Comments Regarding the HMMH Reports

Todd Drummey
Resident Blacksmith Shop Road

Falmouth Board of Selectmen
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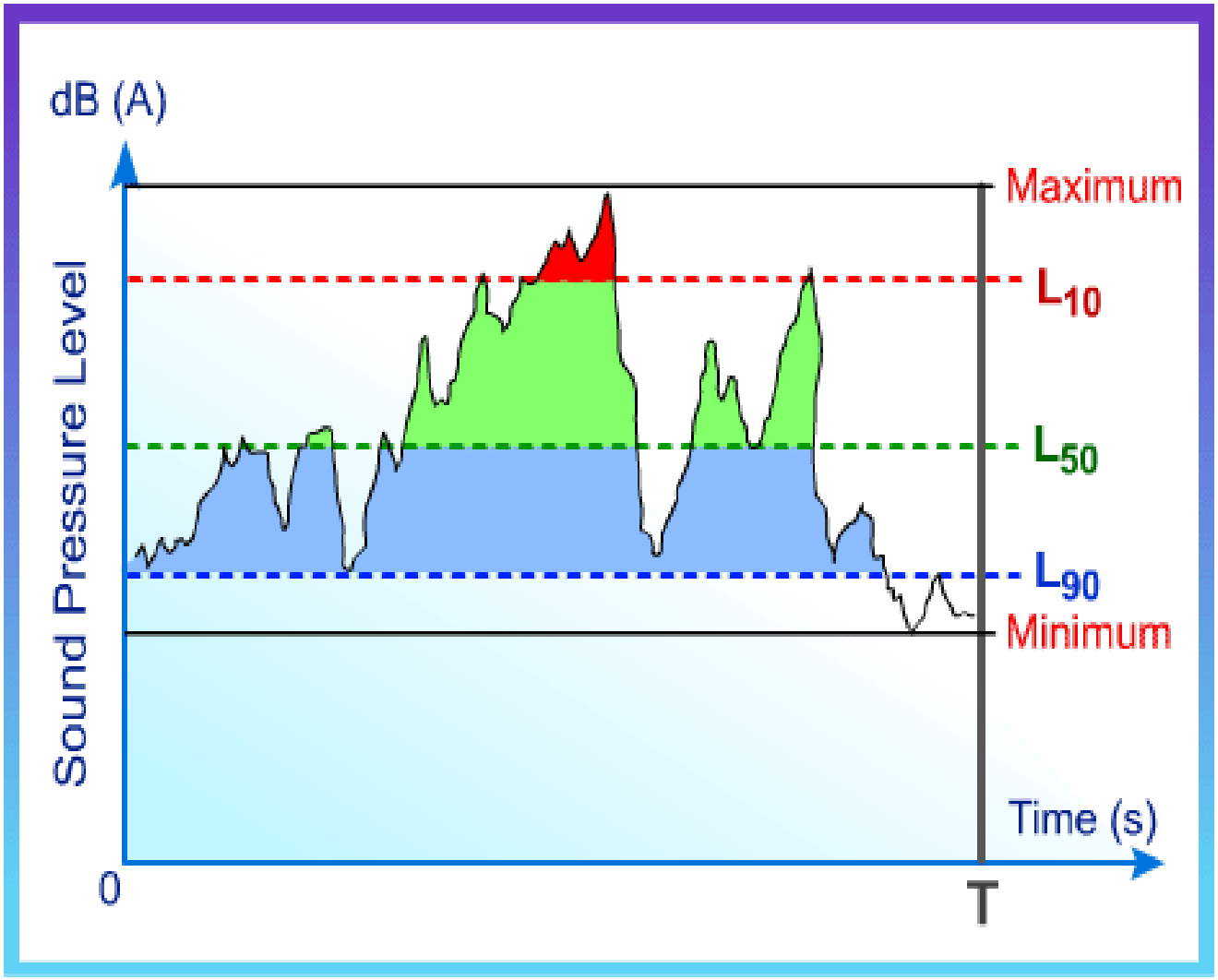
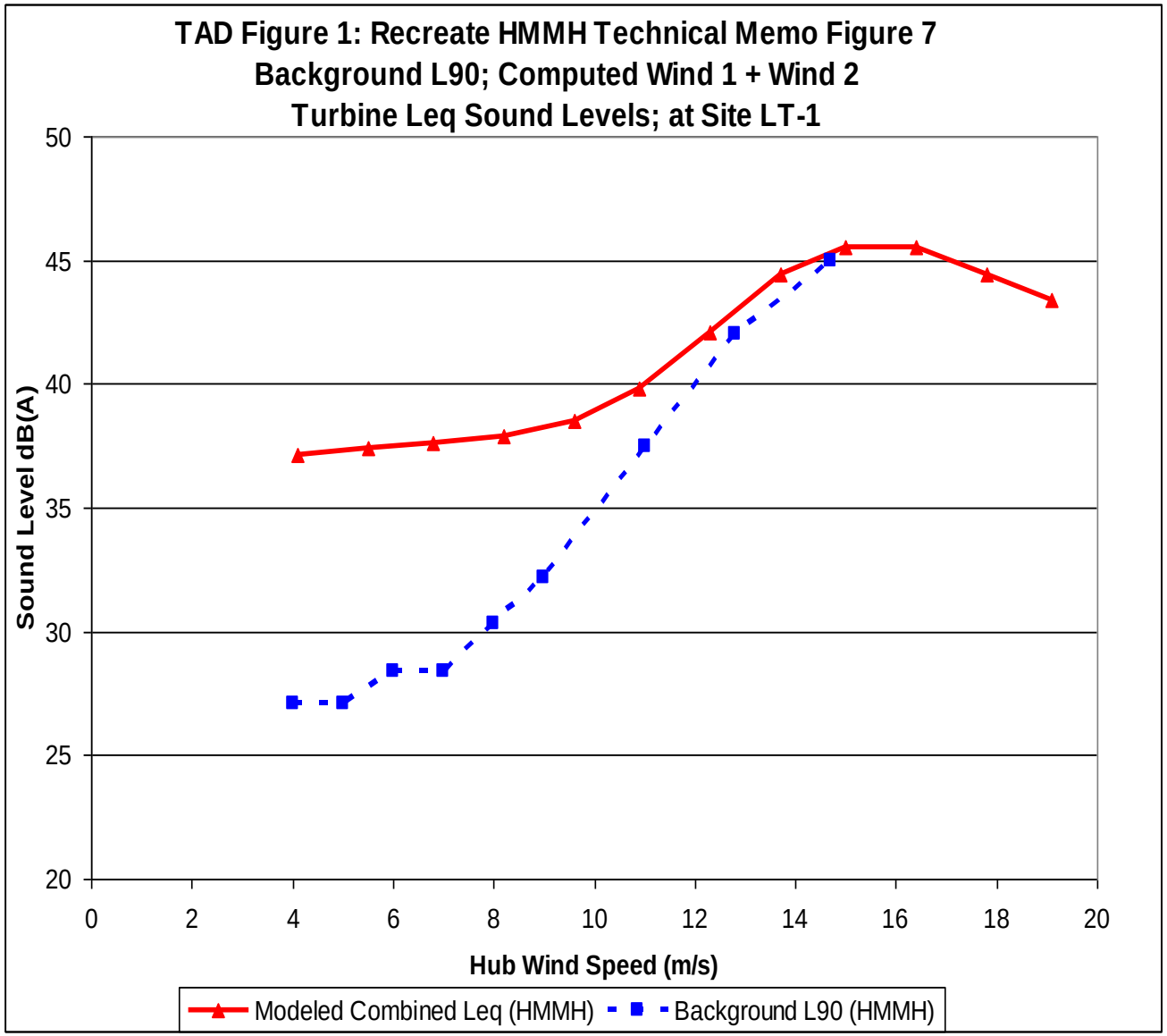
Sound Metrics in Laymen's Terms



Please note that $L_{10} > L_{50} > L_{90}$ for the same sound or noise.

- When you take a sample with a sound meter, the meter reports more than one value
- L90 is close to the lowest sound level recorded and is used to represent the background sound level
- L50 & Leq represent more of an average sound level
- L10 is close to the highest sound level recorded and is used to represent the intrusive sound level

What's wrong with this picture?



- Shows 10 dBA increase at low wind speeds
- Shows no increase at high wind speeds
- The Problem – this is the exact opposite of what neighbors have experienced
- The noise from Wind 1 is very annoying at low wind speeds
- The noise is intolerable at high wind speeds
- So I asked myself: What's wrong with this picture?

A Possible Explanation

Use of the Incorrect Wind Shear Factor

- Winds were low during the study. HMMH relied on background sound level measurements reported in the March 2008 Epsilon report for the NOTUS turbine
- Epsilon utilized the OTIS 10 meter wind speed and a 0.15 wind shear factor to calculate the 80 meter hub wind speed
- By comparing the wind speed data collected by HMMH at Wind 1, with the corresponding data collected at OTIS, I calculated the actual wind shear factor using this formula

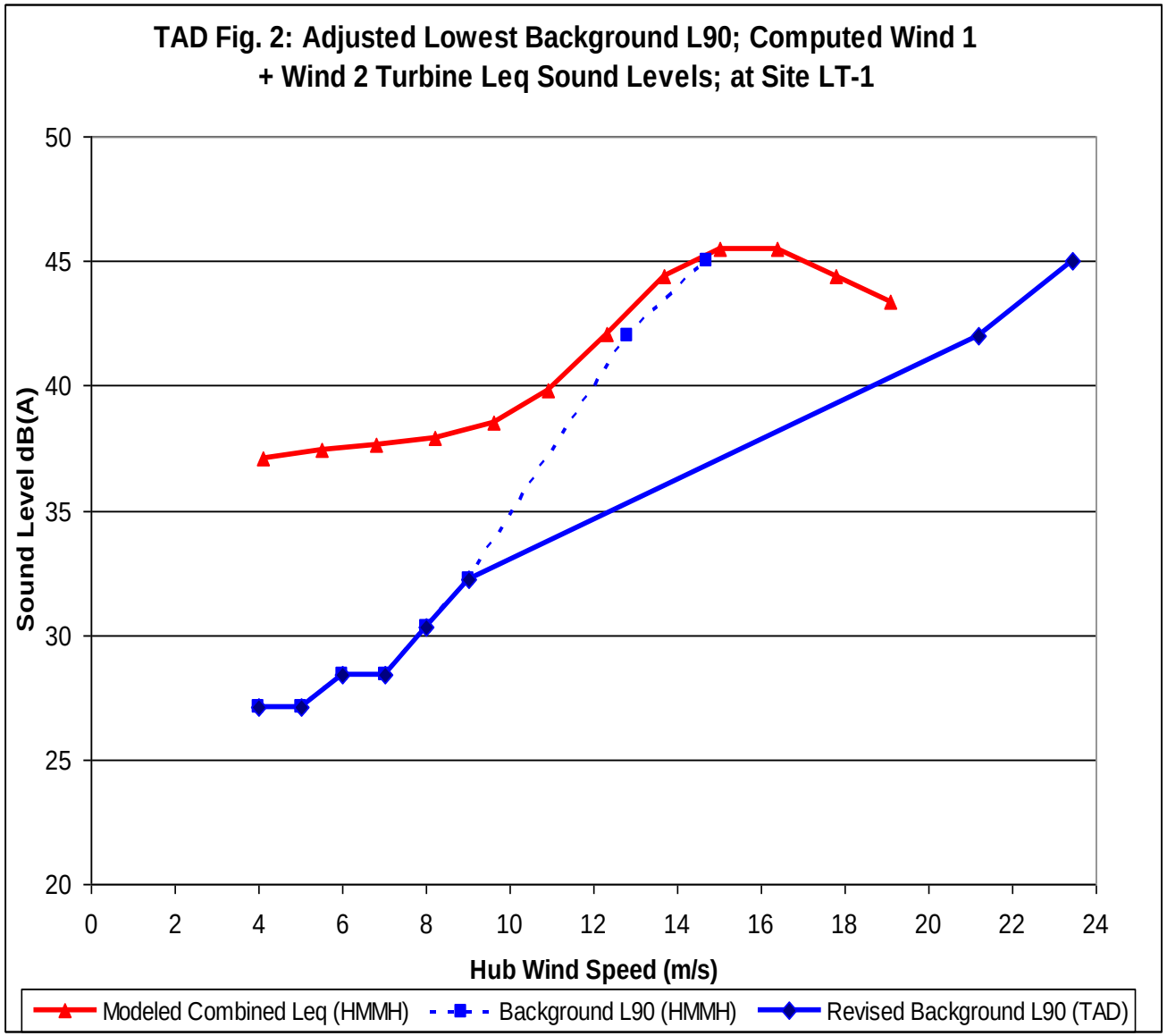
$$\text{Wind shear factor} = \ln(V_2 / V_1) / \ln(H_2 / H_1)$$

- The OTIS 10 m / Wind 1 80 m wind shear factor is 0.39
- The 80 meter NOTUS wind speed was recalculated using the 0.39 wind shear factor

– OTIS 10 m wind speeds were	9.5 m/s & 10.5 m/s
– 80 m speed using 0.15 factor (Epsilon)	12.8 m/s & 14.7 m/s
– 80 m speed using 0.39 factor (Actual)	21.2 m/s & 23.4 m/s

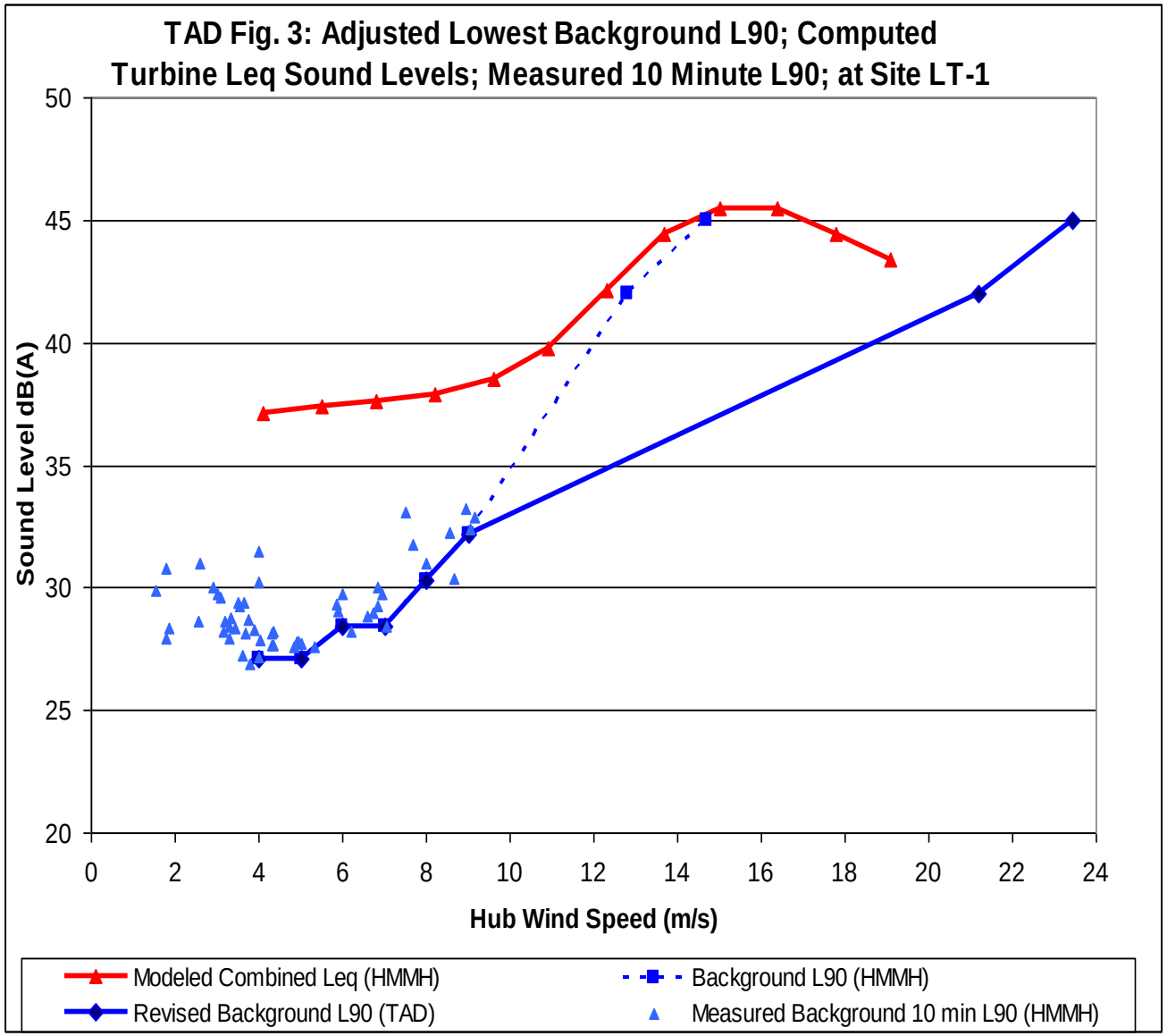
- This results in a substantial increase to the estimated wind speeds for the NOTUS data

Adjust Background Level



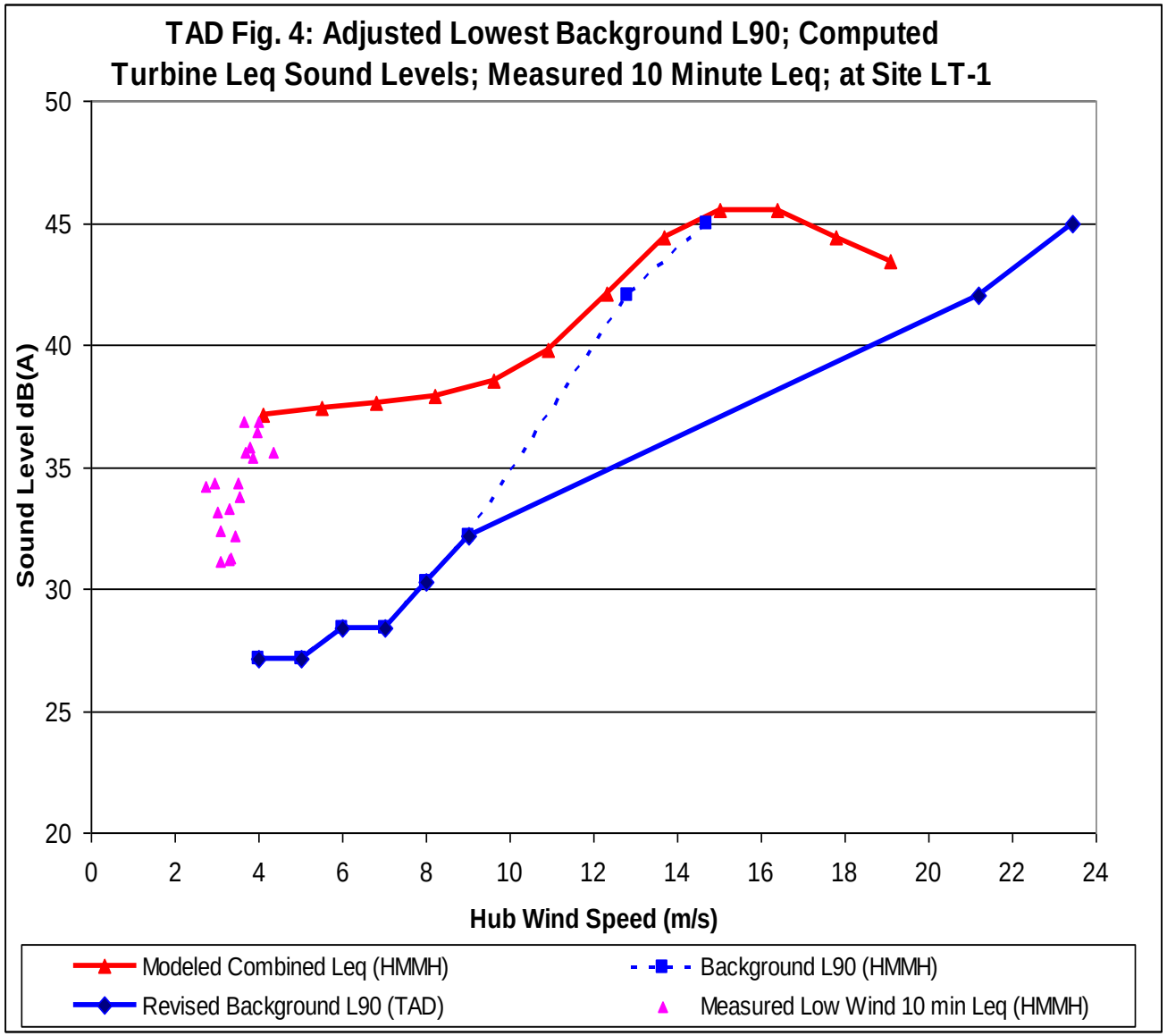
- The background sound level (blue line) was adjusted using the two recalculated wind speeds for the 2 NOTUS data points
- At low wind speeds the increase is approximately 10 dB
- At medium wind speeds the increase is approximately 6 dB
- At high wind speeds the increase approaches 10 dB again

Verify Background L90



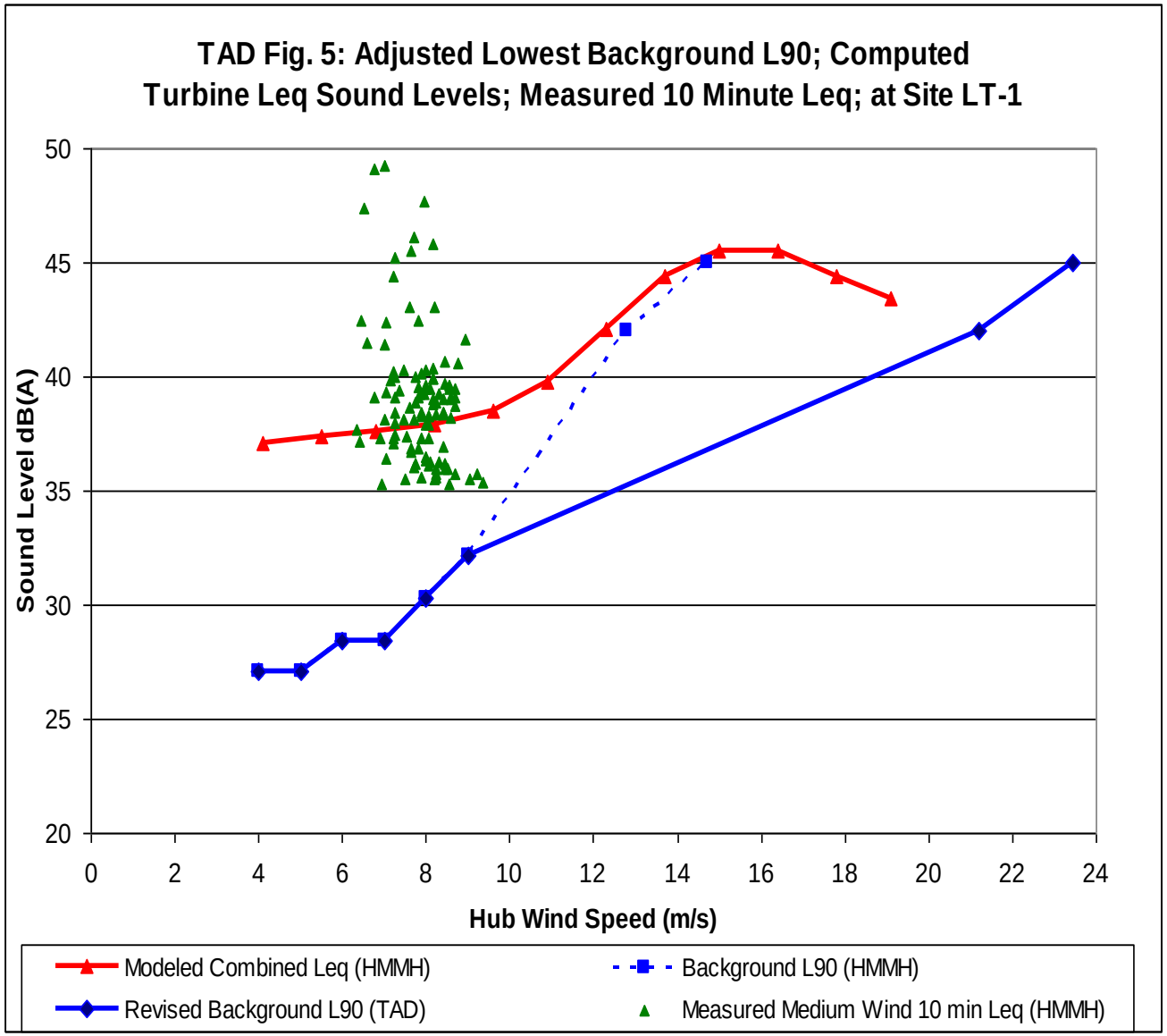
- The nighttime background L90 measurements taken by HMMH were plotted on the chart (light blue triangles)
- All of the actual measurements should be above the blue line
- Background sound level is verified below 10 m/s
- There are no measurements available to verify the background sound level at higher wind speeds

Verify Model at Low Wind Speed



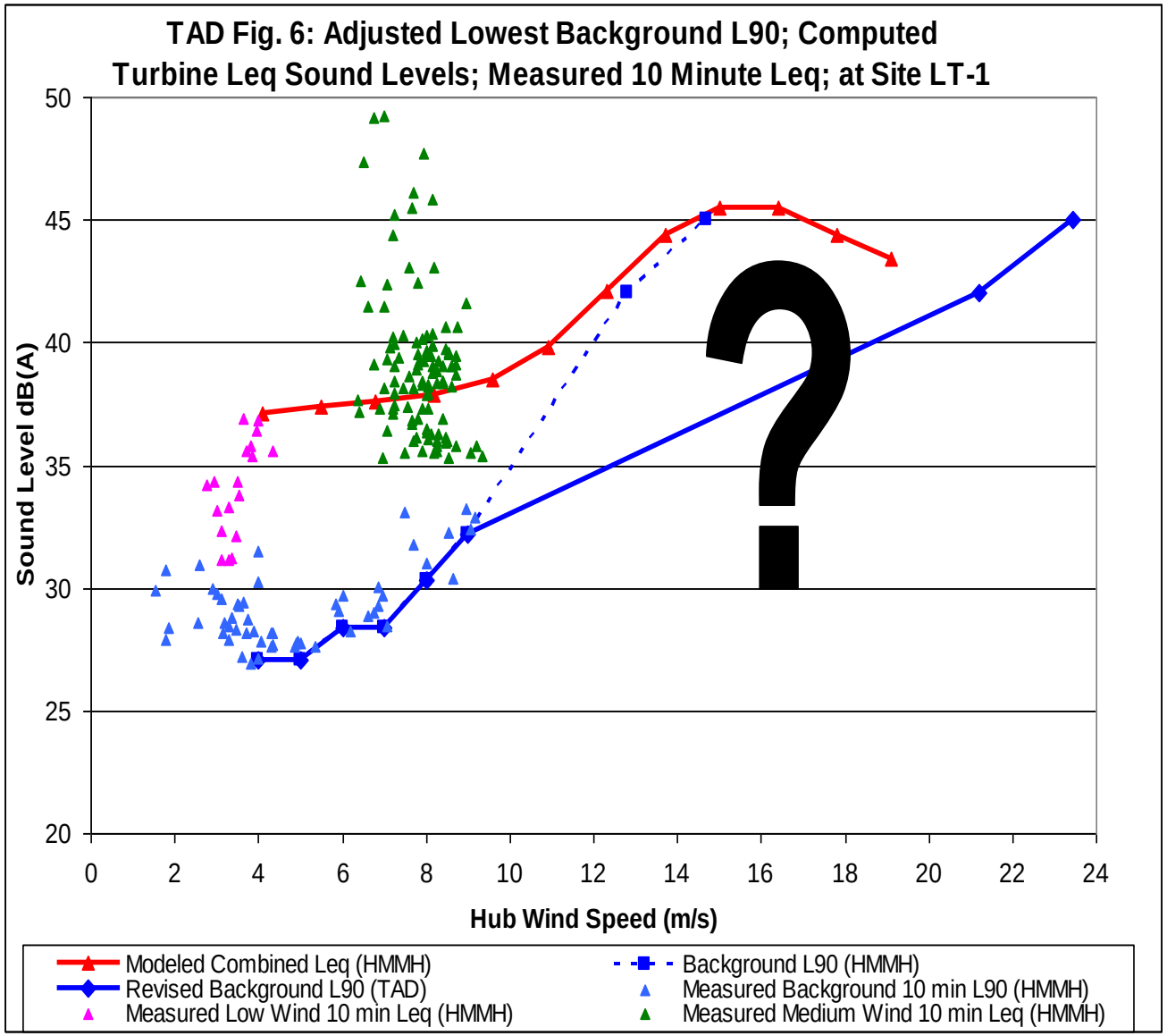
- The nighttime Leq measurements with @ wind speeds less than 6 m/s, were plotted (pink triangles)
- All of the actual measurements should be below the red line (worst case scenario)
- The measurements appear to verify the predictions of the model, but.....
- Only Wind 1 was operating
- The predominate wind direction was South, Southwest
- Site LT-1 was upwind of the turbine for most of the study period (best case scenario)

Verify Model at Medium Wind Speed



- The nighttime Leq measurements @ wind speeds between 6 – 10 m/s, were plotted on the chart (green triangles)
- All of the actual measurements should be below the red line
- 2/3 of the measurements are above the worst case prediction with both turbines operating
- The model appears to grossly underestimate the actual condition at site LT-1
- Many measurements exceed the 40 dBA Town Windmill zoning bylaw

Verify Model at High Wind Speed



- There are no night time measurements available to verify the predictions of the model at higher wind speeds
- Only two points were calculated by me
- All I have done in this analysis is plot the ***actual measurements*** from one spreadsheet with the ***predicted measurements*** from the model
- I don't think you need to be a certified noise expert to see that there is something seriously wrong with this picture

Are We Asking the Right Questions?

- Is the model making accurate predictions of the noise from the turbines?
- In a March 14, 2011 memo, MassDEP stated, *"Many of the parameters for the study are not consistent with what MassDEP would have recommended had we been involved in the initial study scoping."* If this is the case, should another study be performed which is consistent with the guidelines?
- Noise has been the main source of complaints from wind turbines for many years. The 2005 Feasibility Study estimated a noise impact of 42-44 dBA (2-4 dBA above the Town bylaw). If the experts new this: Why wasn't a noise study conducted **before** the Town decided to build these turbines?
- If the 40 dBA threshold set by the Town's Windmill Bylaw is being exceeded: Do we even need to ask any more questions?