Falmouth Wind Turbine Noise Study
Update and Findings

- **Background and Timeline**
  - Noise study scope developed in June 2010 in collaboration with Town of Falmouth, Weston & Sampson Engineers, Vestas, and nearby residents and their acoustical consultant, Noise Control Engineering, Inc.
  - Noise measurements conducted June 18-28, 2010: before, during and after Vestas' turbine maintenance shut-downs
  - Collected noise and wind data was shared with public via Town's Website August 2010
  - Final Report issued September 21, 2010
  - Report presentation to Town and nearby residents September 27, 2010

Update

- **Harris Miller Miller & Hanson Inc. (HMMH) and Weston & Sampson Engineers met with Mass DEP representatives about the January 24, 2011 letter**
- **Mass DEP issued meeting minutes clarifying requested additional analysis**
- **HMMH provided results of that analysis in April 1, 2011 report addendum**
- **Primary points:**
  - DEP suggested the data be shown in one-hour intervals
  - DEP suggested the background be represented by the quietest measured one hour by time of day at each wind speed

Key Findings

- **The Town is very concerned about effects of turbines on neighbors, and interested in hearing ideas**
- **Background sound levels increase with wind speed**
- **Sound from Wind-1 does not cause violations of MassDEP noise guidelines, but sound levels approach the 10 dBA increase threshold on Blacksmith Shop Rd. late at night**
  - Maximum measured sound level increase over the quietest measured background at comparable wind speeds and times of day was 8 dBA at 211 Blacksmith Shop road
- **No pure tone conditions per MassDEP policy were measured or are predicted with Wind-2**

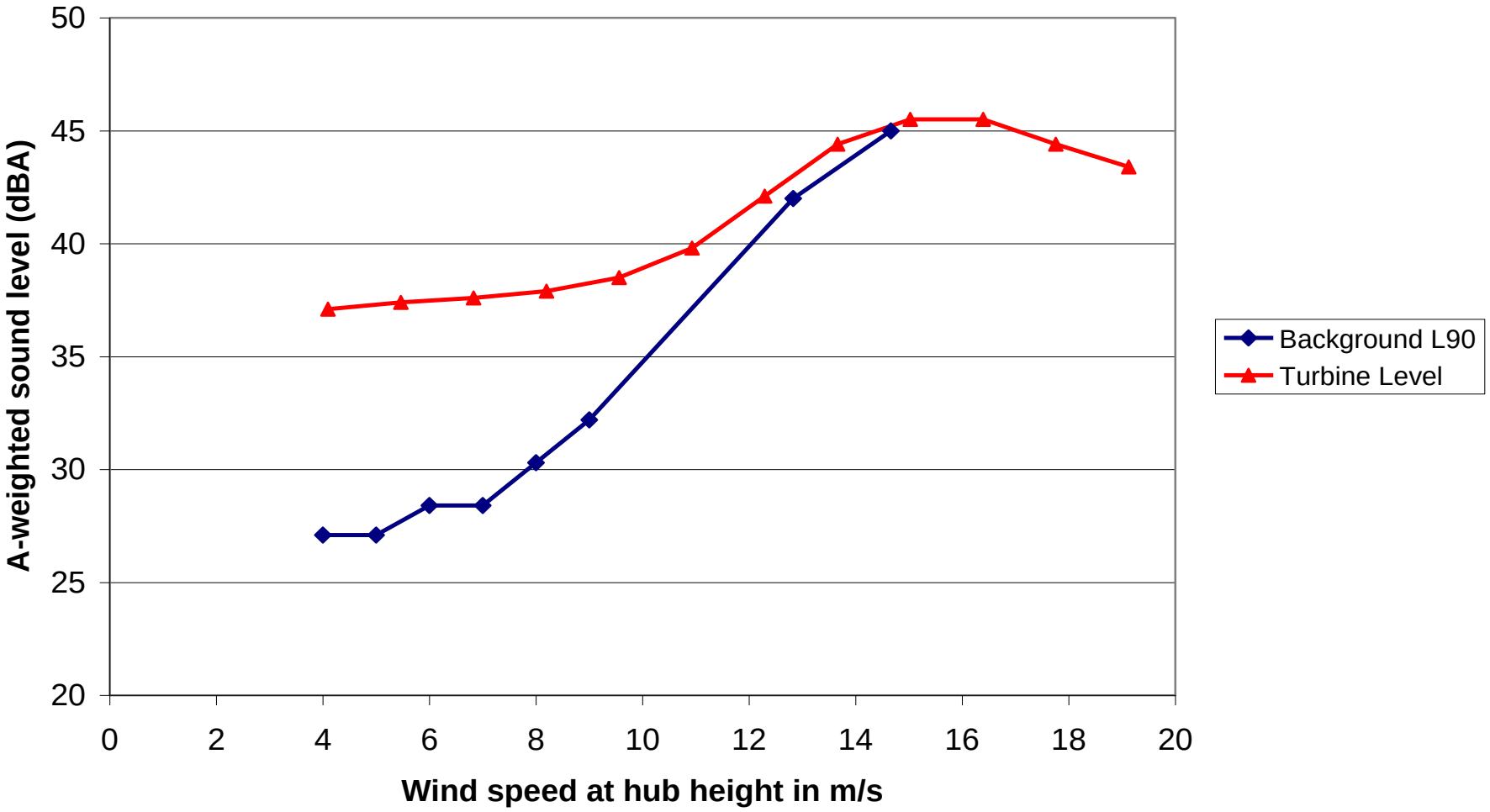
Key Findings

- **With both Wind-1 and Wind-2 operating, modeling predicts that the DEP's 10 dBA increase criterion will be exceeded at the closest homes, but only with both turbines operating and:**
  - During early morning hours when background is quietest, and
  - With wind speeds less than 8 m/s at turbine hub
- **Nighttime background sound levels with low wind measured in June 2010 are nearly the same as those measured in January 2008, suggesting minimal seasonal variation**
- **Reference measurements suggest the Wind-1 turbine is operating at or below the manufacturer's noise specs.**

Measurement Sites

Computed Wind-1 + Wind-2 Turbine Sound Levels relative to Quietest Background

LT-1: Lowest Background L90 and Computed Wind-1 + Wind-2 Turbine Sound Levels as a Function of Hub Wind Speed



Increase in Quietest Nighttime Background L90 at 4 m/s Hub Wind Speed

Site ID	Address	Nighttime Backgrnd L90 (dBA)	Turbine Sound Level plus Background (dBA)		Increase above Background (dBA)	
			Wind-1 alone	Wind-1 & Wind-2	Wind-1 alone	Wind-1 & Wind-2
LT-1	211 Blacksmith Shop Rd.	27.1	36.9	37.5	9.8	10.4
LT-2	124 Ambleside Drive	28.3	33.8	38.4	5.5	10.1
ST-1	161 Blacksmith Shop Rd.	28.3	34.5	35.6	6.2	7.3
ST-2	27 Ridgeview Street	28.3	35.8	38.0	7.5	9.7
ST-3	Research Rd & Thomas B Landers Rd.	27.1	29.4	32.0	2.3	4.9
ST-4	30 Durham Rd.	27.1	32.5	33.5	5.4	6.4

Wind-1 + Wind-2 Noise Levels vs. Ambient Background at Hub Wind Speeds of 8 m/s and higher

	Site LT-1	Site LT-2	Home closest to Wind2
Wind1 + Wind2 Turbines together			
At 8 m/s hub wind speed			
Background L90 =	30.3	31.5	31.5
Turbine Leq noise level =	37.9	38.7	40.0
Total Turbine Leq + background=	38.6	39.5	40.5
Increase in background =	**8.3**	**8.0**	**9.0**
At 9 m/s hub wind speed			
Background L90 =	32.2	33.4	33.4
Turbine Leq noise level =	38.3	39.1	40.4
Total Turbine Leq + background=	39.3	40.1	41.2
Increase in background =	**7.1**	**6.7**	**7.8**
At 11 m/s hub (8 m/s @ 10m) wind speed			
Background L90 =	37.5	37.5	37.5
Turbine Leq noise level =	39.8	40.6	41.9
Total Turbine Leq + background=	41.8	42.3	43.2
Increase in background =	**4.3**	**4.8**	**5.7**

Conclusions and Recommendations

- **Operating individually, Wind-1 and Wind-2 are expected to increase the quietest nighttime broadband noise levels by no more than 10 decibels, complying with the Mass DEP criteria**
- **With both turbines operating, increases in background are predicted to exceed 10 decibels at a few of the closest homes late at night under low-wind conditions**
- **Recommendation: During the quietest early morning hours, one of the two turbines should have an increased cut-in speed of approximately 8 m/s to avoid the most significant increases in background sound**
  - Either Wind-1 or Wind-2 can be used for this curtailment

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