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FAIRHAVEN WIND's PROPOSED UPDATED MITIGATION PLAN

November 11, 2013

This Updated Mitigation Plan[1] ("Mitigation Plan") is being submitted by Fairhaven Wind LLC ("Fairhaven Wind") to the Fairhaven Board of Selectmen ("Selectmen") and Fairhaven Board of Health ("BoH") as a follow-up to our settlement discussions[2] during the summer of 2013[3] and the Amended Order for Abatement of Nuisance issued by the BoH on July 30, 2013 (the "Amended Order").[4] Fairhaven Wind acknowledges the collaborative stance that the Town of Fairhaven has taken with regard to working with Fairhaven Wind, MassDEP, and MassCEC to resolve noise concerns related to the wind turbines.

This Mitigation Plan reflects Fairhaven Wind's understanding of the discussions to date and Fairhaven Wind recognizes that additional conversations with the Selectman, BoH, MassDEP and MassCEC may be necessary to finalize this Mitigation Plan. Further, as discussed below, Fairhaven Wind believes that any Mitigation Plan is not static but can evolve as more information and new technology become available. As such, Fairhaven Wind reserves its rights to submit proposed modifications to this Mitigation Plan over time.

The Mitigation Plan outlined in this document seeks to minimize the economic impact to the Town of Fairhaven while proposing what Fairhaven Wind believes is a conservative approach to ensuring that the combined acoustic measurements of the two wind turbines complies with the current MassDEP Noise Policy[5] as set forth in, and measured by, the MassDEP Wind Turbine

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[1] Neither this plan nor any settlement plan nor any settlement discussions presented by Fairhaven Wind can be construed as an admission by Fairhaven Wind that it has in any way violated any laws or regulations with respect to noise or that Fairhaven Wind has exceeded the Noise Policy of the Massachusetts Department of Environmental Protection ("MassDEP") for reasons previously provided to the Town of Fairhaven ("Town") and MassDEP. Nor can they be construed as an admission that Fairhaven Wind's operation is a nuisance or a health hazard or otherwise in violation of any local, state or federal regulation or bylaw. Further, this Mitigation Plan is only being presented as a settlement document with respect to possible actions which the Town may seek to take against Fairhaven Wind and is not a waiver of any claims that Fairhaven Wind may have against the Town and/or any of its Boards for actions taken by the Town and/or any of its Boards which may be in breach of the Town's contractual obligations with Fairhaven Wind or in excess of that Board's authority.

[2] Including meetings separately or together with the BoH and the Selectmen and working group sessions on June 21, July 10 and July 17, 2013.

[3] Most of the meetings to date were also attended by representatives of MassDEP and the Massachusetts Clean Energy Center ("MassCEC"). Fairhaven Wind is grateful for the continuing involvement and commitment of MassDEP and MassCEC for this settlement process.

[4] On July 1, 2013, Fairhaven Wind submitted a DRAFT Mitigation Plan to the Town as Exhibit C to Fairhaven Wind's letter to the Selectmen in response to the Selectmen's notice of default dated June 14, 2013. While submitted as a draft for discussion, the Amended Order issued by the BoH effectively adopted the July 1 DRAFT Mitigation Plan, deeming that compliance with said plan would be deemed sufficient. However, the BoH also requested that Fairhaven Wind submit "a final mitigation plan" to the BoH. This submission is a further step toward that final mitigation plan.

[5] Fairhaven Wind acknowledges the MassDEP is re-evaluating its existing noise policy, especially as it relates to wind turbines, with the initial step being convening the Wind Noise Technical Advisory Group ("WNTAG") which is evaluating different metrics and alternate means of setting standards. Currently, WNTAG is scheduled to have meetings through the end of January 2014. It is uncertain if WNTAG will be producing a consensus report.

Noise Study Protocol for Fairhaven which was presented to the BoH in July 2013 and which is today's standard being used by MassDEP.

Background

On May 21, 2013, MassDEP issued a report, entitled *Interim Report/Preliminary Results Attended Sampling of Sound from Fairhaven North Wind Turbine and South Wind Turbine*, in which MassDEP referred to five separate instances where MassDEP alleged that the turbines exceeded the 10 dBA MassDEP Noise Policy during specific wind conditions and at specific locations (Peirce's Point, Little Bay Road, and Teal Circle) using MassDEP's testing protocol.[6] MassDEP issued a subsequent letter report to the Town of Fairhaven on August 8, 2013, which reported on three more tests on June 3, 2013, and which alleged a noise violation of 0.2 dBA over the sound limit at one location (Peirce's Point).[7] The May 21 report and the August 5 notice are collectively referred to herein as the "Interim Report."

A table showing all of the readings from the Interim Report and containing other data and comparisons is included as Exhibit A. As shown in Exhibit A, there are no exceedances when comparing comparable metrics (L_{90} to L_{90}, L_{max} to L_{max}, L_{eq} to L_{eq}); however, that is not how MassDEP currently defines an "exceedance" for wind, despite MassDEP using comparable metrics for other sound sources (see footnote 5).

A summary of the "exceedances" from the Interim Report is provided in Table 1 below:

Table 1 – Summary of "Exceedances" Reported by MassDEP

Wind Direction	Wind Speed (m/s)	Impacted Site	Date of Test	Amount Over 10 dBA	Direction from Turbines[8]
NNW	7-9	12 Little Bay Road	11/9/2012[9]	0.7	Crosswind
WNW	4-5	7 Peirce's Point	3/20/2013	1.4	Combination
WNW	5-7	12 Little Bay Road	4/2/2013	2.9	Crosswind
ENE	3-5	12 Little Bay Road	4/12/2013	1.0	Crosswind
NE	3-5	Teal Circle	4/12/2013	1.5	Combination
SSW	7	7 Peirce's Point	6/3/2013[10]	0.2	Crosswind

[6] Although not an objective of the MassDEP testing, MassDEP also found no indications that the wind turbines were exceeding the 60 dBA noise limits in the Town of Fairhaven's Wind Energy Facilities Bylaw as applicable at the time the turbines were constructed.

[7] "[T]he wind turbines slightly exceeded our 10 dBA noise threshold."

[8] For a testing location to be considered downwind, the wind turbines would be directly between the wind direction and the site. For a crosswind location, the site is perpendicular to the wind direction. For a combination location, the site is either between crosswind and downwind or may be downwind of one turbine and crosswind from the other.

[9] MassDEP did not initially report this test as an "exceedance" given the low amount over the 10 dBA limit and some questions about the results from the testing: "The first time this exceedance was recorded (November 2012) was viewed as a potential anomaly because of high levels of wind sound in the tress. MassDEP did not, therefore consider this an exceedance ..." (pg. 11 of May 21 report)

[10] Fairhaven Wind questions whether this was an "exceedance" caused by the wind turbine or major changes in the background. As shown in Exhibit A, the background readings fluctuated as much as 11.5 dBA. The Lmax

In addition to the above test results for potential compliance, MassDEP, alongside Fairhaven Wind, conducted sound level impact tests on June 26, 2013, to determine the effectiveness of potential sound reduction options.[11] The two options tested included feathering the blades[12] and shutting one turbine down completely. In both scenarios, the closest turbine to the testing location was "curtailed" during the sound monitoring. The evening of the test reflected the period of concern identified by MassDEP (midnight to 4 am and low wind conditions). All sampling was measured 900 feet from the closest turbine to represent the distance to the closest residence.[13] Again, no "exceedances" were reported. The results of those tests are summarized in Tables 2 and 3 below:

Table 2 – Acoustic Measurements Downwind of Wind Turbines (Test Site #1) – June 26, 2013

Operating Condition	L_{90} (dBA)	L_{max} (dBA)	L_{eq} (dBA)	L_{max} - L_{90} (dBA)	Range (dBA)	dBA Impact of Mitigation
Ambient (both turbines off)	36.4				34.9-42.8	
Both Turbines Operating Full		44.5	43.1	8.1	41.4-44.6	
Closest Turbine Off/Other Turbine Operating Full		42.7	41.1	6.3	38.8-42.9	-1.8
Closest Turbine Blades Feather 12.5%/Other Turbine Operating Full		44.2	42.9	7.8	41.3-44.3	-0.3

Table 3 – Acoustic Measurements Crosswind of Wind Turbines (Test Site #2) – June 26, 2013

Operating Condition	L_{90} (dBA)	L_{max} (dBA)	L_{eq} (dBA)	L_{max} - L_{90} (dBA)	Range (dBA)	dBA Impact of Mitigation
Ambient (both turbines off)	33.7				32.6-40.6	
Both Turbines Operating Full		42.5	41.1	8.8	39.4-42.7	
Closest Turbine Off/Other Turbine Operating Full		38.9	36.6	5.2	35.1-39.7	-3.6
Closest Turbine Blades Feather 12.5%/Other Turbine Operating Full		42.4	40.8	9.2	38.6-42.8	-0.1

background was 10 dBA over the L_{90} background level and the maximum sound from the turbines was only 0.2 dBA over the maximum background sound.

[11] To maximize the effectiveness of the testing, these test locations "were chosen so there would be no masking influence from trees or other structures." This differs from the actual sampling sites where "there are trees between the wind turbines and all three sampling sites where exceedances were found during compliance testing."

[12] Feathering the blades refers to pitching the blades to reduce their speed.

[13] Since the objective of the testing was to measure the decrease in sound output from the turbines during low wind conditions for locations both downwind and crosswind, the actual wind direction did not need to comply with the directions of concern.

Including these tests, MassDEP has conducted a total of 29 separate acoustic tests of the wind turbines in Fairhaven.[14] With the exception of these latter tests, MassDEP purposely "defined the locations and conditions under which sound impacts were perceived to be the greatest"[15] according to the complaint log provided to MassDEP by the BoH. Yet, in only 6 instances, did MassDEP report any finding of an "exceedance" of the MassDEP Noise Policy and in only 3 instances were the "exceedances" greater than 1 dBA.[16] In addition, no "exceedances" were reported when background was above 40.3 dBA and no "exceedances" were reported outside of the midnight to 4 am timeframe

MassDEP has not issued a final report and, to date, MassDEP has issued no notice of violation against Fairhaven Wind nor has it commenced any enforcement action.

As summarized in MassDEP's letter regarding the mitigation tests reported in Table 2 and 3 above:

> *In order to draw some conclusions on how the results from this testing might be applied to mitigation of the specific exceedances in MassDEP's Interim report, the position of the properties where the exceedances were found should be considered. On March 20, 2013, the Peirce's Point sampling site with an exceedance of 11.4 was downwind[17] of the wind turbines in a similar wind speed (4-5 m/s). On April 12, 2013 and under similar wind conditions (3-5 m/s), the Little Bay Road sampling site was also in the downwind position[18] with an exceedance of 11.0 dBA and the Teal Circle sampling site was halfway between downwind and crosswind (exceedance of 11.5 dBA).*

Proposed Mitigation Plan

The above testing results from MassDEP, including its mitigation testing, are used as the basis for this proposed Mitigation Plan.

Findings:

1. All of the reported "exceedances" occurred between the hours of midnight and 4 am.
2. The only noticeable "exceedances" occurred in the winter when all the leaves are off the trees and the insects and other animal noises are the lowest.

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[14] MassDEP still intends to complete additional testing. As testing has been ongoing for over a year, the remaining wind condition appears to be rare. Fairhaven Wind believes that the proposed Mitigation Plan may be easily updated if necessary to include this wind condition should MassDEP find an "exceedance."

[15] Pg. 2 of MassDEP Interim Report dated May 21, 2013.

[16] MassDEP Noise Policy considers both broadband (reported in the tables above) and pure tone. According to MassDEP (pg. 11 of May 21 report) "[o]peration of the two wind turbines was found to not contribute to a pure tone under the conditions tested."

[17] In the Interim Report, Peirce's Point was receiving wind from the "WNW" and was considered "downwind and right" of the turbines.

[18] In the Interim Report, Little Bay Road was reported to receive wind from the "ENE" and it was "downwind and left" of the turbines.

3. No "exceedances" were reported when background in the neighborhood was 40.3 dBA or higher.
4. All of the "exceedances" were at locations closest to the South Turbine.
5. All of the "exceedances" were reported when wind speeds during the background measurements[19] were generally at or below 7 meters/second.
6. The highest reported "exceedance" (2.9 dBA at Little Bay Road) occurred during light crosswind conditions. Mitigation testing showed that shutting off one turbine during crosswind conditions would reduce the noise level by 3.6 dBA, which is more than any "exceedance" reported by MassDEP.
7. The next highest reported "exceedance" (1.5 dBA at Teal Circle) occurred during combination wind conditions, and also during an exceptionally quiet[20] background noise period. Mitigation testing showed that shutting off one turbine during downwind conditions would reduce the sound level by 1.8 dBA, which again is more than any "exceedance" level reported by MassDEP for combination wind conditions.
8. As reported by MassDEP in its May 21 report (pg. 11), "preliminary results show that the sound impact at 12 Little Bay Road, Teal Circle and 7 Pierces [sic] Point Road in … northwesterly and/or easterly wind conditions exceed the MassDEP 10 dB(A) above ambient limit … using the methodology adopted for this report."
9. Further, in MassDEP's August 8th update, MassDEP said that a SSW wind (6.5-7.3 meters/second) on June 3 caused a minor "exceedance" at Peirce's Point.[21]

Notwithstanding Fairhaven Wind's questions about the testing methodology and some of MassDEP's data, in the interest of working with the Town of Fairhaven, Fairhaven Wind proposes to implement the following curtailment strategy:

From the period of November 15 to April 15, Fairhaven Wind will curtail the operation of one wind turbine[22] between the hours of midnight and 4 am during the following conditions (collectively, the "Mitigation Conditions"):

(a) Wind is, or is projected to be, generally from the Northwest, Northeast or South-Southwest;
(b) Wind is, or is projected to be, below 7 meters/second; and
(c) No precipitation is projected during the time period.

The above Mitigation Conditions (a) and (b) currently state "is, or is projected to be" because the wind turbines are not yet programmed to accomplish these tasks. Fairhaven Wind has initiated

[19] In almost all reported cases of "exceedances," the wind speed during MassDEP testing of the turbine sound was at or above the wind speed during testing of the background noise. This increase in wind speed alone could result in higher wind noise which is attributable to the turbines under MassDEP's protocol and also brings some of the testing protocol into question.
[20] MassDEP's technician reported it as "eerily quiet."
[21] Fairhaven Wind questions these June 3, 2013 sampling results for the reasons stated previously about wide fluctuations in the background readings. Further as WSW, SSW, and SW directions had all been tested at various wind speeds with no exceedances, the 0.2 dBA exceedance in June is an outlier among the collected data.
[22] Generally, Fairhaven Wind will plan to curtail the South Turbine as it is closest to residences. However, if there are times that the North Turbine is not running, the South Turbine will be allowed to run.

discussions with the turbine supplier to provide the required programmatic changes to the wind turbine and is hopeful that the changes can be programmed and implemented by the end of November. Until such time as the programming is complete and Fairhaven Wind has some comfort that it is working properly, Fairhaven Wind will be reviewing nightly forecasts using www.westislandweather.com to make a decision each evening regarding whether the Mitigation Conditions will require one turbine to be shut down between midnight and 4 am. If in doubt, one turbine will be shut down during those hours.

Once the programming is completed, Fairhaven Wind will plan to use the programming to run this protocol automatically for conditions (a) and (b).[23] Fairhaven Wind will have the option to override the programming based on a forecast of certain weather conditions (e.g., rain is forecast) or the South Turbine is down for some reason. While the North Turbine will also receive the same programming, during most Mitigation Conditions, the North Turbine will continue to operate as designed.

Future Efforts

Based on research done by Fairhaven Wind and certain contacts that have been made, additional technology may be developed and be available for testing in the near future which might more accurately track and predict issues for compliance. Fairhaven Wind hopes to continue its cooperative relationship with the Town to address the alleged compliance issue and may be proposing testing of such technology.

Conclusion

Fairhaven Wind appreciates the collaborative effort the Town has engaged in to work with Fairhaven Wind. We are particularly grateful to MassDEP and MassCEC for their input and participation. Fairhaven Wind believes the above proposed mitigation plan is fair and balanced and we look forward to working with the Town to implement it and to help answer the Town's questions.

[23] Fairhaven Wind anticipates that the programming changes will control for wind speed by changing the "cut-in" speed for the wind turbine; i.e., when the turbine sensors determine that the wind has been operating for a long enough time at a high enough wind speed, the turbine will commence production of power. Similarly wind direction will depend on the average direction of the nacelle which rotates into the wind.

EXHIBIT A -- Compilation of MassDEP Data -- Sorted by Neighborhood

		Background								Impact							Equal Comparisons			MASS DEP COMPARISONS	
Date	Location	L90	Lmax	Lmax - L90	dBA Range	Leq (Note 1)	Wind Speed	Wind Direction	Percent Voided	L90	Lmax	Lmax - L90	Leq (Note 1)	Wind Speed	Wind Direction	Percent Voided	L90 Comps	Lmax Comps	Leq Comps	Lmax- L90 (dBA) (note 2)	Leq-L90 (dBA) (note 3)
9-Aug-12	Little Bay Road	46.2	47.0	0.8	1.3	46.4	3.4	SW	0%	46.5	47.4	0.9	46.9	3.3	SW	0%	0.3	0.5	0.5	1.2	0.7
26-Sep-12	Little Bay Road	46.0	48.5	2.5	3.3	47.0	7.9	SW	8%	49.9	52.3	2.4	50.7	9.5	SW	20%	3.9	3.8	3.7	6.3	4.7
10-Oct-12	Little Bay Road	38.8	42.1	3.3	5.4	40.0	5.4	NE	11%	42.2	44.8	2.6	43.4	5.0	NE	27%	3.4	2.8	3.3	6.0	4.6
9-Nov-12	Little Bay Road	40.3	45.6	5.3	6.7	41.9	7.8	NNW	13%	47.6	51.0	3.2	49.0	8.9	NNW	39%	7.3	5.4	7.1	10.7	8.7
2-Apr-13	Little Bay Road	32.9	37.4	4.5	7.7	34.6	5.6	NW	0%	42.7	45.8	3.1	43.9	6.2	NW	14%	9.8	8.5	9.3	12.9	11.0
12-Apr-13	Little Bay Road	29.9	34.8	4.9	6.2	31.8	3.4	ENE	4%	38.5	40.9	2.4	39.5	3.4	ENE	11%	8.6	6.2	7.6	11.0	9.6
9-Aug-12	Mill Road	38.9	40.9	2.0	2.7	39.5	3.2	SSW	20%	40.5	42.4	1.9	41.1	3.3	SSW	17%	1.6	1.5	1.6	3.5	2.2
26-Sep-12	Mill Road	45.4	49.8	4.4	6.2	47.5	6.5	SW	21%	45.4	48.0	2.6	46.4	7.3	SW	38%	0.0	-1.8	-1.1	2.6	1.0
10-Oct-12	Mill Road	31.1	33.6	2.5	3.8	31.7	3.2	NE	12%	34.7	36.6	1.9	35.5	3.3	NE	3%	3.6	2.9	3.8	5.5	4.4
12-Apr-13	Mill Road	33.8	35.5	1.7	3.1	34.4	4.0	NE	16%	35.3	37.6	2.3	36.0	4.4	NE	19%	1.5	2.1	1.6	3.8	2.2
3-Jun-13	Mill Road	37.1	50.2	13.1	13.9	41.0	5.3	SSW	0%	40.7	43.5	2.8	43.5	6.1	SSW	27%	3.6	-6.7	2.5	6.4	6.4
9-Aug-12	Peirce's Point	44.1	45.0	0.9	1.5	44.5	3.3	South	16%	45.0	46.2	1.2	45.3	3.5	South	14%	0.9	1.2	0.8	2.1	1.2
26-Sep-12	Peirce's Point	44.8	50.6	5.8	8.5	46.9	9.7	SSW	18%	49.1	53.3	4.2	50.8	10.7	SSW	41%	4.3	2.8	3.8	8.5	6.0
15-Oct-12	Peirce's Point	42.1	46.1	4.0	9.5	43.4	8.9	SW	19%	49.6	51.5	1.9	50.5	7.4	SW	37%	7.5	5.4	7.1	9.4	8.4
9-Nov-12	Peirce's Point	40.3	45.6	5.3	6.7	41.9	7.8	NW	13%	44.9	49.9	5.0	47.1	7.8	NW	31%	4.6	4.3	5.2	9.6	6.8
20-Mar-13	Peirce's Point	34.4	39.7	5.3	6.5	36.1	4.7	WNW	6%	41.9	45.8	3.9	43.5	4.7	WNW	20%	7.5	6.2	7.5	11.4	9.1
3-Jun-13	Peirce's Point	37.1	47.1	10.0	11.5	39.5	6.9	SSW	0%	44.2	47.3	3.1	46.2	7.3	SSW	39%	7.1	0.2	6.7	10.2	9.1
26-Sep-12	Shawmut	42.9	48.1	5.2	6.4	44.7	nd*	nd*	18%	46.2	49.1	2.9	47.2	nd*	nd*	28%	3.3	1.0	2.5	6.2	4.3
3-Jun-13	Shawmut	36.6	48.9	12.3	14.1	40.9	5.5	SSW	0%	42.5	45.2	2.7	43.7	7.3	SSW	33%	5.9	-3.7	2.8	8.6	7.1
9-Aug-12	Shawmut Deck	43.8	46.0	2.2	3.5	44.3	3.4	SSW	0%	45.3	46.8	1.5	45.8	3.4	SSW	7%	1.5	0.8	1.5	3.0	2.0
31-Aug-12	Shawmut Deck	47.8	48.9	1.1	1.6	48.2	6.7	WSW	10%	46.7	48.3	1.6	47.3	4.6	WSW	3%	-1.1	-0.6	-0.9	0.5	-0.5
31-Aug-12	Shawmut Ground	47.6	49.6	2.0	3.0	48.4	6.5	WSW	33%	46.4	48.5	2.1	47.7	7.2	WSW	24%	-1.2	-1.1	-0.7	0.9	0.1
31-Aug-12	Teal Circle	44.4	45.8	1.4	2.7	44.8	6.3	WSW	7%	45.0	46.1	1.1	45.4	6.0	WSW	9%	0.6	0.2	0.6	1.7	1.0
26-Sep-12	Teal Circle	43.3	46.0	2.7	3.6	44.1	7.2	SW	21%	46.2	49.2	3.0	47.4	8.7	SW	21%	2.9	3.2	3.3	5.9	4.1
10-Oct-12	Teal Circle	33.9	36.6	2.7	4.0	34.9	4.5	NE	16%	38.7	42.4	3.7	39.9	3.7	NE	3%	4.8	5.8	5.0	8.5	6.0
9-Nov-12	Teal Circle	38.1	44.5	6.4	7.7	40.5	7.8	NW	8%	41.9	45.8	3.9	43.8	7.7	NW	29%	3.8	1.4	3.3	7.7	5.7
2-Apr-13	Teal Circle	34.9	41.6	6.7	10.3	37.3	5.6	WNW	26%	38.0	44.7	6.7	41.3	6.7	WNW	9%	3.1	3.1	4.0	9.8	6.4
12-Apr-13	Teal Circle	27.7	33.0	5.3	7.8	29.8	3.2	NE	3%	37.2	39.2	2.0	38.0	3.4	NE	31%	9.5	6.3	8.2	11.5	10.3

No exceedances were observed by MassDEP in Mill Street or Shawmut Neighborhoods.

Little Bay Road Exceedances occurred during winter (November thru April) when background was low
Background L90 appears to correlate well with wind speed during the winter conditions
Low winter wind speed likely to cause exceedance.

Peirce's Point Exceedances occurred during low wind speed, winter condition which also produced lowest background L90.

Teal Circle Exceedance occurred during low wind speed, winter conditions.
Higher wind speed (over 5 mps) which produced higher background in November and early April did not cause exceedance.
April 2nd readings show 10.3 dBA range of background noise but turbine Lmax is only 9.8 dBA over L90 background.

NOTES

1 Leq is the average sound of the good readings
2 MassDEP Nuisance Noise assessment calls for comparision of Lmax attributable to the sound source to the L90 with the sound source turned off
3 MassDEP says "Leq - L90 is provided to compare to the predicted modelling results" but TE says modeling is L90 to L90 like permits
nd* * SCADA data provided by Fairhaven Wind LLC did not cover the time period of this sampling event