

TECHNICAL REPORT

Personal Interview Protocol Report

SERDP Project WP-1546

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ABSTRACT

The objectives of Strategic Environmental Research and Development Program (SERDP) Project SI-1546, “An Investigation of Community Attitudes Toward Blast Noise,” are to enhance the understanding of human response to blast noise and to develop a better methodology for predicting human response to impulsive military noise. The focus of this report is the Personal Interview (PI) Protocol, which is the initial component of a series of studies being conducted as part of SERDP Project SI-1546. The PI was executed in the vicinity of three military installations between October 2008 and February 2009. The objective of the PI was to identify the language/terminology that residents living near military installations use to describe their community, environment, and blast noise. These descriptors were then compared to the descriptors that will be used in other forthcoming SERDP SI-1546 survey instruments. It was found that the language PI participants used to define noise and their environment was similar to the language that will be used in the upcoming survey instruments. The qualitative PI findings indicate that residents living near military installations are aware of the installation and the noise generated by the installation. Participants reported that they adapt to the basic noise environment over time and often do not notice smaller noise events, but do notice unusually large noise events or noise in conjunction with house vibrations. A number of participants reported that their current neighborhood is less noisy than other areas in which they have lived and is a better place to live. Several of the participants stated that they would not leave the area because of the noise, and almost all participants expressed that they are content with their neighborhood. The PI results will also be important for interpreting the findings from future SERDP SI-1546 protocols.

Table of Contents

List of Tables	iv
Table of Acronyms.....	v
Acknowledgements	vi
Introduction.....	1
Background	1
Research Designs.....	1
Qualitative Research.....	3
Coding of Themes	4
Previous Subjective Noise Studies	4
Methodology	6
Participant Selection	6
Identification of Themes.....	7
Analysis of Themes	7
Comparison of Participant Comments.....	13
Results	16
Comparison of Participant’s Language to General Survey Language	21
Discussion and Conclusions	22
Comparable Language.....	23
Role of Vibration in Generation of Complaints.....	24
Role of Habituation in Generation of Noise Complaints.....	25

Application of PI Protocol Findings to the GS Protocol.....25

Application of PI Findings to SERDP SI-1546 Protocol Designs26

References..... 27

Appendix A – Personal Interview Protocol A-1

A1. Informed Consent A-1

A2. Interview Format A-2

APPENDIX B – Comments from Participants B-1

List of Tables

Table 1. Elements of Qualitative and Quantitative Research ³	3
Table 2. Categories of Blast Complaints Army-Wide (1983) ⁷ and at Installation A (2008) ⁸	5
Table 3A. Thematic Features Observed in Personal Interviews for Installation A	9
Table 3B. Thematic Features Observed in Personal Interviews for Installation B.....	10
Table 3C. Thematic Features Observed in Personal Interviews for Installation C.....	11
Table 3D. Comparison of Thematic Data in Tables 3A, B and C	12
Table 4. Comments on Attitude Towards Noise From Each Participant at All Three Installations.....	13
Table 5A. Occurrence of Themes in Current Study vs. Nykaza et al. (2008): Installation A	17
Table 5B. Occurrence of Themes in Current Study vs. Nykaza et al. (2008): Installation B.....	17
Table 5C. Occurrence of Themes in Current Study vs. Nykaza et al. (2008): Installation C.....	18
Table 6. Acceptable Counts for Thematic Content Compared to Nykaza et al. (2008)	18
Table 7A. Frequency of Occurrence of Themes at Installation A vs. Luz et al. (1983).....	19
Table 7B. Frequency of Occurrence of Themes at Installation B vs. Luz et al. (1983)	20
Table 7C. Frequency of Occurrence of Themes at Installation C vs. Luz et al. (1983)	20
Table 8. Acceptable Counts for Thematic Content Compared to Luz et al. (1983)	21
Table B1. Comments from Participants at Installation A	B-1
Table B2. Comments from Participants at Installation B	B-2
Table B3. Comments from Participants at Installation C	B-4

Table of Acronyms

CERL	Construction Engineering Research Laboratory
CONUS	Contiguous United States
DOD	Department of Defense
ERDC	Engineer Research and Development Center
GS	General Survey [Protocol]
ICBEN	International Commission on the Biological Effects of Noise
IRB	Institutional Review Board
IS	In-Situ [Protocol]
NASA	National Aeronautics and Space Administration
OMB	Office of Management and Budget
PI	Personal Interview [Protocol]
PSU	Pennsylvania State University
SERDP	Strategic Environmental Research and Development Program
SPL	Sound pressure level

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Laura James: Penn State Applied Research Lab and Statistics program. Laura is an undergraduate student working with Kathleen Hodgdon and Trent Gaugler on the statistical analysis and other support tasks for the project. It is anticipated that she will conduct her graduate research in Statistics on future efforts for the SI-1546 project.

Introduction

This report documents a personal interview field study that was conducted near three U.S. military installations between the months of October 2008 and February 2009. The study is a component of Strategic Environmental Research and Development Program (SERDP) Project SI-1546, “An Investigation of Community Attitudes Toward Blast Noise,” and is referred to as the Personal Interview (PI) Protocol. The overall objectives of SERDP Project SI-1546 are to enhance understanding of human response to blast noise and to develop a better methodology for predicting human response to impulsive military noise than the 30-year old methodology currently used by the Department of Defense (DoD). Of particular interest are the variables which predict when a community transitions from tolerance of impulsive military noise as a minor nuisance to formal complaints about the noise and/or active resistance to the noise. New methods are needed to provide reliable and practical recommendations for managing day-to-day testing/training operations and long-term noise impact decisions, e.g. building or expanding a tank gunnery range.

The objectives of the PI are to define a list of blast noise descriptors, to compare the language that residents living near military installations use to describe the environment and noise to the language that is used by the research community in social surveys, and to provide a more complete understanding of community impact from blast noise. The findings will define a range of response descriptors that will be used to better interpret the findings from other forthcoming SERDP SI-1546 protocols, which will include a structured community survey and an in-home participant response study. These studies are referred to as the General Survey (GS) Protocol and In-Situ (IS) Protocol, respectively, in ERDC/CERL SR-07-24, “An Investigation of Community Attitudes Toward Blast Noise: Methodology.”

Background

Research Designs

Research investigations of community impact can be conducted using qualitative, quantitative or mixed research methods. One distinction between qualitative and quantitative research is that qualitative research is hypothesis-generating research, whereas quantitative research is

hypothesis-testing research. Qualitative research relies on questioning rather than measuring and uses theoretical coding to generate hypotheses (Auerbach, 2003).¹ Some examples of qualitative methods include personal interviews, narrative conversations and written narratives. Quantitative methods provide a more standardized assessment. Some examples of quantitative methods include structured surveys, laboratory behavioral observations and experiments, bio-physiological measures of mind-body states, field studies, and development and assessment of computational models. Mixed research methods combine qualitative and quantitative research methods that allow for observations to be compared across multiple protocols and provide a synergy that can further advance the usefulness of the overall research findings.

Narrative information can be gathered from participants in an open-ended or structured interview. An open-ended interview introduces a topic and allows a free discussion to emerge based on the comments provided by the subject. Interviewers can ask questions that may prompt conversation, but their role is to listen to the participants without influencing their responses by asking strictly bounded questions. The advantage of the personal interview, or narrative, approach is that it affords the greatest latitude of response options to the participant and allows the participants to describe an item of interest using their own language. A semi-structured interview or qualitative approach identifies a set of global topics for guided discussions without asking rigidly designed questions.

Structured surveys provide a well-defined set of questions, typically with an associated set of responses that provide a limited list or multiple-choice answers. The advantage of the structured survey is that it allows the researcher to obtain uniform responses to a set of well-defined questions across a large population fairly readily. It can also be evaluated with greater ease, since the response categories are limited and readily tabulated. A criticism of structured surveys is that the participant may be influenced by the wording or format of the questions or by the order in which the questions are presented. The International Commission on the Biological Effects of Noise (ICBEN)² team developed guidelines for conducting noise surveys to facilitate comparison across different research studies and to address concerns about the wording of survey questions and the structure of the noise surveys. These guidelines were included during the development of both the qualitative and quantitative SERDP SI-1546 protocols. Table 1 provides a comparison of elements in the qualitative and quantitative research approaches.

Table 1. Elements of Qualitative and Quantitative Research³

<i>Elements of Qualitative Research Tend Toward...</i>	Process of Research	<i>Elements of Quantitative Research Tend Toward...</i>
Understand meaning individuals give to a phenomenon inductively	Intent of the research	Test a theory deductively to support or refute it
Minor role Justifies problem	How literature is used	Major role Justifies problem Identifies questions and hypotheses
Ask open-ended questions Understand the complexity of a single idea (or phenomenon)	How intent is focused	Ask closed-ended questions Test specific variables that form hypotheses or questions
Words and images From a few participants at a few research sites Studying participants at their location	How data are collected	Numbers From many participants at many research sites Sending or administering instruments to participants
Text or image analysis Themes Larger patterns or generalizations	How data are analyzed	Numerical statistical analysis Rejecting hypotheses or determining effect sizes
Identifies personal stance Reports bias	Role of the researcher	Remains in background Takes steps to remove bias
Using validity procedures that rely on the participants, the researcher, or the reader	How data are validated	Using validity procedures based on external standards, such as judges, past research, statistics

Qualitative Research

Narrative analysis is typically coded for thematic- and/or emotional-based content. Huberman and Miles (1994, as cited in Coffey⁴) link qualitative data analysis to three sub-processes: data reduction, data display and conclusion drawing and verification. They characterize these processes in the following manner. Data reduction is a conceptual framework that utilizes assessment instruments that are refined as the data is broken into clusters, categories and summaries. Data display presents a compressed assembly of findings that are used for drawing conclusions. Conclusion drawing and verification compares and contrast themes, patterns and trends.

The use of a semi-structured interview encourages the participants to freely express their opinions, attitudes, feelings or observations about a given topic or situation, while minimizing the researcher's potential to bias their responses. This method is very labor intensive, both for the acquisition of the information per participant and for thematic analysis and interpretation of the responses that are obtained.

Coding of Themes

Labov and Waletzky (1967)⁵ included the following evaluative devices in their coding of themes: emotional labels, evaluative comments, cognitive states and hedges, intensifiers and qualifiers, negotiations, figurative language, attention markers and repetition. Emotional labels indicate an emotional state, such as frightened; evaluative comments express an opinion, such as it was uncomfortable; cognitive states and hedges refer to hopes or uncertainty, such as, it would be intrusive if the range expands; intensifiers and qualifiers emphasize the words they modify, such as it was really loud; negotiations express what is not the case; figurative language includes names; and attention markers and repetition include descriptors such as sound effects and/or repetition of words that emphasize the importance of the statement. Several of these evaluative devices can be seen in the comments from participants in Table 4 and in greater detail in Appendix B. The devices were one of the tools that were used to identify the themes in Table 3.

Previous Subjective Noise Studies

As stated by Fields⁶ in a NASA-funded catalog of social surveys of residents' reactions to environmental noise between 1943 and 1989, "social surveys have been widely used since the early 1960's to assess the impact of environmental noise in residential areas. These surveys have usually measured impact on each surveyed individual (respondent) with some type of standardized questionnaire . . . In most studies environmental noise levels have been either measured or estimated for each respondent's residence." Analyses in the studies have identified characteristics of the noise environment, non-noise environment and the respondents that affect the impact of environmental noise.

When Fields compiled his catalog in 1991, he listed over 200 surveys. Approximately 39% of these surveys were about aircraft noise and another 28% were about road or expressway noise. Only 5% were concerned with impulsive noise, and within this group, only two studies were

concerned with impulsive military noise, which amounts to less than 1% of the surveys. Since that time, researchers of community noise have continued to publish social surveys, but only a few have addressed impulsive military noise. Of these few, two qualitative studies are particularly pertinent, as described below.

These two qualitative studies were a content analysis of noise complaints received Army-wide over a one-year period (Luz et al., 1983)⁷ and a content analysis of blast noise complaints received at a single Army installation (Nykaza et al., 2008)⁸. In the 1983 study, which included complaints about both impulsive weapons noise and aircraft noise, the contents could be summarized with nine categories. These categories are listed in Table 2. For blast noise complaints, the most mentioned category (54%) was “vibration, rattling, shaking, etc.” For aircraft noise complaints, the most mentioned category was “fear, physiological distress, adverse health effects.” When Nykaza et al. used the nine categories to analyze heavy weapons blast noise complaints at a single Army installation (referred to here as Installation A) in 2008, the profile was not significantly different from the Army-wide profile published 25 years earlier (cf. Table 2). The findings indicate that 51% of the complainants mentioned “vibration, rattling, shaking, etc.” for this single installation.

Table 2. Categories of Blast Complaints Army-wide (1983)⁷ and at Installation A (2008)⁸

Content Category by Rank Order in 1983 Army-wide Blast Noise Complaint Study	Percent (1983)	Percent (2008)	P-Value	Significant Difference
Vibration, rattling, shaking, etc	54%	51%	0.748	NO
Putative, feared or actual damage to house	32%	27%	0.437	NO
Objectionable, irritating, annoying sound	30%	20%	0.138	NO
Objects falling from shelves or walls	14%	6%	0.082	NO
Sleep disturbance	13%	4%	0.015	YES
Disturbance of children	10%	3%	0.027	YES
Disturbance of animals	5%	10%	0.165	NO
Fear/physiological distress/adverse health effects	4%	8%	0.290	NO
Damage to wells	2%	0%	0.154	NO

Methodology

Participant Selection

The Personal Interview (PI) Protocol was developed and submitted to both the Federal Office of Management and Budget (OMB) and the Institutional Review Board (IRB) at the Office of Research Protections at the Pennsylvania State University (PSU). The OMB approval number is 0710-0015 and the PSU IRB number is 27457. The interviews were conducted at three separate CONUS (contiguous United States) installations in three different areas of the country by two of the authors of this report. The sites were selected to include installations from different geographic areas of the country with at least some common types of blast noise. The geographic areas represented different yearly weather conditions and an anticipation of different house construction types. In order to protect the identity of the participating installations, it was agreed a priori that the name and location of each installation would remain anonymous in all reports and written material. As such, the installations at which the research took place will be referred to as Installation A, Installation B, and Installation C. In no particular order, one of the installations was located in the south, one in the west, and one in the northeast CONUS.

Two investigators from the SERDP team who are proficient in both qualitative and quantitative methods conducted the interviews. Their combined expertise included academic backgrounds in social survey methodology and psycho-acoustic subjective testing and interviews, as well as practical knowledge gained from applying these skills in prior research studies. The team discussed interview methodology and individual stylistic differences while developing this protocol. The interviewers further discussed their rationale for their individual interviewing style before conducting the interviews, and the team identified and adopted an optimal approach that was implemented at Installation A. The interviewers conducted the interviews at Installation A jointly. The team reviewed and updated their approach, as warranted, based on situations that arose during the interviews. The team agreed to implement this updated approach at each of the subsequent installations. One researcher then proceeded to conduct the interviews at Installation B, and the other researcher conducted the interviews at Installation C.

Participants were randomly selected from publicly available phone lists in areas around each installation that are typically exposed to high-energy impulsive noise. The interviews were

loosely structured and open-ended (refer to Appendix A for IRB documentation on PI). The participants were informed that the purpose of the study was an investigation of community attitudes toward noise and that their participation was voluntary. The Informed Consent form is reproduced in Appendix A.

Identification of Themes

The personal interviews were recorded, transcribed verbatim, and evaluated manually to successively code thematic concepts from the interviews. A list of evaluation devices defined by Labov and Waletzky in 1967⁵ was utilized to develop the themes (see “Coding of Themes” above). The themes identified in the interviews were then compared for common observations and terminology. This process provided an insightful assessment of the neighborhood and community from the perspective of the individual subject. A sampling of comments from each participant can be found in Table 4 and Appendix B.

Analysis of Themes

The transcribed interviews were highlighted for thematic content and analyzed across broad categories. The categories included demographic variables, individual characteristics of each participant, community attitude, general attitude, and specific comments regarding various noise sources. The categories used in this report are defined in Tables 3A through D. The first nine rows of each subsection (A-D) of Table 3 include the content analysis from the noise complaint studies as listed in Table 2. Also included in Tables 3A-D are data on objects that rattle or vibrate and the type of house construction. These findings have been included to determine if any trends can be identified between the nature of the comments, the presence of rattle or vibration and the house construction type. Previous research has been conducted on vibration levels and low frequency noise response. Hubbard⁹ established acceleration threshold criteria for rms acceleration levels and developed a set of criteria for outdoor sound pressure level (SPL) sufficient to cause perceptible vibration of house structure elements (windows, walls, and floors). These SPL criteria can be found in Figure 9 of Reference 9. The criteria established by Hubbard suggest that wood frame residential construction is more likely to resonate in response to low frequency noise than more solid construction, such as brick or concrete block.

The data in Tables 3A, 3B, and 3C were tallied from the individual participants for each thematic category. If a participant did not mention a particular theme, a 0 was entered. If the participant mentioned the theme three times, a 3 was entered. There were times when the participants repeated a concept on their own accord. There were other instances when the repeated statement was prompted by a comment from the interviewers. Some of the interviewer prompts were utilized to verify the statements made by the participant, while other prompts were made to encourage the participant to continue talking. The participant often presented additional information, adjective descriptors or elaborated on an aspect of the theme during the repeated comment. As such, the repeated comments were of value for the qualitative review of the comments, whether they were prompted or not prompted. Only the number of participants that indicated a particular theme was utilized in the statistical analysis.

Table 3D provides a comparison of the thematic data contained in Tables 3A-C. The statistical analysis was conducted using Minitab's probability calculator and the data on the number of people that mentioned a particular theme. Our null hypothesis assumes that the percentage of participants in this study that mention a particular theme should not differ from the percentage of participants that mentioned that same theme in the Luz et al. 1983 study, which is indicated in the first column of Table 2. For this analysis, the random variable was defined as the variable that counts the number of participants that mention a given theme "i" at a given installation. As such, for example, we let $X_{i,B}$ = number of participants that uniquely mention theme "i" in the study at Installation B.

Table 3A. Thematic Features Observed in Personal Interviews for Installation A

[Values are entered for each participant. If a theme was not mentioned, a 0 was entered. If the theme was mentioned repeatedly, the number of times it was mentioned was entered.]

Category	Installation A								
	201	202	203	204	301	302	303	N	Percent
Comparison to Luz 1983 content categories:									
Vibration, rattling, shaking, etc	3	0	1	3	0	1	2	5	71.4%
Putative, feared or actual damage to house	0	0	1	0	0	0	0	1	14.3%
Objectionable, irritating, annoying sound	1	0	0	0	0	0	0	1	14.3%
Objects falling from shelves or walls	0	0	0	0	0	0	0	0	0.0%
Sleep disturbance	0	1	0	0	0	0	0	1	14.3%
Disturbance of children	0	0	0	0	0	0	0	0	0.0%
Disturbance of animals	0	0	0	0	0	2	0	1	14.3%
Fear/physiological distress/adverse health effects	0	0	0	0	0	0	0	0	0.0%
Damage to wells	0	0	0	0	0	0	0	0	0.0%
Comparison to natural events:									
Thunder	1	1	1	1	0	0	0	4	57.1%
Earthquakes	0	0	0	0	0	0	0	0	0.0%
Verbal descriptor of annoyance due to noise from:									
Bass noise from music in passing cars	2	0	0	0	0	1	0	2	28.6%
Street noise	0	0	0	0	1	0	0	1	14.3%
Commercial aircraft	0	0	0	0	0	0	0	0	0.0%
Military aircraft (jets, helicopters, prop planes)	1	0	0	2	0	1	0	3	42.9%
Military ground vehicles	0	0	0	0	0	0	0	0	0.0%
Small military gunfire	1	0	0	1	0	1	0	3	42.9%
Blast noise (large guns, bombs, or explosions)	0	1	0	1	2	0	0	3	42.9%
Objects that rattle or vibrate:									
Window	3	0	0	2	0	0	0	2	28.6%
Walls	0	0	0	0	0	1	0	1	14.3%
Shelves	0	0	0	0	0	0	0	0	0.0%
China	0	0	0	0	0	0	0	0	0.0%
Small decorative items	0	0	0	0	0	0	0	0	0.0%
Type of house construction:									
Brick	0	0	0	0	0	0	0	0	0.0%
Vinyl siding	0	0	0	0	0	0	0	0	0.0%
Stucco	1	0	0	0	0	0	0	1	14.3%
Wood frame	1	1	0	1	1	0	0	4	57.1%
Modular unit	0	0	0	0	0	0	0	0	0.0%
Concrete block	0	0	1	0	0	0	0	1	14.3%
Does noise:									
Startle you or make you jump	0	0	0	0	0	0	0	0	0.0%
Frighten you	0	0	0	0	0	0	0	0	0.0%
Make you feel irritable, tense or nervous	0	0	0	0	0	0	1	1	14.3%
Interfere with your ability to talk	0	0	0	0	0	0	0	0	0.0%
Disturb or disrupt other activities	0	0	0	0	0	0	0	0	0.0%
Other categories:									
Installation importance to local economy	0	0	0	0	0	0	0	0	0.0%
Acceptance of military noise	1	1	0	3	1	1	2	6	85.7%
Contentment with the area	2	1	0	1	2	2	2	6	85.7%
Ability to adapt to military noise environment	2	2	0	3	3	1	2	6	85.7%
Use of terms (booms, bombs, vibration)	1	4	0	3	1	2	2	6	85.7%
Describe blasts as booms, bombs and explosions	0	0	0	1	0	1	2	3	42.9%
Describe small arms as rat-a-tat-tat	0	0	0	0	0	0	0	0	0.0%
Time of day noise is more intrusive	0	1	0	0	0	0	0	1	14.3%
Recalled a single loud blast event from the past	0	2	2	0	0	0	0	2	28.6%

Table 3B. Thematic Features Observed in Personal Interviews for Installation B

[Values are entered for each participant. If a theme was not mentioned, a 0 was entered. If the theme was mentioned repeatedly, the number of times it was mentioned was entered.]

Category	Installation B												N	Percent
	102	103	104	105	201	203	205	206	207	208	210			
Comparison to Luz 1983 content categories:														
Vibration, rattling, shaking, etc	0	1	1	0	0	4	0	0	0	1	0	4	36.4%	
Putative, feared or actual damage to house	0	0	0	0	0	1	0	0	0	0	0	1	9.1%	
Objectionable, irritating, annoying sound	0	0	0	0	0	1	0	2	0	6	0	3	27.3%	
Objects falling from shelves or walls	0	0	0	0	0	2	0	0	0	2	0	2	18.2%	
Sleep disturbance	0	0	0	0	0	0	0	3	2	1	0	3	27.3%	
Disturbance of children	0	0	0	0	0	2	0	0	0	0	0	1	9.1%	
Disturbance of animals	0	0	0	0	0	0	0	0	0	0	0	0	0.0%	
Fear/physiological distress/adverse health effects	0	0	0	0	0	0	0	0	0	0	0	0	0.0%	
Damage to wells	0	0	0	0	0	0	0	0	0	0	0	0	0.0%	
Comparison to natural events:														
Thunder	1	3	1	0	0	0	0	1	0	0	0	4	36.4%	
Earthquakes	0	0	0	0	0	0	0	0	0	0	0	0	0.0%	
Verbal descriptor of annoyance due to noise from:														
Bass noise from music in passing cars	2	1	1	0	0	0	0	0	0	0	0	3	27.3%	
Street noise	1	1	1	0	1	0	0	2	0	0	0	5	45.5%	
Commercial aircraft	0	0	0	0	0	0	0	0	0	0	0	0	0.0%	
Military aircraft (jets, helicopters, prop planes)	0	0	0	0	1	0	3	1	0	5	0	4	36.4%	
Military ground vehicles	0	0	0	0	0	0	0	0	0	0	0	0	0.0%	
Small military gunfire	2	0	1	2	0	0	0	3	1	0	3	6	54.5%	
Blast noise (large guns, bombs, or explosions)	0	0	1	0	0	0	0	0	1	4	2	4	36.4%	
Objects that rattle or vibrate:														
Window	0	0	0	0	0	2	0	0	0	0	0	1	9.1%	
Walls	0	0	0	0	0	2	0	0	0	2	0	2	18.2%	
Shelves	0	0	0	0	0	2	0	0	0	0	0	1	9.1%	
China	0	0	0	0	0	1	0	0	0	0	0	1	9.1%	
Small decorative items	0	0	0	0	0	0	0	0	0	0	0	0	0.0%	
Type of house construction:														
Brick	1	1	1	1	0	1	1	0	0	0	0	6	54.5%	
Vinyl siding	0	0	0	0	0	0	0	0	0	0	0	0	0.0%	
Stucco	0	0	0	0	0	0	0	0	0	0	0	0	0.0%	
Wood frame	1	0	0	0	1	0	1	0	0	0	1	4	36.4%	
Modular unit	0	0	0	0	0	0	0	1	0	1	0	2	18.2%	
Concrete block	0	1	0	0	0	0	0	0	0	0	1	2	18.2%	
Does noise:														
Startle you or make you jump	0	0	0	0	0	0	0	0	0	2	0	1	9.1%	
Frighten you	0	0	0	0	0	0	0	0	0	1	0	1	9.1%	
Make you feel irritable, tense or nervous	0	0	0	0	0	0	0	0	0	0	0	0	0.0%	
Interfere with your ability to talk	0	0	0	0	0	0	0	0	0	0	0	0	0.0%	
Disturb or disrupt other activities	0	0	0	0	0	0	0	0	0	0	0	0	0.0%	
Other categories:														
Installation importance to local economy	0	1	0	0	0	0	0	0	0	0	0	1	9.1%	
Acceptance of military noise	0	1	3	1	3	1	2	0	0	0	2	7	63.6%	
Contentment with the area	1	2	1	1	0	1	1	2	1	2	1	10	90.9%	
Ability to adapt to military noise environment	2	1	2	1	2	3	2	0	0	2	2	9	81.8%	
Use of terms (booms, bombs, vibration)	1	1	4	0	0	3	0	0	1	2	2	7	63.6%	
Describe blasts as booms, bombs and explosions	1	0	3	0	0	0	0	0	0	1	0	3	27.3%	
Describe small arms as rat-a-tat-tat	2	0	2	0	0	0	0	0	1	0	1	4	36.4%	
Time of day noise is more intrusive	1	0	0	0	0	0	0	0	2	2	0	3	27.3%	
Recalled a single loud blast event from the past	0	0	1	0	0	0	0	0	0	0	0	1	9.1%	

Table 3C. Thematic Features Observed in Personal Interviews for Installation C

[Values are entered for each participant. If a theme was not mentioned, a 0 was entered. If the theme was mentioned repeatedly, the number of times it was mentioned was entered.]

Category	Installation C									
	101	102	201	203	204	301	401	402	N	Percent
Comparison to Luz 1983 content categories:										
Vibration, rattling, shaking, etc	2	0	2	4	0	0	1	1	5	62.5%
Putative, feared or actual damage to house	0	0	0	0	0	0	0	0	0	0.0%
Objectionable, irritating, annoying sound	1	0	0	3	0	1	0	0	3	37.5%
Objects falling from shelves or walls	0	0	0	1	0	0	0	0	1	12.5%
Sleep disturbance	1	0	0	0	0	0	0	0	1	12.5%
Disturbance of children	0	0	0	0	0	0	0	0	0	0.0%
Disturbance of animals	0	0	1	0	0	0	0	0	1	12.5%
Fear/physiological distress/adverse health effects	3	0	0	0	0	0	0	0	1	12.5%
Damage to wells	0	0	0	0	0	0	0	0	0	0.0%
Comparison to natural events:										
Thunder	0	0	1	0	0	0	0	0	1	12.5%
Earthquakes	0	0	0	1	0	0	1	1	3	37.5%
Verbal descriptor of annoyance due to noise from:										
Bass noise from music in passing cars	0	0	0	0	0	0	0	0	0	0.0%
Street noise	0	0	2	0	2	1	0	0	3	37.5%
Commercial aircraft	0	0	0	0	0	0	0	1	1	12.5%
Military aircraft (jets, helicopters, prop planes)	2	0	3	4	3	2	0	1	6	75.0%
Military ground vehicles	0	0	0	0	0	0	0	0	0	0.0%
Small military gunfire	0	1	2	1	2	0	1	0	5	62.5%
Blast noise (large guns, bombs, or explosions)	1	2	3	3	2	0	1	1	7	87.5%
Objects that rattle or vibrate:										
Window	2	0	0	3	0	0	0	0	2	25.0%
Walls	1	0	0	0	0	0	0	0	1	12.5%
Shelves	0	0	0	0	0	0	0	0	0	0.0%
China	0	0	0	0	0	0	0	0	0	0.0%
Small decorative items	0	0	0	1	0	0	0	0	1	12.5%
Type of house construction:										
Brick	0	0	0	0	0	0	0	0	0	0.0%
Vinyl siding	0	0	0	0	0	0	0	0	0	0.0%
Stucco	1	0	1	0	0	1	1	0	4	50.0%
Wood frame	0	0	0	0	1	1	0	0	2	25.0%
Modular unit	0	0	0	0	0	0	0	0	0	0.0%
Concrete block	0	0	0	0	1	0	0	0	1	12.5%
Does noise:										
Startle you or make you jump	0	0	0	0	0	0	0	0	0	0.0%
Frighten you	0	0	0	0	0	0	0	0	0	0.0%
Make you feel irritable, tense or nervous	4	0	0	0	0	0	0	0	1	12.5%
Interfere with your ability to talk	1	0	0	2	0	0	0	0	2	25.0%
Disturb or disrupt other activities	0	0	0	1	0	0	0	0	1	12.5%
Other categories:										
Installation importance to local economy	0	0	0	0	0	1	0	0	1	12.5%
Acceptance of military noise	0	1	1	0	0	0	2	1	4	50.0%
Contentment with the area	0	0	1	0	1	1	1	2	5	62.5%
Ability to adapt to military noise environment	1	1	1	0	0	1	1	1	6	75.0%
Use of terms (booms, bombs, vibration)	4	0	1	2	1	0	3	4	6	75.0%
Describe blasts as booms, bombs and explosions	1	0	1	0	0	0	2	3	4	50.0%
Describe small arms as rat-a-tat-tat	0	0	0	0	0	0	1	0	1	12.5%
Time of day noise is more intrusive	3	0	1	1	0	0	0	0	3	37.5%
Recalled a single loud blast event from the past	0	1	0	0	0	0	1	1	3	37.5%

Table 3D. Comparison of Thematic Data in Tables 3A, B and C

Category	Installation A	Installation B	Installation C	All
Subject Number	Percent	Percent	Percent	Percent
Comparison to Luz 1983 content categories:				
Vibration, rattling, shaking, etc	71.4%	36.4%	62.5%	53.8%
Putative, feared or actual damage to house	14.3%	9.1%	0.0%	7.7%
Objectionable, irritating, annoying sound	14.3%	27.3%	37.5%	26.9%
Objects falling from shelves or walls	0.0%	18.2%	12.5%	11.5%
Sleep disturbance	14.3%	27.3%	12.5%	19.2%
Disturbance of children	0.0%	9.1%	0.0%	3.8%
Disturbance of animals	14.3%	0.0%	12.5%	7.7%
Fear/physiological distress/adverse health effects	0.0%	0.0%	12.5%	3.8%
Damage to wells	0.0%	0.0%	0.0%	0.0%
Comparison to natural events:				
Thunder	57.1%	36.4%	12.5%	34.6%
Earthquakes	0.0%	0.0%	37.5%	11.5%
Verbal descriptor of annoyance due to noise from:				
Bass noise from music in passing cars	28.6%	27.3%	0.0%	19.2%
Street noise	14.3%	45.5%	37.5%	34.6%
Commercial aircraft	0.0%	0.0%	12.5%	3.8%
Military aircraft (jets, helicopters, prop planes)	42.9%	36.4%	75.0%	50.0%
Military ground vehicles	0.0%	0.0%	0.0%	0.0%
Small military gunfire	42.9%	54.5%	62.5%	53.8%
Blast noise (large guns, bombs, or explosions)	42.9%	36.4%	87.5%	53.8%
Objects that rattle or vibrate:				
Window	28.6%	9.1%	25.0%	19.2%
Walls	14.3%	18.2%	12.5%	15.4%
Shelves	0.0%	9.1%	0.0%	3.8%
China	0.0%	9.1%	0.0%	3.8%
Small decorative items	0.0%	0.0%	12.5%	3.8%
Type of house construction:				
Brick	0.0%	54.5%	0.0%	23.1%
Vinyl siding	0.0%	0.0%	0.0%	0.0%
Stucco	14.3%	0.0%	50.0%	19.2%
Wood frame	57.1%	36.4%	25.0%	38.5%
Modular unit	0.0%	18.2%	0.0%	7.7%
Concrete block	14.3%	18.2%	12.5%	15.4%
Does noise:				
Startle you or make you jump	0.0%	9.1%	0.0%	3.8%
Frighten you	0.0%	9.1%	0.0%	3.8%
Make you feel irritable, tense or nervous	14.3%	0.0%	12.5%	7.7%
Interfere with your ability to talk	0.0%	0.0%	25.0%	7.7%
Disturb or disrupt other activities	0.0%	0.0%	12.5%	3.8%
Other categories:				
Installation importance to local economy	0.0%	9.1%	12.5%	7.7%
Acceptance of military noise	85.7%	63.6%	50.0%	65.4%
Contentment with the area	85.7%	90.9%	62.5%	80.8%
Ability to adapt to military noise environment	85.7%	81.8%	75.0%	80.8%
Use of terms (booms, bombs, vibration)	85.7%	63.6%	75.0%	73.1%
Describe blasts as booms, bombs and explosions	42.9%	27.3%	50.0%	38.5%
Describe small arms as rat-a-tat-tat	0.0%	36.4%	12.5%	19.2%
Time of day noise is more intrusive	14.3%	27.3%	37.5%	26.9%
Recalled a single loud blast event from the past	28.6%	9.1%	37.5%	23.1%

Comparison of Participant Comments

Wolcott (1994)¹⁰ employs the use of the processes of description, analysis and interpretation to explore and interpret qualitative data. Wolcott's use of description assumes that the data should speak for itself. He recommends that the analytical account stay as close to the original data as possible. In order to remain as close to the data as possible, a selection of comments from each of the respondents is presented in Table 4 and Appendix B. In addition to searching for themes and patterns, analysis should identify features and relationships. Interpretation of the data utilizes inference or the exploration of alternative formats. One theme that was investigated is the participant's attitude towards noise. Table 4 contains comments from select individuals providing their descriptions of, or attitude towards, the noise from the neighboring installations. These comments allow the data to speak for itself, as suggested by Wolcott.

Table 4. Comments on Attitude Towards Noise from Each Participant at all Three Installations

Sampling of Comments from A201
Well, it's annoying, but you get used to it. It's like living next to railroad tracks, you know. After a while, you don't really notice it.
Sampling of Comments from A202
Just a boom, just boom, like you hear booms going off. And every morning, they put one off between 7:30 and 8:00. That's the only thing I don't like. I don't want to wake up that early . . . Even with the windows shut; you can still hear that at 7:30 in the morning? Oh, yeah.
Sampling of Comments from A203
In the five years we've been here, there's been one time where I'd stop and went, wow, did something hit the house? Because the vibration was so great. But that was about two years ago . . . I thought a tree fell down.
Sampling of Comments from A204
You can hear Installation A. When it goes off, you can hear them, the bomb, or whatever they're doing over there, the shooting or whatever. But you get used to it. You don't even notice it . . . You can hear the planes go over . . . I don't notice it anymore. . . I've lived in the area for 60 years.
Sampling of Comments from A301
You hear explosives from the Installation A occasionally, which, again, don't bother me because I'm used to them . . . You just don't notice it simply because you're used to the sounds.
Sampling of Comments from A302
Installation A doesn't bother us, the planes, the firing. In fact, most of the people around here call it the sounds of freedom.
Sampling of Comments from A303
I've just kind of gotten used to it. At first, like hearing stuff, you know, activity and stuff, I was like, what the heck, you know, at first. And after a while of being here, I'm just like, okay, you know, it's just there.

Sampling of Comments from B102
Sometimes when you go outside and it's real calm night, you know, that rat-a-tat-tat-tat, you can hear that, or you hear a boom and you'll ask yourself, was that thunder? I mean, you know, it's not constant, not like it keeps us up at night or anything like that. . . you can hear rat-tat-tat-tat-tat, rat-tat-tat-tat-tat sometimes about once a month.
Sampling of Comments from B103
I'm sorry that we have to have Installation B. I'm sorry we have to have the military. I'm sorry we have to have war. And I'm sorry we have to practice for it. But I'm aware of the realities of the world and of life... But you know, it's, the military base is not, we really benefit from Installation B..... And so I have no problems with Installation B being here....
Sampling of Comments from B104
We hear it, but it's just sort of like you know what it is. And sometimes, there will be a big boom and, you know, you kind of feel like the house shakes a little bit. But usually, I guess we know what it is so we don't think too much about it, because it's not that loud.
Sampling of Comments from B105
Sometimes I can hear, and I don't even know how often it is. Sometimes I can hear a little shooting, but not very often. I couldn't tell you whether it's been two or three times or not, because I keep my TV on and I'm not outside a lot . . . If I'm outside, I might hear it, but you know, we knew Installation B was out there when we built.
Sampling of Comments B201
They train all around this area. They do a lot of airdrops, the Rangers does . . . It's just like anywhere you go. When you're first there, you know, the least little thing wakes you up, you know. But then you get used to it, you pay no attention to it.
Sampling of Comments from B203
As it is now, most of the time it's bearable, but we would certainly not want to see them extend the boundaries of Installation B range. It would be very intrusive in our lives.
Sampling of Comments from B205
I got used to it in the background. I don't hear. I don't hear too much . . . disturb me of anything. The airplanes is mostly, when the airplanes are low, flying low, that's the biggest noise we hear. This is kind of quiet . . .
Sampling of Comments from B206
We'll be like, hey, do you hear that? Is it thunder? And you know, then all of a sudden, we know that they're having training or something.
Sampling of Comments from B207
You're talking about the shooting of the M16s. How would you describe it? Rat-tat-tat-tat-tat. Rat-tat-tat-tat-tat.
Sampling of Comments from B208
You hear it all the time, the machine, the machine guns going off, the jets flying over. I mean, it's went to the point of knocking pictures off the walls and breaking things. Did it ever break anything or? Oh, yeah. Oh, yeah. I mean, it knocks the pictures off the walls and it vibrates . . . we're settled there. We're happy there. I mean, you know, yes, it's a pain sometimes, but I don't think it's going to run us off, you know.
Sampling of Comments from B210
And like the flares goes up, they go [sound effect]. And then you just hear like the rat-a-tat type noise? Yeah, like the guns, machine guns [sound effect], you know. I sit out there and enjoy it. It starts at 9:00. I'll be out there watching it...

Sampling of Comments from C101

I was a civilian in Israel when Saddam Hussein was bombing Tel Aviv. So this is fairly loud. It certainly takes me back, . . . Yeah. I'm used to it now, but, at first, it was kind of unnerving, I have to say. . . just gets you on the deeper level that, you know, it's not just a noise, it's not just an annoyance, the fact that it's a noise. It's the fact that it's military exercises that are very, you know, they're carrying them out with real weapons. This is the real deal, so that part of it, for sure, is uncomfortable.

Sampling of Comments from C102

I heard what sounded like hammering. And I was going, what in the world is, who's building something at 9:00 at night? And you could hear it. It was like, pound, pound, pound, pound, pound. I was like, amazing. Pound, pound, pound, pound, pound. I couldn't fathom how someone could be pounding that late at night . . . And I went, oh, those are 50 caliber machine guns. And then I realized that subsequent sounds were probably Howitzers on tanks. But that's only happened one time . . . ; I heard howitzer 4.5 years ago.

Sampling of Comments from C201

I don't really pay much attention to it anymore, because I've kind of muted it out of my brain. That's a weird phrase. But I would say it happens every couple of weeks, you know. Not the fog boom part, but the actual artillery launching every couple of weeks. For sure, once a month, maybe every other week, you know.

Sampling of Comments from C203

Well, I'm annoyed. That's a pretty, we were really annoyed. I don't get mad, I just get, it's like helplessly annoyed, because there's nothing I can do about it. It's like . . . busy when they have to be, you know.

Sampling of Comments from C204

Helicopter flyovers . . . have to be doing it at least weekly basis, Do you hear any artillery noise. Yes. Yep, yep. We can hear that other sound of freedom. Faintly inside, yeah.

Sampling of Comments from C301

Sometimes, you know, we hear the helicopters, you know, and the planes going by. But those, they don't bother us, you know, because we know. We've been hearing those since I was here, so.

Sampling of Comments from C401

It's not an annoyance. It doesn't annoy me at all. They could even be louder and it wouldn't annoy me, because it's not in my face. It's not restricting me from doing anything. It's a distant, I also hear the Amtrak, you know. That doesn't annoy me either.

Sampling of Comments from C402

It sounds like a baby earthquake, you know, but it isn't. It's just a big boom of some sort, you know, and everything shakes a little bit. It's just one boom and that's it. And you say, oh, boy, they're practicing again, and you go back to whatever you're doing.

Results

The comments provided in Table 4 and in Appendix B indicate that community members notice the noise and comment on the noise, but would not leave the area because of the noise. These are qualitative observations, which can be drawn by comparing the common themes and observations made across the set of participants. The summary of those themes is presented in Tables 3A-D. The N for the theme in Tables 3A-C indicates the number of participants that mentioned that particular theme. Only the number of participants that mentioned a particular theme was used for statistical analysis, comparing the use of themes in this study across installations as well as to previous studies.

The small number of interviewees precludes extensive statistical analysis of the data. For example, the observation that the sample with the highest percentage of wood frame houses (Installation A with 57.1%) also had the highest mention of vibration (71.4%) is consistent with Hubbard's demonstration that wood frame construction is particularly susceptible to noise-induced resonance. However, many more data points would be needed to confirm this apparent trend.

Other trends were identified through a statistical comparison with the content profiles developed from noise complaint data. For instance, in this analysis, we assumed that the percentage of our participants who mentioned "vibration, rattling, shaking, etc." at Installation B should not differ significantly from the same percentage for Nykaza et al. (2008) at Installation A. In our current study, the number who mentioned that theme at Installation B had a binomial distribution with parameters $n = 11$ (11 participants at Installation B) and $p = 0.5$. This p -value is the probability of this theme occurring among participants in the previous study, as indicated in Table 5. So if this assumption were true, then with roughly 95% probability (actual probability = $1 - 0.06601 = 93.399\%$, from Table 5B), we would expect between 3 and 8 participants to mention this theme in our study. Of particular interest is the comparison between the Nykaza et al. data and the results from Installation A, since both sets of data are from the same installation.

A comparison of these probabilities between our current study and Nykaza et al. (2008) can be found in Tables 5A, 5B and 5C, which give the hypothesis tests for each of the first nine categories listed in Tables 3A, 3B and 3C for Installations A, B and C, respectively. Table 6

provides the acceptable counts (i.e., within the range of 3-8 in the above example) for each of the three installations, assuming that the Nykaza et al. 2008 percentages apply. Column 3 in Tables 5A-C, lists the actual counts of participants that mentioned the given theme. If the actual count for the current study was outside of the range of acceptable counts given in Table 6, a significant difference was noted. Only one significant difference occurred – for “sleep disturbance” at Installation B – with an alpha of .069. This significant difference is indicated in Table 5B. The alpha values provided in Tables 5A-C tell us the probability that we will incorrectly reject the null hypothesis when, in fact, it is true (Type I error probability). The alpha values can be calculated as the probability (using Minitab’s probability calculator) of being outside of the range of acceptable values presented in Table 6. When there was a significant difference between the studies for a theme, the number of individuals that mentioned it in the PI was provided (see Table 6).

Table 5A. Occurrence of Themes in Current Study vs. Nykaza et al. (2008): Installation A

Content Category	Percent Nykaza, et. al. (2008)	Installation A (Current Study)		Significant Difference
		(n=7) # Participants mentioning	alpha	
Vibration, rattling, shaking, etc	51%	5	.06517	NO
Putative, feared or actual damage to house	27%	1	.0905	NO
Objectionable, irritating, annoying sound	20%	1	.03334	NO
Objects falling from shelves or walls	6%	0	.06178	NO
Sleep disturbance	4%	1	.02938	NO
Disturbance of children	3%	0	.01709	NO
Disturbance of animals	10%	1	.02569	NO
Fear/physiological distress/adverse health effects	8%	0	.01401	NO
Damage to wells	0%	0	NA	NA

Table 5B. Occurrence of Themes in Current Study vs. Nykaza, et al. (2008): Installation B

Content Category	Percent Nykaza, et. al. (2008)	Installation B (Current Study)		Significant Difference
		(n=11) # Participants mentioning	alpha	
Vibration, rattling, shaking, etc	51%	4	.06601	NO
Putative, feared or actual damage to house	27%	1	.04323	NO
Objectionable, irritating, annoying sound	20%	3	.05041	NO
Objects falling from shelves or walls	6%	2	.02476	NO

Sleep disturbance	4%	3	.06923	YES
Disturbance of children	3%	1	.04135	NO
Disturbance of animals	10%	0	.08956	NO
Fear/physiological distress/adverse health effects	8%	0	.0519	NO
Damage to wells	0%	0	NA	NA

Table 5C. Occurrence of Themes in Current Study vs. Nykaza et al. (2008): Installation C

Content Category	Percent Nykaza, et. al. (2008)	Installation C (Current Study)		Significant Difference
		(n=8) # participants mentioning	alpha	
Vibration, rattling, shaking, etc	51%	5	.03557	NO
Putative, feared or actual damage to house	27%	0	.03768	NO
Objectionable, irritating, annoying sound	20%	3	.05628	NO
Objects falling from shelves or walls	6%	1	.07916	NO
Sleep disturbance	4%	1	.03815	NO
Disturbance of children	3%	0	.02234	NO
Disturbance of animals	10%	1	.03809	NO
Fear/physiological distress/adverse health effects	8%	1	.0211	NO
Damage to wells	0%	0	NA	NA

Table 6. Acceptable Counts for Thematic Content Compared to Nykaza et al. (2008)

Content Category	Percent Nykaza, et al. (2008)	Acceptable Counts in each Installation Assuming Nykaza, et al. Percents Apply		
		A (n=7)	B (n=11)	C (n=8)
Vibration, rattling, shaking, etc	51%	2-6	3-8	2-7
Putative, feared or actual damage to house	27%	0-3	1-6	0-4
Objectionable, irritating, annoying sound	20%	0-3	0-4	0-3
Objects falling from shelves or walls	6%	0-1	0-2	0-1
Sleep disturbance	4%	0-1	0-1 (n=3)	0-1
Disturbance of children	3%	0-1	0-1	0-1
Disturbance of animals	10%	0-2	0-2	0-2
Fear/physiological distress/adverse health effects	8%	0-2	0-2	0-2

We can perform the same comparisons with the percentages reported in Luz et al. (1983). The comparison of these probabilities can be found in Tables 7A, 7B and 7C, which give the

hypothesis tests for each of the first eight categories listed in Luz et al. (1983) for installations A, B and C, respectively. Table 8 provides the acceptable counts for each of the three installations, assuming that the 1983 study percentages apply. Column 3 in Tables 7A-C, lists the actual counts of participants that mentioned the given theme. If the actual count for the current study was outside of the range of acceptable counts given in Table 8, a significant difference was noted. Only one significant difference occurred – for “putative, feared or actual damage to house” at Installation C – with an alpha of .0477. This significant difference is indicated in Table 7C. When there was a significant difference between the studies for a theme, the number of individuals that mentioned it in the PI was provided (see Table 8).

Table 7A. Frequency of Occurrence of Themes at Installation A vs. Luz et al. (1983)

Content Category	Percent Luz et al. (1983)	Installation A (Current Study)		
		(n=7) # Participants mentioning	alpha	Significant Difference
Vibration, rattling, shaking, etc	54%	5	.05356	NO
Putative, feared or actual damage to house	32%	1	.07268	NO
Objectionable, irritating, annoying sound	30%	1	.08614	NO
Objects falling from shelves or walls	14%	0	.06197	NO
Sleep disturbance	13%	1	.05126	NO
Disturbance of children	10%	0	.02569	NO
Disturbance of animals	5%	1	.04438	NO
Fear/physiological distress/adverse health effects	4%	0	.02938	NO
Damage to wells	2%	0	.00786	NO

Table 7B. Frequency of Occurrence of Themes at Installation B vs. Luz et al. (1983)

Content Category	Percent Luz et al. (1983)	Installation B (Current Study)		
		(n=11) # participants mentioning	alpha	Significant Difference
Vibration, rattling, shaking, etc	54%	4	.07073	NO
Putative, feared or actual damage to house	32%	1	.0453	NO
Objectionable, irritating, annoying sound	30%	3	.04139	NO
Objects falling from shelves or walls	14%	2	.056	NO
Sleep disturbance	13%	3	.04423	NO
Disturbance of children	10%	1	.08956	NO
Disturbance of animals	5%	0	.01524	NO
Fear/physiological distress/adverse health effects	4%	0	.06923	NO
Damage to wells	2%	0	.01951	NO

Table 7C. Frequency of Occurrence of Themes at Installation C vs. Luz et al. (1983)

Content Category	Percent Luz et al. (1983)	Installation C (Current Study)		
		(n=8) # participants mentioning	alpha	Significant Difference
Vibration, rattling, shaking, etc	54%	5	.02806	NO
Putative, feared or actual damage to house	32%	0	.0477	YES
Objectionable, irritating, annoying sound	30%	3	.05894	NO
Objects falling from shelves or walls	14%	1	.08908	NO
Sleep disturbance	13%	1	.07425	NO
Disturbance of children	10%	0	.03809	NO
Disturbance of animals	5%	1	.05724	NO
Fear/physiological distress/adverse health effects	4%	1	.03815	NO
Damage to wells	2%	0	.01034	NO

Table 8. Acceptable Counts for Thematic Content Compared to Luz et al. (1983)

Content Category	Percent Luz et al. (1983)	Acceptable Counts in each Installation Assuming 1983 Percents Apply		
		A (n=7)	B (n=11)	C (n=8)
Vibration, rattling, shaking, etc	54%	2-6	4-10	2-7
Putative, feared or actual damage to house	32%	1-5	1-6	1-6 (n=0)
Objectionable, irritating, annoying sound	30%	1-5	1-6	1-6
Objects falling from shelves or walls	14%	0-2	0-3	0-2
Sleep disturbance	13%	0-2	0-3	0-2
Disturbance of children	10%	0-2	0-2	0-2
Disturbance of animals	5%	0-1	0-2	0-1
Fear/physiological distress/adverse health effects	4%	0-1	0-1	0-1
Damage to wells	2%	0-1	0-1	0-1

Comparison of Participant’s Language to General Survey Language

The community survey questionnaire that will be used in the upcoming General Survey (GS) Protocol will mirror important elements from the Personal Interview (PI) Protocol, including phrasing and language that were revealed in the personal interviews, and will provide additional structure and uniformity in the areas where individuals struggled to describe their experience during the PI. The wording of key questions in the GS will be similar to the language that participants in the personal interviews used to describe their reaction to noise. First, the GS will follow the IC BEN guidelines for assessing community reaction to noise by asking respondents the extent to which a noise “bothers, disturbs, or annoys” them during a specified period. The wording proposed by IC BEN is intended to capture a general negative reaction to noise; many participants in the personal interviews offered these same terms to describe their noise reaction. For example, the excerpts shown in Table B1 include words and phrases like “annoying,” “bothersome” or “bother,” “disruptive,” and “disturb.” It is useful to note that participants sometimes used these terms to refer to the absence of a response as in “it [the noise] is not annoying” or “not bothersome.”

Second, the questionnaire proposed for the GS will ask whether noise “startles or makes you jump,” “frightens you,” makes you “feel irritable or edgy,” or makes you “become tense or nervous.” Although these specific phrases do not appear often in the personal interview results, a

small number of participants noted that the noise was “scary” (or “scares the children”), was “startling and annoying,” “frustrating” or “unnerving.” Other comments by participants suggest emotional responses that are difficult to describe precisely or are unsettling in ways that suggest they were having difficulty describing them in precise terms. For example, participants mentioned the noise can be “aggravating” or make them feel “uncomfortable.” Standardized questions that ask about being startled, frightened, irritable, or nervous may be reliable measures that succinctly describe and differentiate among possible reactions.

Data from the personal interviews show that the individuals’ reactions to noise included experiences other than simply hearing it. They noticed the noise because it shook the house or walls, rattled the window, the china, or the wall hangings; because it woke them up or disrupted their activities; or because they “feel the pressure” or sensed the vibration. The GS will include questions that capture these experiences by asking about “rattle or vibration” in the house due to noise and whether everyday activities, such as conversations inside or outside or other daily activities, are disrupted by noise. Respondents in the General Survey will also be asked whether and how often they have been awakened by noise (which is an experience noted by participants in the personal interviews) as an indicator that will suggest whether the noise is disruptive or not (i.e., not so loud as to awaken them).

The GS will also mirror individuals’ concerns with military and non-military sources of noise. Open-ended questions about community noise in the personal interviews frequently yielded complaints about street noise, train whistles, and car stereos with booming bass levels. As an indicator of the general noise environment, it will therefore be useful for the GS to gauge participants’ reactions to general neighborhood noise (e.g., barking dogs, street traffic, and fireworks) as well as noise from commercial (non-military) aircraft.

Discussion and Conclusions

This study showed that the language used by individuals to describe noise in their neighborhoods is similar to the wording of the survey questions that will be used in upcoming SI-1546 protocols. The findings from the qualitative personal interview analyses indicate that residents living near military installations are aware of the installation and the noise generated by the

installation. Residents reported that they adapt to the basic noise environment over time and often do not notice smaller noise events; however, they do notice unusually large noise events or noise in conjunction with house vibrations. A number of participants reported that their current neighborhood is less noisy than other areas in which they have lived and is a better place to live. Several of the residents stated that they would not leave the area because of the noise, and almost all expressed that they are content with their neighborhood.

Comparable Language

The results of the thematic coding of the qualitative data in the PI indicated that the language used by participants to describe blast noise was similar to the language that was used by the research community and their survey instruments. This finding was further substantiated by the statistical comparison of nine themes in this study to previous studies of the content of noise complaints. The number of participants that mentioned a theme was tallied for each installation. Results from a previous study (Nykaza et al. 2008),⁸ conducted to improve procedures for correlating blast noise events with complaint logs at U.S. Army installations, identified the percentages of responses for these nine themes (see Table 2). The number of responses in the current study was compared to the percentage of responses in the complaint log study. Our research assumption was that the percentages of participants in this study that mention a particular theme should not differ from the percentage of complainants who mentioned that same theme as indicated in Table 2. The only instance where that did not hold true was in comparison to sleep disturbance at Installation B. There were no significant differences in the percentage of participants for eight of the nine themes identified in both studies. The assumption that the percentage of participants that mention a particular theme should be consistent across the two studies was found to be valid for seven of the nine themes enumerated in the complaint log study. One theme included in the past studies, “damage to wells,” was not a relevant theme in this effort.

The response themes that were identified have meaning to the population of interest and can be used in subsequent efforts to further assess a more complete understanding of the complex variables that contribute to community response to blast noise. For the complaint log study, the largest percentage of complainants mentioned the theme “vibration, rattling, shaking.” The occurrence of this theme was similar in the PI study. The observation that over half of the people

complaining about military impulsive noise are concerned over house vibration and rattling introduces a practical question for the management of operational noise around U.S. military installations: “Would it be possible to reduce noise complaints about range operations by asking local planning and zoning boards to require “rattle-proofing” for new construction in the vicinity of heavy weapons ranges?” This practical question translates into two researchable questions:

1. Does the presence of perceptible rattle result in an amplification of the subjective annoyance of the sound of a heavy weapons blast?
2. Is the perception of rattle an important indicator of whether a person will decide to complain about weapons noise?

An answer to the first question was provided by an experiment conducted at the U.S. Army Construction Engineering Research Laboratory (USA-CERL) in 1988 by Schomer and Averbuch.¹¹ In this study, the presence of audible rattle was found to amplify the annoyance of low intensity impulsive sound. A partial answer to the second question is implied by the research reported here.

Comments obtained in the PI Protocol provide insights that can address the second question. One of these installations, Installation A, was the same installation from which Nykaza et al. had collected their noise complaint data. Although the use of random-selection does not preclude the possibility that some of the interviewees were also past complainants, the fact that only a small percentage of the noise-exposed population complains implies that their proportional representation in the samples was low. The hypothesis is that if the percentage of these samples mentioning “vibration, rattling, shaking, etc.” was significantly lower than in the complaining population, there would be reason to suspect that building vibration was an important predictor of complaint.

Role of Vibration in Generation of Complaints

The observation that a randomly selected sample of people living near Installation A mentioned vibration more frequently than did people who actually complained about weapons noise from Installation A is suggestive that house vibration, per se, is not the primary explanation why some people complain. We cannot assume that we are comparing complainants with non-

complainants, as we do not know how many, if any, of the people who participated in the personal interview were ever complainants themselves. The interview format is intended to allow trends to be revealed and connections identified, without necessarily conveying statistical significance. The participants in the interviews were prompted to respond at times, which may have influenced the frequency of responding to a given topic. The comments from the complainants in the early studies were all self-initiated; that is, they were not prompted. The two sets of data can still be compared, as long as that constraint is considered. When the data from the 26 interviewees in the current study was pooled, 53% mentioned vibration – a value that falls between the two comparable percentages listed in Table 2. These findings provide no support for the hypothesis that complainants live in houses where they experience a greater degree of noise-induced vibrations than non-complainants.

Role of Habituation in Generation of Noise Complaints

As documented in Table 4 and Appendix B, a number of interviewees stated that they have become used to impulsive military noise. A more technical term would be that they have become habituated to the noise. Could it be that a distinction between people who complain and those who do not is their ability to habituate to impulsive noise? There is no way to test this hypothesis using the current data set, but such an opportunity may emerge at a later stage in the current SERDP Project. Questions about the ability to habituate to noise will be included in the formal GS survey. In preparation for testing this hypothesis, CERL has prepared a review of the published scientific literature on habituation to noise.¹² This supplementary material is currently in draft, and it is anticipated that it will be published in time for incorporation into the later stages of the current SERDP project.

Application of PI Protocol Findings to the GS Protocol

The results from the personal interviews conducted during the PI Protocol suggest that the proposed wording and structure of questions in the SERDP Project SI-1546 General Survey (GS) Protocol are well suited to assess response to noise among residents in communities near military installations. By following the ICBEN guidelines for assessing community response to noise, the GS will also address two limitations that are apparent in the results from the personal interviews. First, large numbers of participants indicate that they either “get used to” the noise, “don’t really

notice it,” or know that it’s there but “don’t hear it.” In short, people habituate to noise. When asked specifically about a source of noise, they can rate its annoyance level (or lack thereof), but they are unlikely to report the noise unprompted. For these reasons, ICBEN recommends against screener questions that would collect annoyance ratings only among individuals who previously indicated “hearing” a noise, and the GS will ask about annoyance with a number of different noise sources regardless of whether they are “heard.” Second, individual descriptions of the source of military noise lack uniformity and specificity. The personal interviews offered a long list of descriptors, most of which were vague and ambiguous or used terms like “stuff” and “whatever.” Participants mentioned noise from “the exercises,” the “testing,” “activity and stuff,” “machine guns,” “jets,” “the artillery fire,” and “the explosives.” These terms encompass a range of noises that stem from aviation activity, artillery fire, small-arms fire, bombs or explosives. It is not surprising that individual descriptions of military sources of noise lack the degree of uniformity or specificity to ensure consistent understanding; after all, private citizens in the community have limited information about military training exercises or other activities on a military installation involving explosives. However, it does reinforce the importance of employing survey questions that use standard descriptions of noise as well as ensuring that those descriptions are relevant for the surrounding community.

Application of PI Findings to SERDP SI-1546 Protocol Designs

The findings of the PI identified blast noise descriptors that were used by both the research community and the residents living near military installations to describe the environment and noise. The descriptors identified match the language to be included in the SERDP SI-1546 General Survey and In-Situ Protocols for assessing community response to blast noise. The findings of the PI protocol validate the overall design of SERDP Project SI-1546, as it includes both qualitative and quantitative approaches to information gathering that could further enhance understanding of human response to blast noise. Qualitative research is often hypothesis generating research, whereas quantitative research is typically based on hypothesis testing. The findings of the PI both validated existing hypotheses and identified areas of inquiry that should be emphasized or added, as necessary, to the other protocols. Additional questions to be added to other protocols, that resulted from a review of the comments in the PI Protocol are: “Have you ever considered moving to another community because of the noise in your area?”; “Were you

aware that activities at (name of installation) might create noise before you first moved to your current neighborhood?"; and "To the best of your knowledge, is your hearing normal?" If the response is "no", "Do you use a hearing aid?" Answers to these questions will reflect the individuals' awareness of the noise as well as its affect on their contentment with the community.

Other PI Protocol comments revealed the following similar themes: the blast noise community was not the noisiest or most annoying community that most residents had lived in; the noise from bass speakers in cars was repeated as an equally annoying, if not more annoying, noise source; and several residents stated that they would not leave the area because of the noise. Most residents grew accustomed to the basic noise environment but commented that they did notice unusually large noise events or noise in conjunction with strong vibrations.

These findings will be used in conjunction with both the General Survey and the In-Situ Protocols. The General Survey Protocol will afford a sampling of a larger set of participants on a broader set of well-defined topics. The In-Situ protocol will provide noise measurements to correlate with the participant ratings of the noise. By using this mixed research method design, the SERDP SI-1546 Project will provide observations and data that can be compared across multiple protocols and installations. The combined findings will be used to develop a better methodology for predicting human response to impulsive military noise.

References

- ¹Auerbach, C.F., Silverstein, L.B. *Qualitative Data: An Introduction to Coding and Analysis*. New York: New York University Press, 2003.
- ²Fields, J.M., de Jong, R.G., Gjestland, T., Flindell, I.H., Job, R.F.S., Kurra, S., Lercher, P., Vallet, M., Yano, T., Guski, R., Felscher-suhr, U., and Schuemer, R. Standardized General-Purpose Noise Reaction Questions for Community Noise surveys: Research and a Recommendation. *J. Sound Vib.* 242:4, pp. 641-679, 2001.
- ³Creswell, J.W. and Plano Clark, V.L. *Designing and Conducting Mixed Methods Research*. Thousand Oaks, CA: Sage Publications, 2007.

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- ⁴Coffey, A. and Atkinson, P. *Making Sense of Qualitative Data, Complementary Research Strategies*. Thousands Oaks, CA: Sage Publications, 1996.
- ⁵Labov, W. and Waletzky, J. Narrative Analysis: Oral Versions of Personal Experience, In: Helm, J. Ed., *Essays on the Verbal and Visual Arts. Proceedings of the 1966 Annual Spring Meeting of the American Ethnological Society*, Seattle, WA, University of Washington Press, pp. 12-44, 1967.
- ⁶Fields, J.M. An Updated Catalog of 318 Social Surveys of Residents' reactions to Environmental Noise (1943-1989). NASA TM-187553, National Aeronautics and Space Administration, Washington, D.C., 1991.
- ⁷Luz, G.A., Raspet, R. and Schomer, P.D. An Analysis of Community Complaints to Noise. *J. Acoust. Soc. Am.*, 73, pp. 1229–1235, 1983.
- ⁸Nykaza, E.T, Pater, L.L. and Luz, G.A. Improved Procedures for Correlating Blast Noise Events with Complaint Logs at U.S. Army Installations. *Noise Control Engineering Journal* 56 (6), Nov-Dec. 2008.
- ⁹Hubbard, H.H. Noise Induced House Vibrations and Human Perception. *Noise Control Engineering Journal* 19(2), pp. 41-55, 1982.
- ¹⁰Wolcott, H.F. *Transforming Qualitative Data Description Analysis and Interpretation*. Thousands Oaks, CA: Sage Publications, 1994.
- ¹¹Schomer, P.D. and Averbuch, A. Indoor Human Response to Blast Sounds that Generate Rattle. *Journal of the Acoustical Society of America* 86(2), pp. 665-673, August 1989.
- ¹²Luz, G.A. and Nykaza, E.T. The Role of Habituation and Sensitization in Understanding the Annoyance of Community Exposures to Impulsive Noise. ERDC/CERL Technical Report TR-08-Draft, May 2008.

Appendix A – Personal Interview Protocol

A1. Informed Consent

Personal Interview Consent An Investigation of Community Attitudes towards Noise

INTERVIEW ID: _____
(house) (person)

INTERVIEW DATE: ____/____/____
(mo)/(day)/(year)

INTERVIEW TIME: ____:____ AM or PM (Interview is to be conducted between 9 AM and 8 PM)
INTERVIEWER ID: _____

Disclosure/Consent/Introduction

OMB No.: 0710-0015
Expires: 31 May 2011

Agency Disclosure Notice

The public report burden for this information collection is estimated to average 30 - 45 minutes for the interview, including the time for reviewing instructions, searching existing data sources, gathering and maintaining data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this data collection, including suggestions for reducing this burden, to Department of Defense, Washington Headquarters Services, Executive Services Directorate, Information Management Division, (0710-0015), 1155 Defense Pentagon, Washington DC, 20301-1155, and the Office of Information and Regulatory Affairs, Office of Management and Budget, Washington, D.C. 20503, Attn.: Desk Officer for U.S. Army Corps of Engineers.

Respondents should be aware that notwithstanding any other provision of law, an agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number. PLEASE DO NOT RETURN YOUR SURVEY TO THE ABOVE ADDRESSES.

Good morning/afternoon/evening! My name is _____ and I am here on behalf of Pennsylvania State University. We are conducting a noise research study about residents' attitudes about their community. Here's my identification. It is important that we talk to different types of people and your household is one of a small number randomly selected from this community. Are you interested in participating in this interview? This interview will be audio recorded. Recordings will be destroyed within 10 years after the study is completed. The study should be completed in 2013 and the recordings destroyed on or before January 2023. Recordings will be kept on digital storage devices kept in limited access buildings at either PSU ARL or Army ERDC Construction Engineering Research Lab. Access will be limited to project researchers.

Participants will be providing their opinions about noises that are heard in their community routinely. Your response is voluntary, you can quit at any time, and you may choose not to discuss certain topics. The results of this study will be summarized so that the answers you provide cannot be associated with you or anyone in your household. The survey will take approximately 30 minutes. You must be 18 years of age or older to consent to take part in this research study. Responding to the survey questions implies your consent to participate in the survey. If you have any questions about the survey, you can contact Kathleen K. Hodgdon at (814) 865-2447 or (kkh2@psu.edu) at the Pennsylvania State University, 216 ARL University Park PA 16802 or Peg Kreckler at (608) 443-2700 or (peg.kreckler@paconsulting.com) at PA Consulting Group.

____ I give my permission to be **AUDIO** taped.

____ I **do not give** my permission to be **AUDIO** taped.

Participant Signature _____

Interviewer Signature _____

A2. Interview Format

Personal Interview Format

The individual interviews will be conducted to reveal common observations, terminology, and types of complaints. The process provides a more comprehensive and insightful assessment of the community impact.

Qualitative Personal Interviews

The following questions are guidelines for use in the Personal Interview Protocol. The interview is intended as an open-ended discussion driven by the respondent. Allow the respondent to discuss what is most important to them. The questions are intended to prompt discussion, not to dictate it.

These questions are designed to explore respondents' perceptions of impulsive noise events, terminology they use to describe the events, and the factors that are associated with annoyance or impact.

- How do you like living in the area?
- What are the good things, if any, about living in this area?
- What are the negative things, if any, about living in this area?
- Is there anything you would change about this area?
- Do you ever hear noises in the area?
- What are the sources of the noise? Explore different noise sources.
- Ask R to describe the noise events in their own words.
- Ask R about what specific terms mean to them:
 - Annoyance
 - Loudness
 - Vibration
 - Rattle
 - Startle
 - Others

APPENDIX B – Comments from Participants

Table B1. Comments from Participants at Installation A

Sampling of Comments from A201
Teenage boy with amplified base radio in his car ; can hear thump thump of radio; it vibrates the windows.
Would like Installation A to "put a muffler on their testing."
"Depending on the wind and how much testing they're doing they can vibrate the house."
Well, it's annoying, but you get used to it. It's like living next to railroad tracks, you know. After a while, you don't really notice it.
We accept it. We would like it to be quieter so people that are getting cracks in their houses and things would like something done. But it's always been here.
Sampling of Comments from A202
"The noise from Installation A is loud at times, but it, I get used to it. I don't even pay attention. I've been here so long. But you know, they keep putting off bombs and stuff."
Just a boom, just boom, like you hear booms going off. And every morning, they put one off between 7:30 and 8:00. That's the only thing I don't like. I don't want to wake up that early; can even hear it at 7:30am with the windows shut.
Well, one of my neighbors, just about a month ago, said, she said, did you hear that awful boom? I said, yes. And she said, well, it shook my house. And I said, it didn't shake mine. And she said, it didn't? She said, well, it shook mine. That was three doors up.
It's more loud, yes, when we have these severe thunderstorms.
Sampling of Comments from A203
In the five years we've been here, there's been one time where I'd stop and went, wow, did something hit the house? Because the vibration was so great. But that was about two years ago, I thought a tree fell down.
Local trailer park campground, their noise is mostly at nighttime, where during the day, which would be the, you know, when Installation A is doing their thing, it's kind of, I don't know if you're busy doing something and don't really notice Installation A as much as you would notice their noise.
You hear more in the winter than you do in the summer because there's no leaves on the trees, and we're pretty well wooded and insulated down here with the leaves on.
Sampling of Comments from A204
You can hear Installation A. When it goes off, you can hear them, the bomb, or whatever they're doing over there, the shooting or whatever. But you get used to it. You don't even notice it; can hear planes go over, but don't notice it anymore because I've lived in the area for 60 years.
The windows shake and rattle; can hear the vibration.
Kids that have the four-wheelers next door, riding them in a residential area.; have no respect for anybody else's property; that's my biggest complain about noise.
A great big boom. it's more than thunder.
Sampling of Comments from A301
You hear explosives from the Installation A occasionally, which, again, don't bother me because I'm used to them; don't notice simply because you're used to the sounds.
I like the whole area. I think it's great. It's not hustle and bustle like you find in the city. I'm very comfortable living out here as I do.
Sampling of Comments from A302
When the kids get out of high school, you know, it's vroom, vroom. That's for half an hour.
Installation A doesn't bother us, the planes, the firing. In fact, most of the people around here call it the sounds of freedom.
Even when they have a big boom and it shakes the frames on the thing, it doesn't bother us, yeah. It doesn't bother us at all. The only one it bothers is one of my dogs; the dog shivers and shakes, thinks it's a thunderstorm.
We have Harry the Hooter who just blows that train whistle unbelievable, and then we have, you know, other people who are quite gentle, especially during the night. It never wakes me up. Yeah, it's not bothersome.
Sampling of Comments from A303
Blasts at times shook house; feel it; booms; could feel testing from Installation A shaking house; house has shaken 2-3 times in two years.
Do you notice the trains? Of course I notice them. I mean, at first it bothered me. But now I'm kind of like, oh, there goes the train, you know. It's kind of second nature now.

I've just kind of gotten used to it. At first, like hearing stuff, you know, activity and stuff, I was like, what the heck, you know, at first. And after a while of being here, I'm just like, okay, you know, it's just there.

he one thing that does get my nerves up a little bit is when that siren goes off to like test it. ...the boo-ooop one, they have like this emergency alert system that they test every couple of months, and it does like this boo-ooop, boo-ooop, like it goes up, almost like an air raid siren, like what I could imagine what it would be. And it like goes aa-aa-aa at the end of it, and it just says, this is a test. If this had been an actual emergency, I'm like, okay.

Table B2. Comments from Participants at Installation B

Sampling of Comments from B102
Sometimes hear the canon and gunfire from Installation B, even though we're quite far, but I guess they've opened a new range that's not very far from here.
Sometimes when you go outside and it's real calm night, you know, that rat-a-tat-tat-tat, you can hear that, or you hear a boom and you'll ask yourself, was that thunder? I mean, you know, it's not constant, not like it keeps us up at night or anything like that.; hear rat-tat-tat-tat about once a month.
The one negative would probably be the recent trend to loud music coming from your car and all that thumping. Yes, and you can feel the, it will vibrate my eardrums, and it will hurt, and I get frustrated and angry, and I want to say something, but, you know, at this day and age, you have to be very careful if you're going to confront someone; wants to see change about the car noise; enforcement of radio noise rules.
I have noticed that if things go wrong in a community, they like to blame the military post. But if things are going good, you know, it's just, they don't, the benefit of the military there, they don't get the credit for bringing in jobs or, you know, anything good that's happening, even though the military community does a lot to, PR-wise, to make sure that the community knows that they're here to be a good neighbor. They're here to be positive in the community and stuff like that.
If it's a quiet night, I mean, you know, clear, crystal clear, cold, you can hear, it seems, travels a little bit better, the noise.
Sampling of Comments from B103
We have some teenagers run through here with their various loud cars, but that's teenagers. Only every once in a while you hear a car that's not actually an automobile but a musical instrument. A percussion instrument.
As I said, when we have firecrackers and stuff in the neighborhood or bad thunderstorms, these things aggravate you, or a dog barking over here that won't shut up, you know, that bothers you. But that I can hear in my bedroom, these kind of things bother me, but Installation B's guns never do. There's just never enough noise coming from there to bother me, at least here.
It's like a, it's like a rumble. Sort of like if you had to describe it naturally, you would say it's similar to a thunder from a very distant thunderstorm.
I'm sorry that we have to have Installation B. I'm sorry we have to have the military. I'm sorry we have to have war. And I'm sorry we have to practice for it. But I'm aware of the realities of the world and of life... But you know, it's, the military base is not, we really benefit from Installation B..... And so I have no problems with Installation B being here....
The only time you notice it differently is when it's overcast and the ceiling is low. It seems, and in fog. When, then you hear it way more than on a day like this. You almost hear it not at all on a day like this.
Economy is essentially dependent on Installation B
The school district, there was an article in the paper this morning again, constantly has not received from the federal government or from the State ...any benefits from all these students coming in. we are looking at having. . . 5,000 or 6,000 more students, no more buildings, no more teachers, no more anything. They will fund, you know, the military expansion, but they will not fund anything to help the community serve these people that are going to come here.
Sampling of Comments from B104
When they're having exercises at Installation B, particularly at times when the, I think it's when the humidity is up. There's some times that the sound seems to travel more. But it's sort of like they're really in the distance, and you hear the boom-booms and you know that they're doing their exercises. And our daughter said, when she lived here after college, that she thought they did the exercises the last two weeks of the month. It seemed like there was activity certain weeks and not others. But it's really not that disruptive. It's kind of interesting, because when you go outside, you can hear the noise from the highway; on clear nights can sometimes hear rat-a-tat-tat-tat or booms.
so there's noise out there, but there's nothing, you know, it's really not that, it's far enough away from us that I don't think it's a problem,
I don't feel like the ranges impinge upon our life here, about the noise level that we have, it doesn't. And I think, you know, it doesn't really, it's like I can't sleep, it's not one of those I can't sleep because they're shooting the guns at Installation B, and I hope it never becomes that way.
We hear it, but it's just sort of like you know what it is. And sometimes, there will be a big boom and, you know, you kind of feel like the house shakes a little bit. But usually, I guess we know what it is so we don't think too much about it, because it's not that loud.

Sampling of Comments from B105

Sometimes I can hear, and I don't even know how often it is. Sometimes I can hear a little shooting, but not very often. I couldn't tell you whether it's been two or three times or not, because I keep my TV on and I'm not outside a lot; might hear it if outside; knew Installation B was out there when we built.

Installation B is a wonderful place, and so I would rather it be there than something else.

Sampling of Comments B201

"Not that heavy environment as far as noise-wise"; tank doesn't make as much noise as you would think

They train all around this area. They do a lot of airdrops, the Rangers does. It's just like anywhere you go. When you're first there, you know, the least little thing wakes you up, you know. But then you get used to it, you pay no attention to it.; to me it's not loud.

But overall, we wouldn't have our freedom if it weren't for the military bases and troops out there.

Sampling of Comments from B203

They (windows) had been actually shook, the rattling of the windows. They were wooden windows and they, over the years, had rattled so much that we actually had no choice but to replace them, because they were certainly inefficient because they had been compromised with the noise and the continuous shaking.

At one time we had shelves over this window and the kitchen window, and I collect plates, old plates, and those plates, I've even had something fall off and break, you know, because I didn't catch it in time...It didn't happen from any one blast, though. I want to make that clear. It didn't happen from any one thing. It was an accumulation over time.

Certain degree we've gotten used to it. There are times when it's louder than others. And of course, no matter how long you've been here, you're very aware of it.

Sometimes it's, in fact, if you've got young children here, sometimes it scares them and you have a problem with that.

As it is now, most of the time it's bearable, but we would certainly not want to see them extend the boundaries of Installation B range. It would be very intrusive in our lives.

Sampling of Comments from B205

I got used to it in the background. I don't hear. I don't hear too much . . . disturb me of anything. The airplanes is mostly, when the airplanes are low, flying low, that's the biggest noise we hear. This is kind of quiet . . .

Sampling of Comments from B206

Some days it has been annoying. It's, at times, the time that they're doing it, you know, like if you're trying to sleep or whatever; like you get woke up with one of those machineguns or whatever it is that makes that, you know.

I can hear it if they're firing or anything. I can hear that. . . .And sometimes we have thought it was like bad weather coming on.

We'll be like, hey, do you hear that? Is it thunder? And you know, then all of a sudden, we know that they're having training or something.

I wouldn't leave because of it...I mean, I like my location, I definitely do.

Sampling of Comments from B207

We hear sirens going by in the middle of the night. We hear people with their radios so loud it'll wake you up.

You're talking about the shooting of the M16s. How would you describe it? Rat-tat-tat-tat-tat. Rat-tat-tat-tat-tat.

Neighbors over there, they turn their music up real loud.

Sampling of Comments from B208

Stopping the noise at night would be nice-it's startling and annoying.

So do you hear the installation at all? All the time. It's probably unstoppable, I believe, you know. We hear it all hours of the night, also during the day.; gotten used to the noise.

You hear it all the time, the machine, the machine guns going off, the jets flying over. I mean, it's went to the point of knocking pictures off the walls and breaking things. Did it ever break anything or? Oh, yeah. Oh, yeah. I mean, it knocks the pictures off the walls and it vibrates . . .

We're settled there. We're happy there. I mean, you know, yes, it's a pain sometimes, but I don't think it's going to run us off, you know.

Sampling of Comments from B210

Yeah. Boom, boom, boom sometimes, but mostly, you know, it sounds like that. Or the guns, you know... like those, what is it, those guns that they shoot; hear different types of noises once or twice a month.

And like the flares goes up, they go [sound effect]. And then you just hear like the rat-a-tat type noise? Yeah, like the guns, machine guns [sound effect], you know. I sit out there and enjoy it. it starts at 9:00. I'll be out there watching it.

I guess I'm so used to it, it don't bother me. . .mean, you know, the military needs training, and they, you know, I don't think they should change anything about, you know.

Table B3. Comments from Participants at Installation C

Sampling of Comments from C101
I was a civilian in Israel when Saddam Hussein was bombing Tel Aviv. So this is fairly loud. It certainly takes me back, . . . Yeah. I'm used to it now, but, at first, it was kind of unnerving, I have to say. Sometimes they're so loud, in fact, that it's hard to distinguish whether you just live near something or it's that close where it kind of, you know, feels uncomfortable, . . . we moved here, sight unseen. My husband moved here for work, and so did I. And then, we started hearing the noises. And then, we realized we were that close.
Just gets you on the deeper level that, you know, it's not just a noise, it's not just an annoyance, the fact that it's a noise. It's the fact that it's military exercises that are very, you know, they're carrying them out with real weapons. This is not just, you know, kids playing in the backyard. This is the real deal, so that part of it, for sure, is uncomfortable.
And for some people, this may bring a level of comfort, that there is a, you know, a government installation with weapons that could possibly protect them. You know, maybe there is a level of comfort. I don't know. That might be something to consider. But, yeah, for me, it just, it's been uncomfortable.
The booms and the bangs, they actually shake the windows on the apartment. And I'm going to say the night before last; I had trouble falling asleep, because I could hear the bangs and the loud booms. All the sound was traveling, probably way past midnight.
A lot of helicopters that are flying really low. You can see a lot of detail on these large Army helicopters. And it's pretty scary, because they fly low, like I said. And they're so large and noisy that we're not quite sure what they're doing above this peaceful, little corner, you know.
It's a general vibrating feeling on the building. On the larger booms that come in, the building, you can sort of feel the walls, as well as the windows. But some of the, you know, not so impactful noises that come through, you just hear them, you know, ricochet by the windows, the sound.
It's almost like somebody is doing target practice. It's like, boom, boom, bang, and then it will stop. And then, there's, you know, there are almost like, like a family of noises that follow each other, you know. And then, there are loud, through the hills here, so they continue all the way into the buildings, and you can hear them. And neighbors that I have, actually friends of mine, have heard, late into the night, they've heard actually voices and exercises being carried out into the hills.
A cluster of sounds, different sounds. Some are deeper, some are not. Some have more of a kickback to them, you know.
Sampling of Comments from C102
I heard what sounded like hammering. And I was going, what in the world is, who's building something at 9:00 at night? And you could hear it. It was like, pound, pound, pound, pound, pound. I was like, amazing. Pound, pound, pound, pound, pound. I couldn't fathom how someone could be pounding that late at night. And I went, oh, those are 50 caliber machine guns. And then I realized that subsequent sounds were probably Howitzers on tanks. But that's only happened one time . . . I heard howitzer 4.5 years ago
Periodically, late at night, (the boy in the apartment downstairs) has anger management problems, so he will slam the doors in the apartment, two, three, four, five, six, eight times at night at 12:00, 1:00, 2:00 in the morning. Wakes me up, wakes my son up. When that happens, sometimes my son is real, he's very calm, but sometimes, he gets really mad about it.
Other than neighbors that periodically get kind of strange, it's pretty quiet. You can hear children playing and screaming, and skateboards. They're not supposed to ride them here, but they do. And they call it grinding, where you ride it into the curb and the board will go, slam, and it makes that real wood sound. You can hear that.
Sampling of Comments from C201
It's not too terribly bad. The artillery fire is frequent. It does boom on occasion, particularly if it's foggy and weather-dependent, but it's not intrusive or overpowering. Very rarely do the windows rattle or anything like that, so . . . we had a lightning storm, of all things, not too long ago, and that bothered the dog more than anything. So he's gotten used to the artillery. So if the dog doesn't start, it's not bad.
It's not a rattling, but you can kind of feel the pressure wave occasionally, you know. But I guess you could, you know, like when you have the bass on a radio turned up and you kind of feel the vibration of the sound wave itself? Every now and then, you get a small one like that, but it's not bad. And it's usually when there's overcast clouds and stuff like that that echoes it down or something. It just feels more, something like that.
It's a lower section where the fog comes in more frequently. . . Pressure, yeah. But it's very mild. It's not even affecting us. It's enough that you kind of know the thumps are happening, but it's not overbearing, it's not dangerous. It's not, I mean, I used to live in Lennox, which is right underneath the flight path of LAX, and that was more intrusive than this is.
I don't really pay much attention to it anymore, because I've kind of muted it out of my brain. That's a weird phrase. But I would say it happens every couple of weeks, you know. Not the fog boom part, but the actual artillery launching every couple of weeks. For sure, once a month, maybe every other week, you know.
Artillery doesn't sound like thunder. To me, no. You know, it sounds like they're doing training, you know. And they're firing off 10, 15 rounds, waiting a half hour, firing off 10, 15 rounds. You know, that kind of thing? It's not like small arms fire or even automatic weapons or anything like that. It's just in intervals of 30 seconds, a minute apart. You know, it's not very, it's not intrusive, to be honest, you know. No.

Sampling of Comments from C203

Except my only complaint is from the (installation). And between 4:00 and 10:00, almost every day, there's huge planes that come over here. And you have to even turn the TV louder or talk louder . . . that's really a bad, bad thing..... Big passenger planes, transfer planes from different bases....Jumbo jets.

Some pictures, and some baskets,... some more items, they fall off all the time... see that picture is crooked? Over there. And they broke a picture over here. The frame is busted, because it popped off the wall... Airplane, yeah. It's the aircraft, mostly

No, it's just annoying . . . some of those bombs really send the glass, send the windows rambling too. And the percussion of them is really surprising, as if there's an actual war going there. I mean, sometimes with the aircraft, the . . . get sometimes . . . really feel them.

Yeah, the artillery is just in booms. And there are some big booms, I'll tell you...so before you might actually hear the aircraft itself, the windows would shake? Jiggle.

Well, I'm annoyed. That's a pretty, we were really annoyed. I don't get mad, I just get, it's like helplessly annoyed, because there's nothing I can do about it. It's like . . . busy when they have to be, you know.

I saw a little gazebo area in the center. Yeah. where people are out, getting . . . at any rate . . . well, the argument goes on. Did you feel that earthquake last night? That wasn't no earthquake. That was just (the installation), you know. . . .You know, it rattled my bones . . .

Sampling of Comments from C204

We've heard this guy across the street say something, but it seems like it just comes up at us, like we're in an amphitheater.

The loudest thing that happens here is the sound of freedom, as I explained to the gentleman that called to set up the appointment.

With the artillery.... You can feel the thump, you know. It's on a much lower frequency, so it moves things a little bit more for sound attenuation. But, I mean, dishes don't rattle or anything like that.You kind of maybe almost feel it, more than hear it.

Helicopter flyovers.... have to be doing it at least weekly basis, Do you hear any artillery noise. . Yes.Yep, yep. We can hear that other sound of freedom. Faintly inside, yeah.

In terms of describing the noise, I asked, you know, is it annoying? From Installation C? Minimal.... it's not like it's scary or bothersome or anything...It's more of a vague kind of . . . oh, they must be doing some exercise or something over at Installation C. It's not offensive, it's not annoying.

Sampling of Comments from C301

You hear the avenues and a lot of traffic going by, you know. Yeah.

Sometimes, you know, we hear the helicopters, you know, and the planes going by. But those, they don't bother us, you know, because we know. We've been hearing those since I was here, so.

Sampling of Comments from C401

Retirement community . . .So it's very quiet because we're all retired . . .And so, we don't even see anything, much less hear anything. The only sound we have is what we call the sound of freedom, and. . .That doesn't bother us at all. You hardly think about it, unless there's a real good boom that shakes the house, you know. And they usually tell you in the paper that that's going to happen.

We can go days and days with; you hear nothing but booms and guns. And then, you don't hear anything for a long time. So, you know, you get used to it. It's kind of like living on the ocean, where you don't hear the breakers anymore. But nobody, I've never heard a complaint.

Sometimes we feel it, you know, if they shoot off some really big guns. At first, I come from earthquake country, and the first time it happened, I just stopped in my tracks and thought, boy, I've got to get out of here.

Our windows and doors are open all the time.

It's really just a distant boom, sometimes a rat-tat-tat. But it's distant.

It's not an annoyance. It doesn't annoy me at all. They could even be louder and it wouldn't annoy me, because it's not in my face. It's not restricting me from doing anything. It's a distant, I also hear the Amtrak, you know. That doesn't annoy me either.

Sampling of Comments from C402

When they have their maneuvers, sometime in August there, you hear a few banging and moving, you know. But overall, I mean, I always consider them a good neighbor. I mean, they have to do what they have to do. And the noise that they have is, you know, it's acceptable. No problem.; for two weeks, start banging away with some big boom, boom boom; most the time peaceful and quiet.

It sounds like a baby earthquake, you know, but it isn't. It's just a big boom of some sort, you know, and everything shakes a little bit. It's just one boom and that's it. And you say, oh, boy, they're practicing again, and you go back to whatever you're doing.

They have these, you know, maneuvers there, usually in the summertime. It's about two weeks there, they start banging away with some big boom, boom, boom. But, you know, like I say, you hear it, you know what they're doing, and it's over in a few days, and you're back to normal again. But like I say, most of the time, it's quiet and peaceful, and there's no problem.

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Endnotes (do not include – moved to “References” section)

- ¹ Auerbach, C.F., Silverstein, L.B., *Qualitative Data: An Introduction to Coding and Analysis*, New York: New York University Press, 2003.
- ² Fields, J.M., de Jong, R.G., Gjestland, T., Flindell, I.H., Job, R.F.S., Kurra, S., Lercher, P., Vallet, M., Yano, T., Guski, R., Felscher-suhr, U., and Schuemer, R. 2001. Standardized general-purpose noise reaction questions for community noise surveys: research and a recommendation. *J. Sound Vib.* 242:4, pp. 641-679.
- ³ Creswell, John W., and Plano Clark, Vicki L. *Designing and Conducting Mixed Methods Research*, Thousand Oaks, CA: Sage Publications, 2007.
- ⁴ Coffey, A., Atkinson, P. *Making Sense of Qualitative Data, Complementary Research Strategies*, Thousands Oaks, CA: Sage Publications, 1996.
- ⁵ Labov, W. Waletzky, J. *Narrative Analysis: Oral Versions of Personal Experience* In: Helm, J Ed., *Essays on the Verbal and Visual Arts*; (pp 12-44) Proceedings of the 1966 Annual Spring Meeting of the American Ethnological Society, Seattle WA University of Washington Press 1967.
- ⁶ Fields, J. M. 1991 *NASA TM-187553, National Aeronautics and Space Administration*, Washington, D.C.: An updated catalog of 318 social surveys of residents' reactions to environmental noise (1943-1989).
- ⁷ Luz, G. A. Raspet, R. and Schomer, P.D. “An analysis of community complaints to noise”, *J. Acoust. Soc. Am.*, **73**, 1229–1235, (1983).
- ⁸ Nykaza, E.T, Pater, L.L., Luz, G.A., Improved procedures for correlating blast noise events with complaint logs at U.S. Army installations, *Noise Control Engineering Journal* 56 (6) Nov-Dec. 2008.
- ⁹ Hubbard, H.H. Noise induced house vibrations and human perception. *Noise Control Engineering Journal*. 19(2), 1982, pp. 41-55.
- ¹⁰ Wolcott, H.F. *Transforming Qualitative Data Description Analysis and Interpretation*, Thousands Oaks, CA: Sage Publications, 1994.
- ¹¹ Schomer, P.D. and Averbuch, A. Indoor human response to blast sounds that generate rattle, *Journal of the Acoustical Society of America* 86(2), August 1989, pp. 665-673.
- ¹² Luz, G.A. and Nykaza, E.T. The role of habituation and sensitization in understanding the annoyance of community exposures to impulsive noise. ERDC/CERL Technical Report TR-08-Draft. May 2008.