



## **Borzym Acoustics**

Consulting & Engineering

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1 September 2017

To: John Rehberg

**Re: Responses to EDI Noise Impact Assessment  
Proposed WOLF II Sanctuary, Red Feather Lakes, Colorado**

Hello John,

This memorandum contains my comments and criticisms about the Noise Impact Assessment for the WOLF II Sanctuary (the "Assessment") produced by Stuart McGregor, PE, of EDI (Engineering Dynamics Incorporated), dated 25 May 2017.

It is my professional opinion that this Assessment is faulty in several regards, in particular in obfuscating or hiding the important noise disturbance and annoyance that will occur if this proposed sanctuary of wolf/dog-hybrid animals is permitted.

The acoustical analysis in this Assessment does not seem to be incorrect. However the statement of conclusions is weak, and hides relevant and important conclusions.

There are also problems of incorrect terminology, incorrect information, irrelevant information, inconsistent data, underestimation of sound levels, irrelevant and unrealistic statements about mitigation measures, and a highly misleading quotation. The Assessment does not address disturbance or annoyance, which is an essential part of the Noise Ordinance.

This memo will not address incorrect or unclear type except as they pose a problem in understanding the Assessment.

The final paragraph of this memo will state that in my professional opinion, the conclusion of the Assessment should have stated the following:

**In six of the fourteen residences studied (or 43%), noise of wolf/dog-hybrid barking and howling will be Clearly Audible outside residences during quiet background noise conditions.**

## **Comments Regarding the Assessment**

### **Background Sound Level is 28 dBA – Not Clearly Stated**

Page 5

States:

“The L90 is considered to be the residual or true minimum background noise level.”

Page 12, Table 4.1:

States:

“Background Sound Level, L90; = 28 dBA.”

Comment: The report does not anywhere conjoin these two statements to announce to the reader that the relevant background noise level is 28 dBA. This is an important fact for understanding later tables of data.

### **Inconsistent Statements about Background Sound Level**

Pages 12 and 14

Page 14 states: “The data presented in Section 4.0 of this report showed that the existing background sound levels in area (sic) of the Wolf property and surrounding properties, without direct line of sight to CR 74E is in the range of 27 to 30 dBA.

Page 12 shows in Table 4.1 that the Background sound level, L90, is 28 dBA.

Comment: The only data in this Assessment states that the L90 background sound level is 28 dBA. There is no presentation of data in Section 4.0 showing a range of 27 to 30 dBA. Thus the statement on Page 14 seems to be incorrect.

### **Incorrect use of the terms “Sound Power Level” and “Sound Pressure Level”**

Pages 8, 10

Technical Comment: Sound Power and Sound Pressure are different, analogous to the difference between water quantity and water pressure. These terms are not defined in the Assessment, but are commonly understood in the profession of acoustics.

Comment: Figure 3.1 on Page 8 is titled “Wolf ‘Typical’ Maximum Barking and Howling, Sound Power Level, Single Wolf”. The text above this Figure suggests that this graph indeed shows Sound Power level. However, the label of the vertical axis of the graph therefore incorrectly states that the level values are Sound Pressure,

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and then gives the reference value for Sound Pressure. This graph is not correctly presented.

Page 10, paragraph c states: "After applying attenuation effects to the source SPL data." (sic)

Comment: "SPL" is the common abbreviation for Sound Pressure Level. This sentence should actually refer to Sound Power Level, commonly abbreviated "PWL". Thus, this statement is technically incorrect.

Comment: For completeness, this paragraph c should also refer to the conversion of PWL values to SPL values.

**Predicted Exterior Sound Levels Underestimated**

Page 14

Table 5.2.1

This table includes a column of dBA values labeled "Predicted Exterior Wolf Sound Levels, dBA"

Page 3, Section 1.2 states: "Distances from Wolf enclosures to nearby property lines and residences were taken from Figure 1.2 and scaled from Google Earth Pro."

Comment: This statement seems to mean that distances used for estimating disturbance at residences are at the building, not the property line of that residential address closest to the enclosures.

Comment: If these are levels at a residential building, it is probable that the exterior wolf/hybrid-dog sound levels will be louder at the property line than the values reported in this table. Thus, the stated sound levels are underestimated.

**Irrelevant Information on Sound Levels**

Page 6

Comment: Section 2.0, Items 1, 2, 3 and 4 all concern noise from "aircraft and traffic". These sources of noise are not relevant to the annoyance caused by barking and howling from wolf/dog-hybrid animals.

**Irrelevant and Highly Misleading Quotation**

Pages 6, 7

Section 2.0.5 paragraph #1 refers to a book "Handbook of Acoustical Measurements and Control"; the actual title is "Handbook of Acoustical Measurements and Noise Control".

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Section 2.0.5 paragraphs #2 through #4 refer to Chapter 24 of this reference textbook.

Comment: This first sentence on Page 7 is apparently presented to connive the reader into an assumption that “If a noise is expected and familiar, ... noise will show no effect.” This protestation is completely unsupported by the reference text Chapter 24, and is completely unrelated to noise from wolf/dog-hybrids in a quiet environment. The title of the Chapter 24, as correctly typed in the Assessment, is “Human Performance and Noise”. The very first sentence of this very scholarly chapter is this: “Performance effects of noise are quite distinct from those of annoyance or physiology;...” The remainder of the three pages of this chapter leading up to the misleading quotation refer numerous times to: “loss of efficiency in performance”, “work”, “tasks”, “industrial studies”, “the beneficial effects of noise reduction on productivity in industry”, and so forth. This chapter is about human performance of tasks in noisy environments. This chapter does not present any information about human annoyance in quiet environments due to unusual noise. This quotation is irrelevant and highly misleading.

**Establishes “Annoyance” as the Correct Term of Art**

Page 6

States: “Section 6d (of the Noise Ordinance) uses the phrase “unreasonable interference” which can be interpreted to mean “annoyance” which has been addressed by the EPA, covered in several books on acoustics and in numerous reports and publications.”

Comment: It is indeed the word “annoyance” which is used in the scientific vocabulary of acoustics in many studies and reports.

**Missing Information about Annoyance**

Page 6, Section 5, first paragraph

States: “Harris, C.M., ed 1998. Handbook of Acoustical Measurements and Control, (sic) McGraw Hill, Chapter 23, “Noise Induced Annoyance of Individuals and Communities”. This chapter is an extensive treatment of annoyance. ... A discussion of the information presented in this reference is presented herein.”

Comment: There is no discussion of annoyance anywhere other than this statement on Page 6 of the Assessment. Discussion of annoyance is missing from this Assessment. This Chapter 23 does have useful information about annoyance, however it is not reflected in this Assessment.

**Irrelevant Citation**

Page 7, third paragraph

Comment: This reference to sleep loss seems to have no relevance to the Assessment or its conclusions.

**Irrelevant Citation – Another Instance**

Page 7, fourth paragraph

Comment: This reference to a study of Eastern Coyotes seems to have no relevance to the Assessment or its conclusions.

**Two Independent Criteria in the Larimer County Noise Ordinance, Number 97-03**

Pages 6, 7

States:

“Compliance with Section 6a is measurable with sound level meters while Section 6d is not.”

Comment: This is a crucial distinction between two independent requirements for compliance with the Noise Ordinance. This distinction is not made clear in subsequent places in the Assessment.

**Ignores Second Criterion in the Larimer County Noise Ordinance, Number 97-03**

Page 13

States, two times, (and uses almost exactly the same wording a third time):

“That maximum Wolf sound levels Comply with both the Larimer County Noise Ordinance, Number 97-03, Daytime and Nighttime noise limits of 55 and 50 dBA, ...”

Comment: There is a crucial distinction between two independent requirements for compliance with the Noise Ordinance, which is weakly acknowledged in another part of the Assessment. These three statements address only Section 6a of the Ordinance. These statements do not amply distinguish and recognize the collateral Section 6d of the Ordinance. If this sentence is repeated or quoted without context of the rest of the report, it could be interpreted by the lazy reader that compliance has been found. No compliance has been reported with respect to Section 6d.

### **Conclusion Not Precisely Worded**

Page 17

States:

“The proposed Wolf II Sanctuary complies with Larimer County Noise Ordinance, Number 97-03, Daytime or Nighttime noise limits of 55 and 50 dBA at the nearest Wolf property lines and at all nearby residences.”

Comment: This statement addresses only Section 6a of the Ordinance. This statement does not amply distinguish and recognize the collateral Section 6d of the Ordinance. If this sentence is repeated or quoted without context of the rest of the report, it could be interpreted by the lazy reader that compliance has been found. No compliance has been reported with respect to Section 6d.

### **Irrelevant Proposed Noise Mitigation**

Page 16, Paragraph 6.1

States: “Delay morning feed times, when Wolves have high rates of vocalization, to later morning hours; 9 to 10 am.”

Comment: The requirement of the Noise Ordinance Section 6d has no time-of-day component. This proposed mitigation measure would not reduce audibility of wolf/dog-hybrid noise.

### **Proposed Noise Mitigation Unrealistic**

Page 16, Paragraph 6.2 b

Comment: This paragraph alludes to noise mitigation by relocating rock and soil. No estimate of the degree of noise mitigation is stated. Prior experience studying such attempts shows that the cost and effort of constructing rock berms for this purpose are unrealistic.

### **Incorrect Listing of Predicted Exterior Wolf Sound Levels – Downplays Audibility**

Page 15, Table 5.2.2

Comment: The listing in this table for the Property at 56 Linsey Court indicates the predicted exterior wolf sound levels will be “Slightly Audible”. However, applying the method used in this Assessment for relating sound level to audibility demonstrates that this property should be listed with exterior wolf sound levels as “Clearly Audible”. This listing downplays the degree of audibility at this property. Thus, the five properties listed as having Clearly Audible sound should really show

six properties having Clearly Audible sound. Six of the fourteen properties studied mean that 43% show Clearly Audible exterior sound.

### **Hiding the Word “Clearly”, as used in the Phrase “Clearly Audible”**

Page 14

States:

“Clearly Audible – Wolf sounds are within 5 dBA of the background sound levels.”

Comment: This adjective, “Clearly”, is used to distinguish clearly audible sound from less audible sound; i.e. “Slightly Audible”, “Barely Audible”, and “Inaudible”. This one instance of the use of the phrase “Clearly Audible”, on Page 14, is the only such instance in the entire report.

Page 15

Table 5.2.2

Comment: This table gives predicted exterior wolf sound levels, dBA, for fourteen residences. Six of these fourteen residences are listed (including the sixth one as noted above) for exterior wolf/dog-hybrid sound levels as “Audible”. The term defined on Page 14, “Clearly Audible”, is not used. Comparison to Table 5.2.1 demonstrates that the exterior wolf sound levels are “Clearly Audible”. It seems that some effort is being given here to downplay the audibility of wolf/dog-hybrid sound. In these locations the correct description is “Clearly Audible”, not just “Audible”.

### **Hiding the Word “Clearly”, from the Phrase “Clearly Audible” – Second Instance**

Page 17

Comment: This page reports that at residences to the south and to the southeast, that “Wolf barking and howling well be,” ... “audible outside the residence...” (Two instances in this summary.) Again it seems that some effort is being given here to downplay the audibility of wolf/dog-hybrid sound. In these locations the correct description is “Clearly Audible”, not just “Audible”.

### **Incorrect Correlation of Frequency of Occurrence with Annoyance**

Page 17, the final paragraph of conclusions

States: “Additionally, it is important to note that Wolf howling or barking, that is Clearly, Slightly or Barely audible, sounds occur will occur (sic) on the order of 1 percent or less of a typical day.”

Comment: Sounds that are annoying are annoying whether they occur frequently or infrequently. Section 6d of the Noise Ordinance has no time-of-day component for

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compliance. This sentence presents a faulty correlation between frequency of occurrence with annoyance.

**Total Daily Duration of Howling Incorrect and Understated**

Page 17, the final paragraph of conclusions

States: "Additionally, it is important to note that Wolf howling or barking, that is Clearly, Slightly or Barely audible, sounds occur will occur (sic) on the order of 1 percent or less of a typical day."

Comment: This statement of total daily duration of howling appears to be inconsistent with the statement of duration in the WOLF II Sanctuary Project Description (page 11). Using data presented there the range of total daily duration of howling is somewhere in the range of 1.1 to 3.7% of daylight hours.

**Conclusion Stated in a Weak and Confusing Manner**

Page 17

Regarding the five paragraphs following the statement: "Wolf barking and howling will be,"

Comment: The wording and phrasing of these five paragraphs hide the most important finding of this Assessment. Clarifying this text and presenting this important information, we can summarize these five paragraphs in the following way:

**In six of the fourteen residences studied (or 43%), noise of wolf/dog-hybrid barking and howling will be Clearly Audible outside residences during quiet background noise conditions.**

Please do not hesitate to contact me with questions or comments.

Thank you.

Jim X. Borzym, PE, INCE

