

PO Box 85
Gustavus, AK 99826
March 26, 2006

Mr. Paul Berry
Manager, Gustavus Disposal and Recycling Center
City of Gustavus
PO Box 1
Gustavus, Alaska 99826

Subject: Noise Survey of DRC Operations and Equipment

Dear Paul:

Introduction

This will confirm the results of the noise survey that you and I conducted on March 21 and 25, 2006. The purposes were to:

- Measure noise emitted from key pieces of equipment and operations for the determination of hearing protection needs or engineering controls.
- Determine whether DRC workers should be in a hearing conservation program.
- Document environmental noise levels at the boundary of the facility and to determine whether additional engineering or work practice controls would be warranted for reduction of noise discernable by neighbors.

Methods

On March 21 and 25, I measured noise levels using a Quest Model 215 Type 2 sound level meter while you operated the glass crusher, balers, Bobcat, and Trom 406 Screen. The meter was set to read in decibels on the A-weighted scale (dBA) with slow response, the standard settings for such evaluations. I measured noise levels during glass crushing at various distances from the machine both inside the building and outside. It has been the practice to close the front door of the facility during glass crushing but to leave the back door open. We measured glass crushing noise just inside the fence line of the landfill area and along Boat Harbor Road with the back door open and again with it closed to evaluate whether noise would be reduced at the boundaries of the facility by closing the back doors. These tests were conducted during cool, still air conditions.

Results

Results of our measurements are included in Table 1 for the equipment tested under various conditions. Sound levels are given in the last column in decibels with A-weighting (dBA). Where a range of levels is indicated, the high end of the range usually represents brief events. Steady noise was usually in the bottom third of the range.

Table 1. Noise levels measured at the Gustavus DRC

Equipment in Operation	Location of measurement	Conditions or Comment	Sound Level (dBA)
Glass Crusher	5' from crusher	Running, but not crushing	81
Glass Crusher	3' from hopper	Dumping in glass bottles	112
Glass Crusher	5' from crusher	Crushing	86-94
Glass Crusher	Door between bldg. sections	Crushing	85-90
Glass Crusher	At outer door	Crushing, outer door open	70-82
Glass Crusher	Bale fill area—Center	Crushing, back door open	45-58
Glass Crusher	Bale fill area at fence line	Crushing, back door open	40-54
Glass Crusher	20' outside back door	Crushing, outer door open	65-76
Glass Crusher	Edge of Boat Harbor Road	Crushing, back door open	58-66
Glass Crusher	At open back door	Dumping in glass	90-98
Glass Crusher	Edge of Boat Harbor Road	Crushing, all doors closed	50-58
Glass Crusher	Bale fill area at fence line	Crushing, all doors closed	40-51
Bobcat	At operator's ear	Running, high idle	85
Bobcat	5' behind engine	Running, high idle	88
Trom 406	At engine control location	Running & turning drum	91
Trom 406	6' from engine at side	Running & turning drum	82
Trom 406	At drum end	Running & turning drum	77
GPI Baler	2' from front of machine	Dumping in steel cans (brief)	90-100
GPI Baler	2' from front of machine	Compressing steel cans	70-80
GPI Baler	1' from electric motor	Running	80
Cram-a-lot Baler	Operator's ear area	Shoveling in aluminum cans	94-98
Cram-a-lot Baler	Door between bldg. sections	Shoveling in aluminum cans	90
Cram-a-lot Baler	Front door to DRC	Shoveling in aluminum cans	75-80
Cram-a-lot Baler	2' from machine front	Compressing aluminum cans	88
Cram-a-lot Baler	Front door to DRC	Compressing aluminum cans	65-70

Discussion and Recommendations

Operator noise exposure and hearing protection use. Single hearing protection (either formable ear plugs or muffs) should be worn by workers exposed to noise 85 dBA or higher regardless of the length of exposure. Double hearing protection (both plugs and muffs) should be worn for exposures over 100 dBA. Hearing protection requirements for common operating tasks are as follows:

- Glass crushing—Double hearing protection due to noise during hopper loading
- Can or plastics compressing and baling with either baler—Single hearing protection.
- Plastics compressing and baling—Single hearing protection.
- Soft garbage compressing and baling with GPI baler—No hearing protection required.
- Glass crushing—Double hearing protection due to noise during hopper loading.
- Bobcat operation—Single hearing protection.
- Trom 406 operation—Single hearing protection.

The glass crushing operation is the most significant noise source at the DRC. The operation typically takes about 45 minutes and is done no more than once in any operating day, totaling several times per week. When the bottles are dumped into the hopper, they clink loudly against each other generating noise reaching 112 dBA. The operator should don double hearing protection for this task.

Engineering control potential. Because the primary crushing noise is due to bottles striking each other, particularly during hopper loading, it does not appear that much could be gained by applying noise reduction material to the crusher.

Hearing conservation program consideration. Although these tasks involve some operator exposure over 85 dBA, they comprise a relatively small portion of the worker's shift. In my judgment, full shift noise exposures would not exceed occupational exposure limits (e.g. the OSHA Permissible Exposure Limit) and would not be sufficient to trigger enrollment of employees in a hearing conservation program. It is sufficient to require hearing protection use for the tasks identified and include basic hearing conservation awareness training in the safety training program for DRC operators.

Environmental noise. At times in the past there have been complaints from neighbors about noise from the DRC operations. This noise survey provides useful data for responding to complaints and for developing improved operating practices

to reduce the environmental noise from DRC operations. The noise level recorded just inside the fence line at the edge of the balefill area during the glass loading and crushing operation was 40-54 dBA with the front doors closed and the back door open. With all doors closed the noise level at the same location ranged from 40-51dBA—a 3 dBA reduction achieved by closing the back door. At the edge of the boat harbor road the noise with the back door open ranged from 58-66 but dropped to 50-58 with the back door closed. Table 2 below, abstracted from industrial hygiene texts and experience will help put these noise levels in context. Noise is measured in decibels, which are logarithmic. An increase in 3 dBA is a doubling of the sound intensity. The human ear is capable of responding to sound across a huge volume range from the faintest whisper to the roar of a jet engine.

Table 2. Levels of some common sounds

<u>Sound Level</u>	<u>Sound Source</u>
10 dB	Threshold of very good hearing
20 dB	Whisper
40 dB	Average residence
50 dB	Private office, very quiet dishwasher
60 dB	Conversational speech, busy office
80 dB	Noisy office, high quality home vacuum cleaner
85 dB	Hearing protection needed for workers routinely exposed all day
90-95 dB	Factory
100 dB	Passing heavy truck
105 dB	Chain saw, disc grinder, etc.
120 dB	Jet engine

From this table we can see that the noise from glass crushing at the balefill outside fence line is about the same as in a private office and is less than the level of conversational speech. A significant reduction is achieved by closing all doors when the glass crusher is running. At the Boat Harbor Road edge, the noise level is about the same as a busy office—slightly more than conversational speech—with the back door open, but is reduced by about 8 dBA when the door is closed. The conclusions are as follows:

- Noise emission from the DRC is low for an industrial facility. However, Gustavus residents have high expectations for quietness. They don't live in a busy city.
- Glass crushing and can handling are the important environmental sources. The Bobcat and Trom 406 sifter are not significant environmental noise sources.
- Noise from glass crushing and can baling can be reduced markedly by keeping all doors closed during these operations. This is most important for

glass crushing, which seems to have been the noise of greatest concern to neighbors in the past.

- Noise from the glass and can baling operations will still be discernable off site, even with building doors closed because general ambient noise is low and because the human ear can discern very low levels of noise. However, those noises occur only a few times per week and the loudness of each at the property line is less than that of a vehicle passing on the road.

In the interest of assuring that DRC work does not contribute to noise-induced hearing loss for workers, please direct employees and volunteers doing noise-exposed tasks to wear hearing protection as recommended in this report. In the interest of minimizing environmental noise discernable in the neighborhood, please adopt procedures to keep building doors closed during high noise operations such as glass crushing. If you have any questions about this report, please call me at 907-659-4470.

Sincerely,

Michael S. Taylor

Michael S. Taylor, CIH, PE
Industrial Hygienist
Chair—DRC Committee