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BEFORE THE STATE OF WASHINGTON
ENERGY FACILITY SITE EVALUATION COUNCIL

In the Matter of Application No. 99-1:

SUMAS ENERGY 2 GENERATION
FACILITY

**PRE-FILED TESTIMONY OF
JERRY G. LILLY**

ISSUE:

NOISE

SPONSOR:

City of Abbotsford
Abbotsford Chamber of Commerce

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EXHIBIT JGL - T

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1 **Could you please identify yourself?**

2 My name is Jerry Lilly. I am President of JGL Acoustics, Inc. an acoustical consulting
3 firm located in Issaquah, WA.

4 **Would you please summarize your experience and education relevant to your work?**

5 I have a Master of Science degree in Engineering Acoustics from Penn State
6 University (1975) and a Professional Engineer=s License in Acoustical Engineering
7 (Oregon, 1983). I have been providing acoustical consulting services to clients since
8 1975, and I started my own consulting firm in 1983.

8 **Are you familiar with the Sumas Energy 2 Generation Facility proposal submitted to the
9 Energy Facility Site Evaluation Council by Sumas Energy 2, Inc. (SE2)?**

10 Yes.

11 **What specific issues did you focus on with regard to this proposal?**

12 I reviewed the noise study prepared on behalf of the proposed power generation project
13 near Sumas, WA. The original noise study (dated 1/10/00) was prepared by MFG, Inc.
14 at the direction of Mr. Eric Hanson.

15 **What is your overall opinion of the proposal with regard to the noise impacts?**

16 I have two primary concerns about the noise impacts of this facility. My first concern
17 is whether it will be in compliance with the legal limits on noise. Second, even if it
18 is in compliance with noise limits, there could be a significant noise problem caused
19 by low frequency noise and/or the generation of tones (which weren=t considered by
20 the Applicant).

21 **Why are you concerned about whether this facility will be in compliance with the legal
22 limit on noise?**

23 In this case, a computer program was used to predict the power plant noise levels at
24 four selected residential receptor locations. A Receptor location@ is a place that the
25 engineer picks to evaluate the level of noise. It can be a house, a property line, or any
26 place where noise impacts from a facility should be measured.

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1 That the authors of the study used only four residential receptor locations for this very
2 broad area is surprising. The computer program they used can easily compute noise
3 levels at numerous receptor locations fairly quickly.

4 The noise study predicted the power plant noise levels under two different atmospheric
5 conditions. Like the locations, the choice of only two atmospheric conditions is
6 surprising. The reason it's important to consider different atmospheric conditions is
7 that changes in temperature (as a function of altitude) affects sound propagation. That
8 is, fluctuating temperature profiles can increase or decrease noise impacts. A source
9 might emit a very constant level of noise, but a receiver may hear fluctuating noise
10 because of fluctuations in atmospheric conditions. One condition used in the noise
11 study was the Astable atmosphere, where the temperature increases 2 degrees C for
12 each 100 meters of elevation. The other condition was called a Aneutral atmosphere,
13 where the temperature decreases 1 degree C for each 100 meters of elevation.
14 Certainly, one can expect a wide variety of atmospheric conditions throughout the year,
15 yet there is nothing in the document to support the idea that these conditions represent
16 the average or the extremes one might see during the life of the project. I was also
17 surprised to see that the predicted noise level only varied by a few decibels between
18 the two atmospheric conditions that were evaluated. I would have expected to see
19 more of a variation here.

20 All in all, there is a strong possibility that the legal limit will be surpassed at receptor
21 locations not considered or when atmospheric conditions cause facility noise levels to
22 exceed predictions.

23 Also - this science is not exact. When you make assumptions about the level of noise
24 from equipment, it cannot always be predicted accurately. Also, the level of reduction
25 that will occur from mitigation cannot be predicted accurately. In this study, the
26 predicted noise levels do not leave much of a safety margin. That is, they are very
27 close to the noise ordinance nighttime limit of 50 dBA at the residential receiving
28 properties. In fact, all locations are within 2 dBA of the nighttime maximum limit
29 with the assumed stable atmosphere. Obviously, the predicted noise levels are close
30 to the noise ordinance limit because the noise mitigation has been designed to meet
31 this level at all selected receiver locations under both atmospheric conditions. This is
32 understandable, but what happens if the noise mitigation materials do not perform up
33 to their laboratory test data? In fact, it is quite common for field performance to fall
34 short of laboratory performance. If this occurs, and it most certainly will, will the

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1 power plant noise levels exceed the nighttime limit? And what about different
2 atmospheric conditions? If the temperature inversion is more extreme than assumed,
it is likely that noise levels will be even higher than predicted.

3 **Your second concern about this proposal was that there could be a significant noise**
4 **problem caused by low frequency noise and/or the generation of tones, please explain**
5 **that concern.**

6 Measurement of an A-weighted sound level is a frequency filtering technique that
7 is commonly used to come up with a single number to describe the level or loudness
8 of a sound. The A-weighting filter attempts to approximate the frequency response of
9 the human ear, but it is by no means an exact measure of perceived loudness. But
10 when you limit yourself to this one number you lose important information. (An
analogy would be using one sentence to describe the entire novel A Moby Dick.) In
particular, you lose knowledge of the presence of low frequency noise and/or the
presence of audible tones.

11 **Is it possible that there may be a significant noise problem in the community caused by**
12 **this facility?**

13 Yes. Even if the noise mitigation works exactly as planned, and even if the
14 atmosphere behaves as modeled, this does not mean that there will not be a significant
15 community noise problem from the proposed facility. In fact, large industrial facilities
16 similar to this often generate objectionable noise into nearby communities without
exceeding the dBA noise limits. This usually occurs if the facility generates high
levels of low frequency noise or if the facility generates strong tones.

17 Because of the nature of the A-weighted filter, high levels of low frequency noise can
18 go undetected by the computer models and the sound level meters. A low frequency
19 noise is probably best recognized if you picture a car driving by with its windows
20 closed, but with a loud stereo playing inside. When you hear the deep boom of the
21 base - that is low frequency noise. Low frequency noise can have a lot of impact - it
22 can shake walls, rattle windows, cause extreme annoyance, cause headaches in some
23 people, and cause stress. Low frequency noise levels can be high enough to cause
24 these impacts without exceeding the 50 dBA noise ordinance limit. For example, a
25 low frequency tone at 30 Hz (Hz is the unit of frequency B the units of frequency used
26 to be cycles/second, but this was changed in the early 1900=s to Hz in honor of the
27 famous German scientist Heinrich Hertz) could exceed a sound pressure level of 85

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1 dB in the residential community without violating the 50 dBA noise ordinance limit.

2 This sound level is sufficient to rattle the windows of some residential buildings, and
3 it is certainly sufficient to cause significant annoyance and sleep interference. The A-
4 weighted level of an 85 dB tone at 30 Hz is only 46 dBA. If the machinery associated
5 with this project is capable of generating this level of noise (above 80 dB) at low
6 frequencies in the community, there is a significant potential for low frequency noise
7 problems. Because of this concern, I strongly recommend that someone examine the
8 low frequency noise radiation characteristics of the proposed project.

9 The other potential noise problem relates to the generation of tones. Tones are sounds
10 that have most of its energy at a single frequency. You can have tones at any
11 frequency - low or high. For example, a tone is emitted when you strike a piano
12 key, or when you pick up the phone. Most emergency vehicle sirens these days use
13 a high frequency tone whose frequency and level oscillate to further attract attention.

14 Tones are a particular problem because they can be an extreme annoyance even when
15 they are at a low level. If the tones are strong enough at the source, they can be heard
16 for great distances. Tones are particularly troublesome because they have a piercing
17 characteristic that is especially annoying. Tones can also be heard at levels as low as
18 10 dBA below the overall ambient noise level.

19 It appears that the applicant did not look at this facility's potential for generating
20 tones. This should be done because the equipment planned for this project could have
21 a significant problem with the generation of tones. It's very possible that tones from
22 this facility could keep people awake at night.

23 If an industrial facility goes in, and its A-weighted sound levels are within the legal
24 limits, but there is still a community noise problem - it is typically caused by a high
25 level of low frequency noise or the generation of tones. In general, it is good design
26 practice to mitigate tones to a point where they are at least 10 dB below the overall
27 design goal. For example, if your goal is to achieve the 50 dBA nighttime noise level
28 at a receiver location, all tones should be attenuated so that any one tone is not higher
29 than 40 dBA at that location. It doesn't appear that tones have been considered in this
30 noise study, and therefore, I recommend that this issue be investigated further.

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