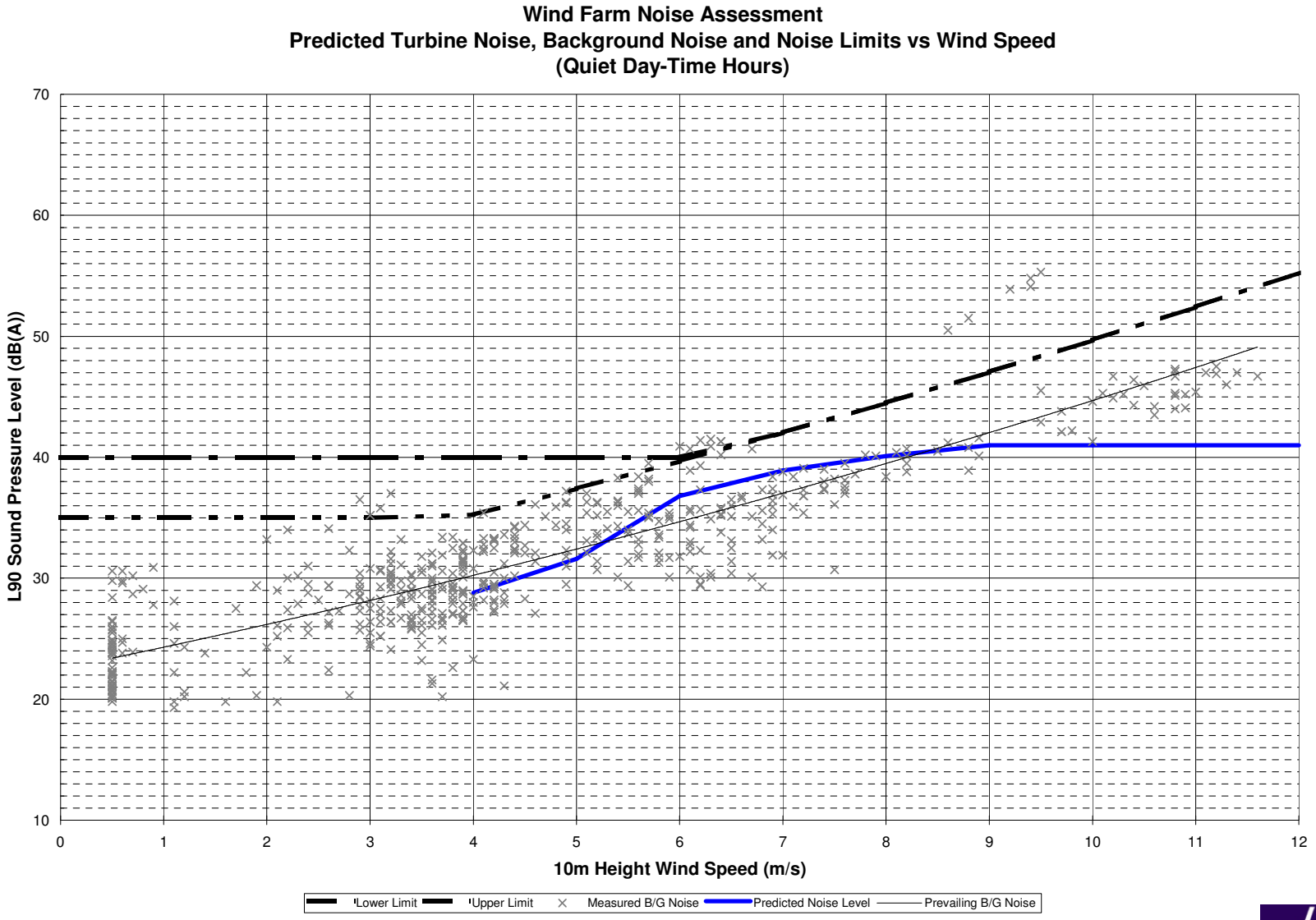

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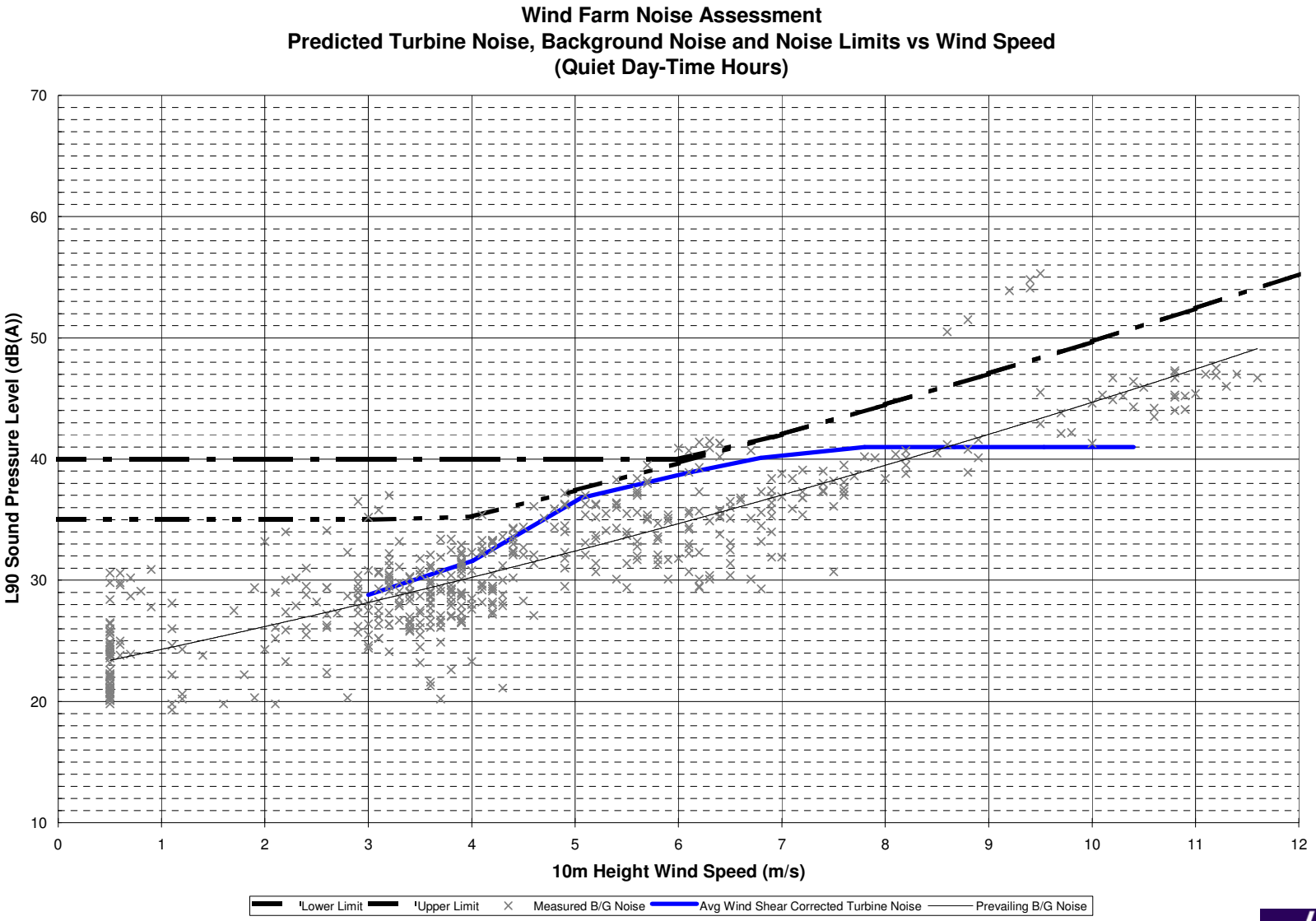

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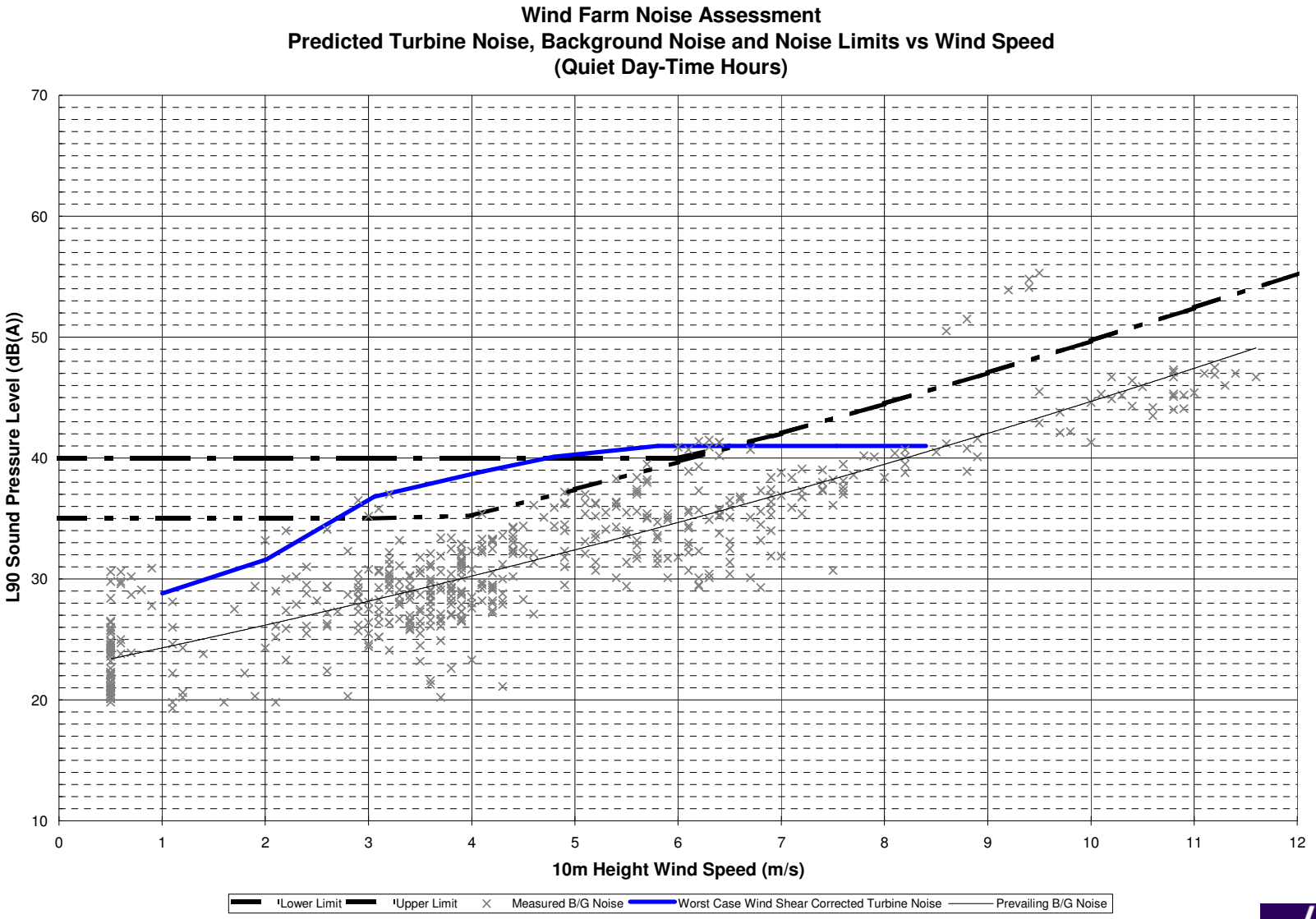


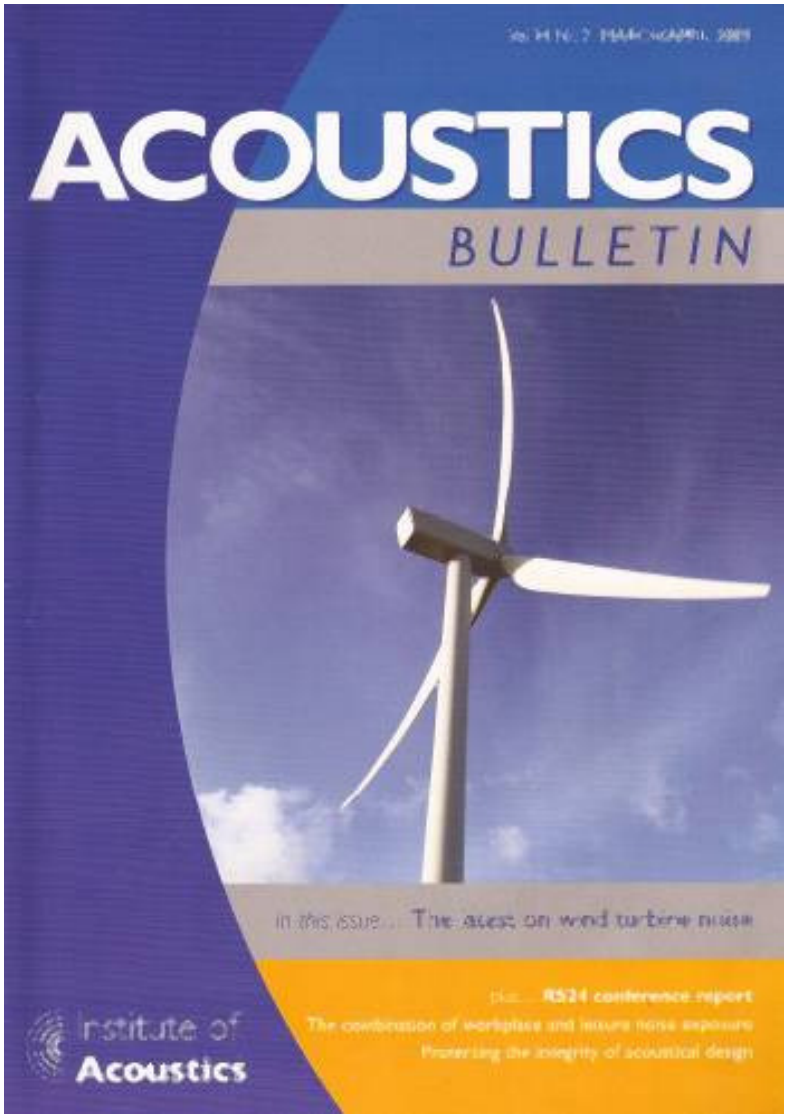
How should wind shear be dealt with?

- Reference b/g noise to 10 metre height wind speed. Predict variation in turbine noise wrt actual 10m wind speed.

  or

- Reference background noise to hub height wind speed ‘standardised’ to 10 metre height. Turbine noise stays constant wrt standardised 10m wind speed.

The IoA Bulletin Agreement…



Noise Predictions

- ISO9613-2
- Source Noise Levels
  - Test Report or Warranted Data
- Propagation
  - Ground Effects: G=0 / G = 0.5 (@4m). Not G=1!
  - Atmospheric Attenuation: 10^{o}C / 70% RH
  - Barrier Attenuation: Just 2 dB. Need to justify any more.

Amplitude Modulation

- ETSU-R-97 says '*the noise levels recommended in this report take into account the character of noise described… as blade swish. Given that all wind turbines exhibit blade swish to a certain extent we feel this is a more common-sense approach given the current level of knowledge*'

Amplitude Modulation

- The DTI/BERR report (on low frequency noise) concluded that '*it may be appropriate to re-visit the issue of aerodynamic modulation and the means by which it should be addressed. In the presence of high levels of amplitude modulation a correction for the presence of the acoustic feature should be considered'.*

Amplitude Modulation

- The Salford University report on Amplitude Modulation concluded that '*since AM cannot be fully predicted at present, and its causes are not fully understood we consider that it might be prudent to carry out further research to improve understanding in this area*'.

- Govt. Statement accompanying report stated that it '*continues to support the approach set out in PPS22*' ... '*through the use of the 1997 report by ETSU to assess and rate noise from wind energy developments*'.

Infrasound, Low Frequency Noise & Vibration

- The majority of noise professionals do not believe that infrasound, low frequency noise and vibration is an issue for on-shore wind turbine sites.

‘Health’ Effects

- Direct health effects
  - Tendancy for a few medical professionals to make a link between this and low frequency noise and / or infrasound.
- In-direct health effects.
  - A possible effect of stress and / or sleep disturbance caused either directly or as a result of stress.

Audibility and Complaints

- Audibility is unacceptable for some (many?) and complaints may occur.

Noise Assessment & Noise Limits

- Should noise assessment be separated from derivation of noise limits? Does the END and the use of Lden have a role to play in assessment?
- Should limits be absolute rather than relative or depend on non-wind related b/g? What should limits be?

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