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COMMUNITY NOISE ASSESSMENT MANUAL

SOCIAL SURVEY WORKBOOK

U.S. ENVIRONMENTAL PROTECTION AGENCY
Office of Noise Abatement and Control
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FOREWORD

The U.S. Environmental Protection Agency has developed a "Community Noise Assessment Manual" to provide local governments detailed guidelines in developing a comprehensive noise control program. This manual includes the following documents:

- Acoustical Survey
- Social Survey Workbook
- Community Noise Strategy Guidelines

This specific document – the second referenced above – is a workbook which provides specific instruction for the design and administration of a social survey of community attitudes toward noise. The reader is referred to the U.S. Environmental Protection Agency's Office of Noise Abatement and Control for assistance in analysis and interpretation of this survey data and for information concerning the other referenced publications.

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The workbook was written by Dr. Ned Levine and Ms. Maria Iosue of I.S.S.R. The basic noise zone concepts were developed by Mr. Steven Skale and Mr. Louis Sutherland of Wyle Research. The sampling framework was developed by Dr. Jay Sumner and Ms. Rita Englehardt of I.S.S.R.

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CHAPTER 1

Introduction

In order for local government officials to effectively design and administer a comprehensive noise management program, they must be equipped with a complete inventory of decision-making tools. These tools include physical monitoring surveys, complaint activity records, public hearings, and available criteria for noise effects on people. This document provides an additional and extremely vital tool, a procedure for implementing a survey of people's attitudes toward noise.

Community attitudes regarding noise will vary widely among communities and a social survey is the means for obtaining a balanced and reliable estimate of these attitudes. In contrast to complaint activity and public hearings which provide city personnel with only a limited picture of public opinion, a social survey can be structured to ensure the gathering of opinions which are representative of the entire community.

An attitudinal assessment of community noise has seldom been fully utilized by local government officials due, in part, to the lack of a comprehensive questionnaire and implementation program. To fill this void, the U.S. Environmental Protection Agency has sponsored the development of this "Social Survey Workbook" for use by local governments in developing a comprehensive noise abatement program. This workbook provides complete detailed instructions for the design and implementation of a large-scale household interview survey. There are two separately bound volumes to the workbook. The first volume provides detailed instructions for survey design and management. The second volume is a set of appendices providing forms and special handbooks for field and office personnel who will administer the survey.

The workbook is designed to be utilized by officials from many local government departments, including elected officials, administrators, planners, enforcement officers, environmental personnel, health personnel, financial managers and public information

personnel. This workbook establishes a program that is totally self-administered by the local government, thus permitting the development of a program uniquely tailored to a city's own needs.

The "heart" of the workbook is an attitudinal questionnaire to be administered to city residents. It was developed through a detailed study of virtually all previous social surveys of noise related attitudes. In order to meet the diverse needs of these potential users, the questionnaire is designed to provide a brief and straightforward instrument for gauging a variety of noise related attitudes and responses in the community. The major subject areas investigated by the social survey are:

- Perceptions of urban and environmental problems.
- Evaluation of public services and environmental programs, including noise control.
- The effects of noise on residents' health and welfare.
- Identification of the specific problem sources of noise in the community.
- Identification of measures taken to reduce noise in the community.
- Support for noise control in the community.

The information obtained through implementation of this survey will permit an assessment of needs for the citizens and a basis for design of a noise abatement program. Fundamental areas encompassed by this assessment include:

Identification of Specific Needs – The social survey will assess the impact of noise on residents' home environment. By asking individuals what types of noise impact them and what effect this has on them, it becomes possible to identify specific needs of various sections of the community. An analysis of a city's noise environment based on physical data – noise measurements, traffic projections, and building construction – does not truly identify the impact of noise on individual citizens.

Identify Priorities for Action – The design of a noise abatement program is directed toward improving the health and welfare of a city's residents. This requires a knowledge of the severity of a city's noise environment and the nature of the specific noise sources which comprise this environment. Based on data obtained from a social survey, these sources can be identified and their severity ranked accordingly. Using this and supporting information gained through noise measurements, priorities for noise abatement action will be established.

Establish a Basis for Noise Abatement Action – The social survey will identify what types of noise sources are not acceptable in the community and, therefore, should be abated. In addition, a survey will indicate the extent of public support for a noise control program. It is essential for the city administration to know that the public is behind them in proposing any kind of legislation or other noise control action. In addition, a survey will establish the community's willingness to pay for noise reduction. Without a survey, it is very difficult for municipal officials to know that they have a "constituency" which will support such actions.

Obtain Additional Information from the Survey – The survey also allows for the identification of major environmental problems in addition to noise, including a limited evaluation of public services. This information is useful for all types of community planning and will serve as the basis for developing a general set of urban priorities. The survey will allow the city to place noise in a broader context of urban growth and change. Generally, noise as a problem is related to the development of other problems: traffic congestion, deterioration of neighborhoods, high unemployment rates, air pollution, and so forth. It becomes important to understand these relationships and to see the reduction of noise as part of a broader urban strategy. The questionnaire and the analysis methods focus on some of these interrelationships and allow city officials to gain a unique perspective into the operation of the city and the manner in which residents are impacted.

This workbook – including questionnaire, administrative procedures, training procedures and survey data analysis techniques – was field tested in Allentown, Pennsylvania, during 1977 and 1978. This program was administered by the Allentown

Community Development Department with consulting assistance provided by the U.S. Environmental Protection Agency. Utilizing the workbook procedures, a survey team prepared a social sample carefully designed to represent an unbiased cross-section of the community and administered the questionnaire to city residents. Survey data were subsequently analyzed by computer methods and used as a basis in developing a comprehensive noise abatement program. Following the survey, revisions were made to the workbook reflecting this field experience. Thus, the methodology represents the culmination of extensive research and practical experience on the type of data required for a comprehensive community noise survey.

Implementation of the social survey set forth in this workbook will involve a detailed examination of the city and the intricate patterns of residential development. Areas within a city differ from one another in terms of income levels, type of housing, and types of people who live there. As this social survey study is enacted, the city research team will become aware of the subtle differences that differentiate areas of the city from one another, and the manner in which these differences influence noise impact.

The research team should approach this project in a spirit of discovery, for the process of examination and understanding underlies any solutions to practical problems. Noise, after all, is produced by people as they live their lives and is intrinsically interwoven in the patterns of their lives. Studying noise, therefore, is a way of understanding the city and its people. This is the basic premise which has guided the production of this workbook.

CHAPTER 2

The Social Survey Design

2.0 INTRODUCTION

The purpose of this workbook is to provide a standardized survey technique for assessing community attitudes toward noise. The survey is a self-contained operation; however, it is designed to be compatible with noise survey procedures described in the Community Noise Assessment Manual for Acoustical Surveys. The survey will give feedback to the community and its leaders on the impact of noise and the public willingness to support a noise control program.

The procedures outlined in this manual have been designed to standardize survey implementation and data analysis between communities. Careful adherence to the instructions will assure the eventual correlation of survey results among cities. In this way, the data will not only be useful for your city, but will add to a general pool of knowledge about community attitudes toward noise.

2.1 Guidelines for Survey Administration

Administration of a social survey is a complex technical operation, involving interaction with many people and the execution of detailed procedures. However, city personnel will gain professional experience and develop new insights into the community in the implementation of this program.

Survey implementation is guided by two basic values of objectivity and ethical responsibility. Objectivity is ensured by conducting the survey in a scientific and unbiased manner. Ethical responsibility, on the other hand, guarantees the rights of the individuals interviewed in the study, the respondents, to confidentiality and to respectful and professional treatment. These ethical issues are discussed in more detail in Section 4.3.1 and are the guiding principles of survey administration.

Implementation of a social survey is an exercise in management. In addition to following the rules and guidelines in the manual, city officials must exercise judgment and "common sense." It is impossible to define every procedure that will be used to implement a study for many different tasks and complex human interactions are involved. Be flexible in responding to the various situations, and be prepared to think out problems as they appear. Assume an alert management role at all times to ensure that the survey is carried out correctly and quickly. This will guarantee that the results will be as accurate and as useful as possible.

2.2 Procedural Overview

There are two major stages to the study: (1) Sample Selection, and (2) Survey Implementation. The following procedures will be carried out:

1. Sample Selection
   - a. Stratification: Noise Zones and Areas
   - b. Cluster Selection
   - c. Listing Households
   - d. Household Selection
   - e. Preparation of Cluster Kits and Letters of Introduction

2. Implementation of the Survey
   - a. Selection of Field Personnel
   - b. Training of Field Personnel
   - c. Sending of Introductory Letters to Selected Households
   - d. Allocating Household Assignments to Interviewers
   - e. Management of Field Operations (record keeping, interviewer instructions, etc.)
   - f. Sorting of Questionnaires for Editing and Coding
   - g. Editing of Questionnaires
   - h. Validating of Questionnaires
   - i. Coding of Questionnaires
   - j. Preparation of Data for Keypunching

In this chapter, an overview of these procedures is presented. Next, the major planning considerations are discussed. Finally, a complete list of the materials required to conduct the study is given. Chapter 3 of the manual provides the detailed instructions for sample selection, while Chapter 4 outlines the implementation of the survey.

2.3 Overview of Sample Selection

2.3.1 Accuracy of the Sample

A sample is a selection of individuals from a larger population. A sample is selected because canvassing everyone in the population would be very expensive and time-consuming. A relatively small number of households – 700 (and one adult from each) – will be selected. Since surveys involve a degree of "non-response," this sample size is expected to provide at least 500 completed interviews. The logic of the sample is that the selected households collectively will represent the population as a whole. Each household in the population has an equal chance or probability of being chosen for interviewing. Also, by taking care to geographically disperse the sample over the city, the distribution of household characteristics in the sample will approximate the distribution of the characteristics in the population as a whole. That is, the sampled households will "more or less" represent the entire population for major characteristics such as, for example, race or the percentage of apartment dwellers. The phrase "more or less" is used because, in practice, the actual distribution of individuals in the sample will rarely fit exactly the distribution of individuals in the population, but the overall discrepancy will be small. In this design, the sample should give only about a 5 percent discrepancy. That is, you will know with a ±5 percent range what your community as a whole feels about noise.

2.3.2 The Sample Design

Stratification is the first step of the sample design. It is a procedure which divides the population into relatively internally homogeneous groups in order to reduce sampling error. In this sample design, the population of the city will be stratefied twice: first, according to noise zones, which roughly define homogeneous noise environments; and second, according to geographical areas, which reflect similar social and residential patterns.

The second step of the sample design is cluster sampling. This refers to the selection of city blocks. We call them clusters because each block is actually a cluster of households. The third step of the sample design is the listing of each and every household in the selected clusters. The fourth step of the sample design is household selection. Approximately seven households from each of the sampled clusters will be chosen for interviewing using the technique of systematic random selection. Before sending interviewers into the field to administer questionnaires, a "kit" of materials must be prepared for each of the selected clusters. Finally, an introductory letter will be prepared for mailing to each of the selected households. This will give advance notice to the residents that an interviewer will contact the household.

2.4 Overview of Survey Implementation

Survey administration is the process of interviewing the respondents who have been selected by the sample. While this sounds simple, it actually involves a great deal of administration and management. First, field personnel must be selected. There are two types: interviewers, and office personnel. Second, these personnal must be trained in the use of the questionnaire, if they are interviewers, and the appropriate office procedures, if they are office personnel. Third, the interviewers will be assigned to households at which they will try to obtain interviews from selected respondents. Fourth, this whole procedure must be managed throughout the duration of the study. Fifth, as the completed questionnaires are returned, a record-keeping (logging) procedure is enacted so that there is accurate information about the completions in each cluster, and an accurate inventory of each interviewer's assignments. Next, the questionnaires are then sorted for editing and coding. They are then edited to assess whether the correct respondent has been interviewed. Some of these questionnaires are then chosen for validation in order to maintain a high quality of interviewing. Then all edited questionnaires are coded, using a standardized coding system in order to prepare the questionnaires for keypunching. Finally, the completed data deck is analyzed using a standardized computer program available from EPA.

2.5 Planning for the Survey

As can be seen, administering a survey involves both time and effort. However, let's start at the beginning. The first task in successfully carrying out the survey is planning. This is a critical part of an effective survey implementation, and it involves several points: the timing of the survey, the organization of resources and senior staff, and the setting up of a timetable.

2.5.1 Timing of the Survey

Choosing an appropriate time of the year to implement the survey is an important decision. The first consideration is weather. Bad weather can considerably slow down the program as was demonstrated in the first test of the survey in Allentown, Pennsylvania. Because the study was conducted in the winter in Allentown, it took at least 1 month longer to complete the interviewing process. The costs of extending a survey can be considerable, so avoid the winter season. On the other hand, conducting a survey in the summer can pose other problems. Because many people are vacationing during this season, more contact attempts are needed in order to reach respondents. This may also mean considerable time as well as economic costs. Therefore, the ideal time to implement the survey would be the early fall or the late spring.

There are, however, two additional considerations. The first is holiday seasons. Response rates will be low during these times since people feel rushed and busy. It is best not to schedule the survey around these times. The second factor is noise impact. Noise itself varies throughout the year, depending on the weather conditions of an area. For example, in colder areas, there is generally less noise impact on residents in winter since they tend to sleep with windows shut. As a general rule, the warmer periods are better for assessing the impact of noise.

2.5.2 Organizing Resources: Space and Budget

To have sufficient space for handling the survey operations, obtain two large rooms, or three or four small rooms. It will be necessary to comfortably house the staff to perform editing, validating, and coding operations all at the same time. It is even a good idea to have enough space to give all the members of the staff places to keep their materials. Enough space should be available for storing questionnaires and for keeping them organized as they proceed through the operations. A system for storing which proved efficient during the test in Allentown was to use envelopes and large boxes. The questionnaires were first kept in envelopes, grouped by clusters. As they were returned and passed through the various office procedures, they would be moved from one large box to another. Finally, they were returned to the original envelopes. You will need storage for all the other materials as well. Remember that for reasons of confidentiality, you should ensure the security of some of the survey items, and so be able to lock them up at night.

You should also have access to at least two telephones. One of these phones must be kept open for contact with interviewers and for use by the Field Director, while the other will be used for validation. Access to any additional phones would be useful.

Besides space and telephone costs, there will be the following expenses. First, there are printing costs for most of the forms, labels, as well as the questionnaires, which are contained in the Appendices. Second, there are funds for listers and interviewers. In some cases, you will be able to obtain volunteers for these jobs, but in other cases, you will have to hire workers. In either case, since both these jobs involve travel, a car is almost a necessity and you will have to budget travel costs. Third, there are costs for stationery, postage, and secretarial help. Finally, there may be unforeseen expenses for special stationery costs, special maps, photocopying, extra travel expenses, etc.

2.5.3 Organizing Senior Staff

The personnel available will vary from community to community. Therefore, the discussion of allocating staff and defining roles will be a general one and the organization will be left to you.

It is strongly recommended that two senior staff be responsible for implementing the survey and that they be given assistants. One of the senior staff should be the Field Director and the other should be the Coding Director. The Field Director should be responsible for all field operations – sample selection, the preparation of questionnaires, the training of listers, the administration of the listing operations, the training of interviewers, the assigning of interviewers to clusters and the administration of field procedures, the logging of returned questionnaires, the editing of questionnaires, and the validation of some questionnaires. The Coding Director should be responsible for all coding operations – the logging of edited questionnaires, the training of coders, the supervision of coders, quality control of coding, and the preparation for keypunching. In practice, however, these two roles are not so clearly distinguished. It is essential that both senior staff work closely with one another, know each other's tasks, and maintain a high degree of coordination. Continual communication between these staff members will make operations more effective and efficient.

The people selected as senior staff should have certain qualities. First, they should enjoy handling complex tasks since the survey includes a multitude of different tasks being carried out simultaneously. Second, they should be capable of handling unexpected situations. These are bound to occur despite the definition of systematic rules and procedures. Third, both senior staff should enjoy managing people. Much of the survey operation is a task in effective management – coordinating people and their responsibilities and intervening when difficulties arise. Hence, experience in management is a good prerequisite.

Assistants to the senior staff will be extremely helpful during the first few weeks of interviewing when it will be necessary to coordinate multiple tasks. Assistants

will also be helpful during the periods when the staff are preparing kits for listers or for interviewers. Having assistants will make operations more efficient, keep mistakes at a minimum, and prevent a backlog from developing. These are crucial issues for maintaining tight control and ensuring a high quality of information-gathering.

2.5.4 Setting Up a Timetable

Once you have read through the manual and organized the various resources and personnel that are available, try to envision what each of the tasks involves and determine a tentative timetable of operations. This will make it easier to be prepared when the time comes to begin the next task. For example, personnel must be ready to do their work, which means they must be adequately trained, and efficient training sessions require planning and preparation of materials. By using the timetable as a guide, it is possible to anticipate the upcoming tasks and be fully equipped and staffed to carry them out.

Figure 2.5-1 presents a model timetable. In the model, the entire survey operation takes 5 months. However, you may find that some tasks will take less time while others will take more. As far as organizing materials, the sample selection items should be obtained immediately, and next the materials for the listers. The questionnaires and other materials for field operations should be prepared while the sample is being taken. After organizing a senior staff, the next personnel consideration is organizing a pool of about five listers who will be needed for about 2 weeks of work. Since it takes time to recruit interviewers, begin the process as soon as possible. A pool of 30 to 40 should make it possible to finish the operations within 8 to 10 weeks. The editor, validator, and coders can be chosen from this pool. Be sure to have secretarial assistance available.

A timetable will help you adjust the flow of operations as well as give a sense of structure and control over the research system. However, it will certainly be necessary to operate with a large measure of flexibility since survey work involves many unforeseen situations.

OPERATIONS	NUMBER OF WEEKS																					
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1. Planning for the Survey																						
2. Sample: Stratification of Areas and Noise Zones																						
3. Sample: Cluster Selection																						
4. Sample: Household Listing																						
5. Sample: Household Selection																						
6. Print & Prepare Questionnaires & Letters of Introduction																						
7. Select & Train Field Personnel																						
8. Allocate Households to Interviewers																						
9. Field Management of Interviewing																						
10. Editing of Questionnaires																						
11. Validation of Questionnaires																						
12. Coding of Questionnaires																						
13. Final Check of All Questionnaires by Staff																						
14. Keypunching of Computer Cards																						
15. Cards Submitted for Analysis																						

Figure 2.5-1. A Model Timetable for Survey Operations

2.6 Checklist of Materials for Sample Selection and Survey Implementation

The following provides a checklist of the data, forms, and work materials which are required to carry out the study. The data are discussed in detail in Section 3.1. Copies of all forms – A through M – are contained in the Appendices. Appendix B contains the forms for sample selection – Forms A through I, and a Letter of Introduction to Selected Households. Appendix E contains the Listing Handbook. Appendix F contains the questionnaire materials which must be assembled in the cluster kits. Appendix G contains the Interviewer Handbook. Appendix H contains the forms for field management – Forms J through M, and an Interviewer Application Form. Appendix I contains the Coding Handbook.

A. Materials for Sample Selection

1. Stratification

- Census Tract Maps
- Detailed Street Map and/or Aerial Photo
- Land Use Data
- Central City Data
- Population Density Data
- Highway Traffic Data
- Construction and Demolition Data at Block Level
- Railroad Operations Data (if relevant)
- Airport Noise Data (if relevant)
- Stationary Noise Source Data (optional)
- Planning and Development Data
- Population Data
- Socioeconomic Data
- Housing Data
- Topographical and Ecological Data
- Work Materials: colored pencils, ruler, #2 pencils, erasers, paper, etc.

2. Cluster Selection

- Census Block Statistics
- Residential Construction and Demolition Data
- 150 copies Form A
- 2 copies Form B (including continuation pages)
- 2 copies Form C (including continuation pages)

3. Listing Households

- 120 copies Form D
- 120 copies Form E
- 120 copies Form F (F-1 through F-7)
- 50 copies Form F (F-8 through F-14)
- 2 copies Form G (including continuation pages)
- 10 copies Listing Handbook
- Work Materials: clipboards, pencils, etc.

4. Household Selection

- 120 copies Form H (including continuation pages)

5. Preparation of Kits and Letters of Introduction

- 120 copies Form I
- 1000 Questionnaires
- 50 sets of Respondent Handcards
- 1000 gummed Respondent Selection Labels
- 1000 Informed Consent Statements
- 1000 Call-Back Cards
- 1000 Thank-You Cards
- 800 Letters of Introduction to Selected Households
- Work Materials: clipboards, pencils, etc.

B. Materials for Survey Implementation

1. Selection of Field Personnel
   - 75 Interviewer Applications

2. Training of Field Personnel
   - 60 Interviewer Handbooks

3. Allocating Household Assignments to Interviewers
   - 150 copies Form J
   - 150 copies Form K

4. Validating of Questionnaires
   - 500 copies Form L

5. Coding of Questionnaires
   - 150 copies Form M
   - 8 Coding Handbooks

CHAPTER 3

Sample Selection

3.0 INTRODUCTION

This chapter outlines the detailed procedures for selecting a sample of approximately 700 households from the community. The sample procedures have been designed to serve a city with a population size varying between 50,000 and 150,000 people. If the population of the city is smaller than 50,000 or much greater than 150,000, then this design will have to be modified. Contact your regional Noise Abatement and Control Office of the U.S. Environmental Protection Agency for further guidance. Appendix A lists the regional offices.

To make the best use of this chapter, first skim it entirely. Then carefully read each section in order.

3.1 Information Required for Sample Selection

This section lists the information required for the sample design and suggests how to obtain it. Make every effort to gather complete and accurate data; otherwise, you will be unable to take the sample correctly. How to use the information is discussed in the subsequent sections.

3.1.1 Data for Defining Noise Zones

1. Maps – Obtain census tract maps from the most recent census. See Section 3.1.3 for a discussion of how to obtain data from the Census Bureau. More detailed street maps as well as aerial photos will be helpful.

2. Land Use Data – This will normally take the form of maps of existing land use which are usually available from municipal or county planning or engineering offices. The information should describe the existing land use in all portions of the city. (Note that while land use zoning maps may be used as guides, they may not reflect actual land use since some areas may have undergone development or zoning changes.)

3. Central City Data – Contact local sources for general information about land use, land values, activities, business interests, public transportation systems, and public services in the central area of the city. Discuss the characteristics of the central area with members of local offices to help distinguish a Central Business District from peripheral areas.

4. Population Density Data – From the local urban planning office, obtain as detailed information as possible for population densities throughout the city. The data should indicate density as the number of people per square mile (or per square kilometer or per acre). If this numerical population data is not available, try to obtain information based on qualitative statements of density, such as "low," "medium," etc. This type of information may be prepared in map form.

5. Highway Traffic Data – Obtain Average Daily Traffic (ADT) counts for all roadways and limited access highways in the city. (ADT is the average number of vehicles that pass a given point traveling either direction in one day.) This data is typically available in map form and Figure 3.2-3 (Section 3.2) illustrates an example. ADT counts are usually available for all types of roads from municipal transportation, highway, engineering or planning offices. If these sources do not have the data, contact similar county or state departments. (Note that ADT counts are usually not conducted for all streets with traffic flows less than 6,000 vehicles per day. For the purposes of this survey, however, it will only be necessary to identify those streets in this range for which ADT data are available.)

6. Construction and Demolition Data – From the planning office obtain the most complete data on construction and demolition, including information about new blocks and about housing changes within a block. The data should refer to industrial and commercial areas, any previously vacant areas, and to residential areas.

7. Railroad Operations Data (required for communities with railroads) – For each local through-route in the city, obtain the average number of day and night operations; that is, the average number of times trains travel on a route in the daytime (7AM to 10PM) and in the nighttime (10PM to 7AM). This information is usually available from the railroad company Linemaster, Dispatcher, Superintendent of Line Operations, or Engineering Department. (Information about operations at railroad yards is discussed in item 9. below.)

8. Airport Noise Data (required for communities with airports) – Obtain noise level contours for local military, commercial, and general aviation airports. This may include airports located near but not actually within the city if there is noise influence extending into the community. The contours may be in terms of any of the four common methods, listed below, for describing the levels of noise that result from airport operations.

   Day-Night Average Sound Level (L_{dn})
   Noise Exposure Forecast (NEF)
   Community Noise Equivalent Level (CNEL, used only in California)
   Composite Noise Rating (CNR).

   If more than one system of contours is available for an airport, the L_{dn} contours are preferred, followed by NEF and CNEL. Use CNR contours only if these are the only ones available for a particular airport. The same system need not be used for all airports influencing the study area.

   Noise contours will be available for any airport which has been required by the Federal Government to prepare an Environmental Impact Statement (EIS). Contours will not be available for some small general aviation airports for which an EIS has not been required. These small airports will have minimal noise influence and it will not be necessary to obtain noise data for them. Airport noise contours for civil airports can usually

be obtained from airport planning agencies, airport managers, municipal planning departments, or regional Federal Aviation Administration (FAA) offices. Contours for military airports are normally available through the office of the facility commander. A typical set of airport noise contours is shown in Figure 3.2-2 (Section 3.2).

9. Stationary Noise Source Data (optional).– Obtain information that will allow you to identify and list stationary noise sources which have a significant noise influence in a residential area. Examples of such sources are: refineries, power plants, major construction sites, sewage plants, race tracks, sports stadiums, or railroad yards. A minimum of a few blocks must be affected by the noise source and it must be a more or less permanent one – that is, in the area for approximately a 1-year period. Municipal law enforcement, environment or health and safety departments, newspapers, or citizens groups may have information on stationary noise sources which have these characteristics.

3.1.2 Data for Defining Areas

1. Maps – Obtain census tract maps from the most recent census.

2. Planning and Development Data – Contact the planning office or community development office to determine whether various geographical areas have been delineated as part of a planning or development program. If such areas have been established, you will probably want to incorporate them into the sample design, in which case the data described in items 3. through 6. below may not be required.

3. Population Data – Besides information on population density, gather data about the distribution of different ethnic or racial groups, as well as demographic groupings of age, sex, and marital status.

4. Socioeconomic Data – Obtain information about the distribution of high versus low income groups, of different educational groups, and of occupational groups.

5. Housing Data – Obtain information which describes the land use patterns in residential areas. This should indicate whether areas are owner-occupied versus renter-occupied, and whether single or multiple dwellings predominate.

6. Topographical and Ecological Data – Obtain aerial photos and detailed maps of the city which clearly delineate the natural characteristics of the community, such as lakes, rivers, hilly areas, etc. Such photos are typically available from municipal or county engineering departments.

3.1.3 Data for Cluster Sampling

1. Census Data – Obtain Census Block Statistics and census tract maps from the most recent census. The Block Statistics information is printed for all cities which had populations over 50,000 in 1970. Table 3.1-1 lists all cities for which the data are available and the report number for the particular book.
(Note that if a community is not listed, there still may be census data available. The reports cover "urbanized areas" and hence often include small cities around a large urban center. Additionally, the "Selected Areas" reports may include data for your community.) The Census Bureau can give more detailed information about what is available. Table 3.1-2 lists the regional offices of the U.S. Census Bureau and how to contact them.

2. Residential Construction and Demolition Data – The Block Statistics report gives the number of housing units or households on every city block at the time the census was taken. This information is crucial

Table 3.1-1

List of HC(3) Block Statistics Reports*

Report number	Area
	ALABAMA
1	Birmingham
2	Gadsden
3	Huntsville
4	Mobile
5	Montgomery
6	Tuscaloosa
7	Selected Areas
	ALASKA
8	Selected Areas
	ARIZONA
9	Phoenix
10	Tucson
11	Selected Areas
	ARKANSAS
12	Fort Smith
13	Little Rock-North Little Rock
14	Pine Bluff
15	Selected Areas
	CALIFORNIA
16	Bakersfield
17	Fresno
18	Los Angeles-Long Beach
19	Oxnard-Ventura-Thousand Oaks
20	Sacramento
21	Salinas
22	San Bernardino-Riverside
23	San Diego
24	San Francisco-Oakland
25	San Jose
26	Santa Barbara
27	Simi Valley
28	Stockton
29	Selected Areas
	COLORADO
30	Colorado Springs
31	Denver
32	Pueblo
33	Selected Areas
	CONNECTICUT
34	Bridgeport
35	Bristol
36	Hartford
37	Meriden
38	New Britain
39	New Haven
40	Norwalk
41	Stamford
42	Waterbury
	DELAWARE
43	Wilmington
	DISTRICT OF COLUMBIA
44	Washington
	FLORIDA
45	Fort Lauderdale-Hollywood
46	Jacksonville
47	Miami
48	Orlando
49	Pensacola
50	St. Petersburg
51	Tallahassee
52	Tampa
53	West Palm Beach
54	Selected Areas
	GEORGIA
55	Albany
56	Atlanta
57	Augusta
58	Columbus
59	Macon
60	Savannah
61	Selected Areas
	HAWAII
62	Honolulu
63	Selected Areas
	IDAHO
64	Boise City
	ILLINOIS
65	Aurora-Elgin
66	Bloomington-Normal
67	Champaign-Urbana
68	Chicago-Northwestern Indiana
69	Decatur
70	Joliet
71	Peoria
72	Rockford
73	Springfield
74	Selected Areas
	INDIANA
75	Anderson
76	Evansville
77	Fort Wayne
78	Indianapolis
79	Lafayette-West Lafayette
80	Muncie
81	South Bend
82	Terre Haute
83	Selected Areas

*Data from U.S. Bureau of the Census

The specific names listed below each State refer to urbanized areas; "Selected Areas" refer to other areas of the State which have contracted with the Census Bureau to provide block statistics.

Table 3.1-1 - Continued

Report number	Area
	IOWA
84	Cedar Rapids
85	Davenport-Rock Island-Moline
86	Des Moines
87	Dubuque
88	Sioux City
89	Waterloo
90	Selected Areas
	KANSAS
91	Topeka
92	Wichita
93	Selected Areas
	KENTUCKY
94	Lexington
95	Louisville
96	Selected Areas
	LOUISIANA
97	Baton Rouge
98	Lafayette
99	Monroe
100	Monroe
101	New Orleans
102	Shreveport
	MAINE
103	Lewiston-Auburn
104	Portland
105	Selected Areas
	MARYLAND
106	Baltimore
107	Selected Areas

Report number	Area
	MASSACHUSETTS
108	Boston
109	Brockton
110	Fall River
111	Fitchburg-Leominster
112	Lawrence-Haverhill
113	Lowell
114	New Bedford
115	Pittsfield
116	Springfield-Chicopee-Holyoke
117	Worcester
	MICHIGAN
118	Ann Arbor
119	Bay City
120	Detroit
121	Flint
122	Grand Rapids
123	Jackson
124	Kalamazoo
125	Lansing
126	Muskegon-Muskegon Heights
127	Saginaw
128	Selected Areas
	MINNESOTA
129	Duluth-Superior
130	Minneapolis-St. Paul
131	Selected Areas
	MISSISSIPPI
132	Biloxi-Gulfport
133	Jackson
134	Selected Areas

Report number	Area
	MISSOURI
135	Kansas City
136	St. Joseph
137	St. Louis
138	Springfield
139	Selected Areas
	MONTANA
140	Billings
141	Great Falls
142	Selected Areas
	NEBRASKA
143	Lincoln
144	Omaha
145	Selected Areas
	NEVADA
146	Las Vegas
147	Reno
	NEW HAMPSHIRE
148	Manchester
149	Selected Areas
	NEW JERSEY
150	Atlantic City
151	Trenton
152	Vineland-Milleville
153	Selected Areas
	NEW MEXICO
154	Albuquerque
155	Selected Areas

Table 3.1-1 - Continued

Report number	Area
	NEW YORK
156	Albany-Schenectady-Troy
157	Binghamton
158	Buffalo
159	New York-Northeastern New Jersey
	Part 1 - New York City
	Part 2 - New York Portion Outside New York City
	Part 3 - Northeastern New Jersey
160	Rochester
161	Syracuse
162	Utica-Rome
163	Selected Areas
	NORTH CAROLINA
164	Asheville
165	Charlotte
166	Durham
167	Fayetteville
168	Greensboro
169	High Point
170	Raleigh
171	Wilmington
172	Winston-Salem
173	Selected Areas
	NORTH DAKOTA
174	Fargo-Moorhead
	OHIO
175	Akron
176	Canton
177	Cincinnati
178	Cleveland
179	Columbus
180	Dayton
181	Hamilton
182	Lima
183	Lorain-Elyria
184	Mansfield
185	Springfield
186	Steubenville-Weirton
187	Toledo
188	Youngstown-Warren
189	Selected Areas
	OKLAHOMA
190	Lawton
191	Oklahoma City
192	Tulsa
193	Selected Areas
	OREGON
194	Eugene
195	Portland
196	Salem
197	Selected Areas
	PENNSYLVANIA
198	Allentown-Bethlehem-Easton
199	Altoona
200	Erie
201	Harrisburg
202	Johnstown
203	Lancaster
204	Philadelphia
205	Pittsburgh
206	Reading
207	Scranton
208	Wilkes-Barre
209	York
210	Selected Areas
	RHODE ISLAND
211	Providence-Pawtucket-Warwick
	SOUTH CAROLINA
212	Charleston
213	Columbia
214	Greenville
215	Selected Areas
	SOUTH DAKOTA
216	Sioux Falls
217	Selected Areas
	TENNESSEE
218	Chattanooga
219	Knoxville
220	Memphis
221	Nashville-Davidson
222	Selected Areas
	TEXAS
223	Abilene
224	Amarillo
225	Austin
226	Beaumont
227	Brownsville
228	Corpus Christi
229	Dallas
230	El Paso
231	Fort Worth
232	Galveston
233	Harlingen-San Benito
234	Houston
235	Laredo
236	Lubbock
237	McAllen-Pharr-Edinburg
238	Midland
239	Odessa
240	Port Arthur
241	San Angelo
242	San Antonio
243	Sherman-Denison

Table 3.1-1 – Continued

Report number	Area
	TEXAS (Continued)
244	Texarkana
245	Texas City-La Marque
246	Tyler
247	Waco
248	Wichita Falls
249	Selected Areas
	UTAH
250	Ogden
251	Provo-Orem
252	Salt Lake City
	VERMONT
253	Selected Areas
	VIRGINIA
254	Lynchburg
255	Newport News-Hampton
256	Norfolk-Portsmouth
257	Richmond
258	Roanoke
259	Selected Areas
	WASHINGTON
260	Seattle-Everett
261	Spokane
262	Tacoma
263	Selected Areas
	WEST VIRGINIA
264	Charleston
265	Huntington-Ashland
266	Wheeling
267	Selected Areas
	WISCONSIN
268	Green Bay
269	Kenosha
270	Madison
271	Milwaukee
272	Racine
273	Selected Areas
	WYOMING
274	Selected Areas
	PUERTO RICO
275	Mayagüez
276	Ponce
277	San Juan
278	Selected Areas

Table 3.1-2

U.S. Bureau of the Census
Field Data User Services Offices

(July 1977)

- 1365 Peachtree St., N.E., Room 625
  Atlanta, Georgia 30309
  Telephone: (404) 881-2274

- 441 Stuart St., 10th Floor
  Boston, Massachusetts 02116
  Telephone: (617) 223-0668

- 230 So. Tyron St., Suite 800
  Charlotte, North Carolina 28202
  Telephone: (704) 372-0711, ext. 351

- 55 E. Jackson Blvd., Suite 1304
  Chicago, Illinois 60604
  Telephone: (312) 353-0980

- 1100 Commerce St., Room 3C54
  Dallas, Texas 75242
  Telephone: (214) 749-2394

- 575 Union Blvd.
  P.O. Box 25207
  Denver, Colorado 80225
  Telephone: (303) 234-5825

- Federal Bldg., U.S. Courthouse
  231 W. Lafayette, Room 565
  Detroit, Michigan 48226
  Telephone: (313) 226-4675

- One Gateway Center
  4th & State Streets
  Kansas City, Kansas 66101
  Telephone: (816) 374-4601

- 11777 San Vicente Blvd., Room 810
  Los Angeles, California 90049
  Telephone: (213) 824-7291

- Federal Office Bldg., Room 4102
  26 Federal Plaza
  New York, New York 10007
  Telephone: (212) 264-3870

- William J. Green, Jr. Federal Bldg.
  600 Arch Street, Room 9244
  Philadelphia, Pennsylvania 19106
  Telephone: (215) 597-8314

- Lake Union Bldg.
  1700 Westlake Avenue North
  Seattle, Washington 98109
  Telephone: (206) 442-7080

for the sample design and, therefore, must be as up-to-date as possible. Obtain data on any changes in the number of households on a block that have occurred since the most recent census by gathering information about housing starts, demolition, construction of new blocks, consolidation of blocks, and so forth. Often current information may be obtained from a regional planning office, city engineer or tax assessor. Utility companies may be able to provide information about utility installations. It may even be necessary to visit some areas of the city in order to count changes in buildings and households. Use initiative to gather complete data. The more accurate the information obtained beforehand, the less correction will need to be made.

3.2 Stratification: Noise Zones and Areas

This section gives instructions for dividing the city into two strata: first, into noise zones; and second, into areas. The noise zones are defined on the basis of a predominance of activities with distinctive noise characteristics. The areas are defined on the basis of population, social, ecological and environmental characteristics. Although many of the noise zones are not residential zones, we nevertheless expect that there will be households in every zone. Furthermore, the sample is designed to select households from each zone as well as from each area.

3.2.1 Definition of Noise Zones

Noise Zones

In this sample design, as many as 16 basic noise zones can be defined, although there will probably be fewer. The zones are listed in Table 3.2-1. While 16 types of zones are given, many communities will not have all types. Some cities, for example, will not have an airport or a railroad. It is also very unlikely that communities with population sizes appropriate for this study will have any residential sections with very high densities ("Very High Density" is defined in STEP 12).

The names of the noise zones reflect the type of activity or land use for that area. For example, a railroad noise zone will consist of a strip of land alongside a railroad track, an area assumed to be influenced by train noise. However, there may be three or four railroad routes crossing a city. In this case, there is only one railroad noise zone but it is made up of three or four strips of land alongside each of the routes. Similarly, for the other zones, all areas which have the qualities of a particular zone type will be considered as a single zone. Thus, most of the "noise zones" will actually consist of many small individual areas located throughout the city. Figure 3.2-1 illustrates this concept. Each Stationary Source Noise Zone is considered separate since the concept of acoustic homogeneity within a zone must be maintained and each stationary source may exhibit quite different noise characteristics.

Table 3.2-1

Recommended Noise Zones

Noise Zone	Code Number
Stationary Source Noise Zone (Optional)	16
Airport Noise Zone A	15
Airport Noise Zone B	14
Railroad Noise Zone	13
Central Business District Noise Zone	12
Major Roadway Noise Zone A	11
Minor Roadway Noise Zone - High Volume	10
Highway Noise Zone	09
Minor Roadway Noise Zone - Low Volume	08
Major Roadway Noise Zone B	07
Commercial Noise Zone	06
Industrial Noise Zone	05
Residential Noise Zone - Very High Density	04
Residential Noise Zone - High Density	03
Residential Noise Zone - Medium Density	02
Residential Noise Zone - Low Density	01

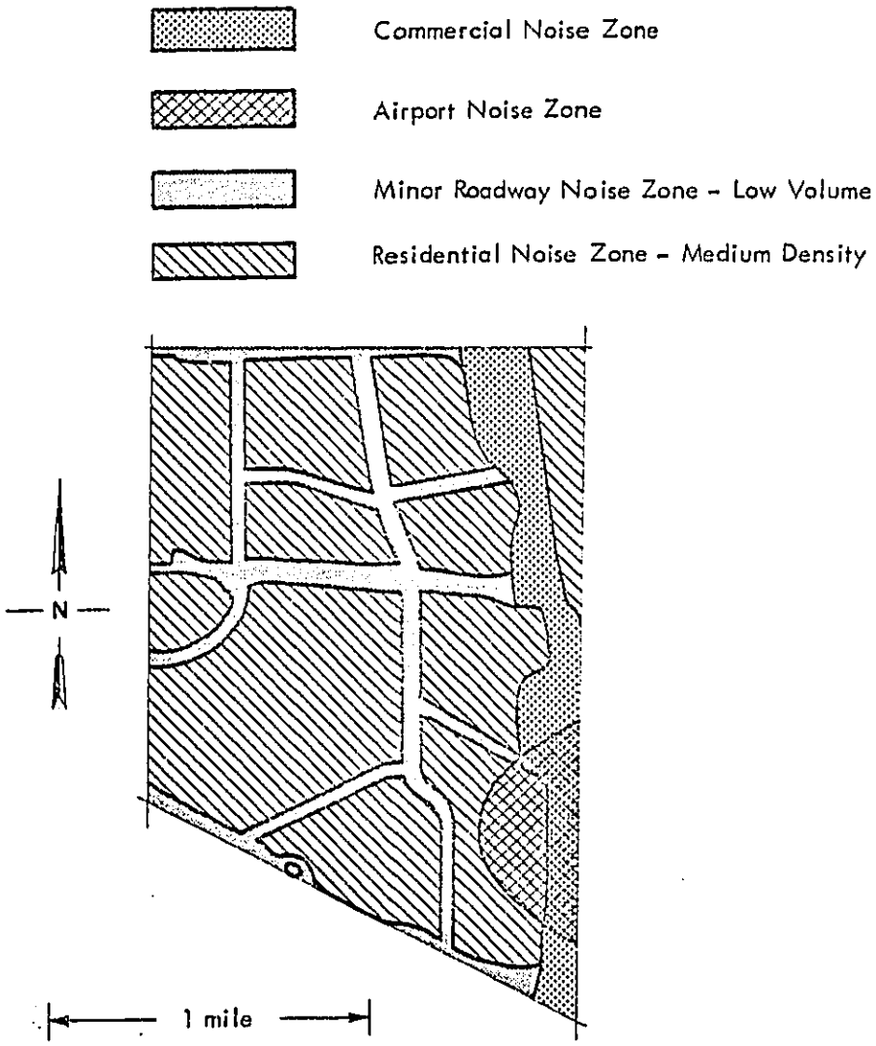


Figure 3.2-1. Example Noise Zones Plotted on a Portion of a City Map

It is important to realize that the noise zones which will be defined according to the procedures in this section are quite approximate. The definitions based on estimates of noise influence have been simplified for presentation in this workbook, but they are adequate for the sample design. The noise zones do not accurately define specific noise level contours or regions (with the exception of airport noise zones), and should not be used exclusively as a sharp geographical basis for community planning or the expenditure of public funds for relief from noise. In cases where accurate geographical delineations are required, qualified acousticians should be consulted.

Procedures for Plotting Noise Zones

STEP 1 – Obtain the Census Map of the City

Obtain the census tract maps of the city which were described in Section 3.1.1. While the noise zone boundaries will be plotted on these maps, any other detailed maps and/or aerial photos will be useful for defining zones.

STEP 2 – Review Data

All the data listed in Section 3.1.1 will be utilized in STEPS 3 through 12 to define noise zone boundaries. At each step, the information will have to be studied carefully.

Two types of data, however, are discussed in order to provide definitions about the information which they contain:

a. Airport Noise Data – A typical set of airport noise contours is shown in Figure 3.2-2. The contour marks the boundary of an area with a certain level of noise exposure. Within the NEF 40 contour in Figure 3.2-2, for example, there is one level of noise exposure. Between that line and the NEF 30 contour, there is a different (lower) level of noise exposure.

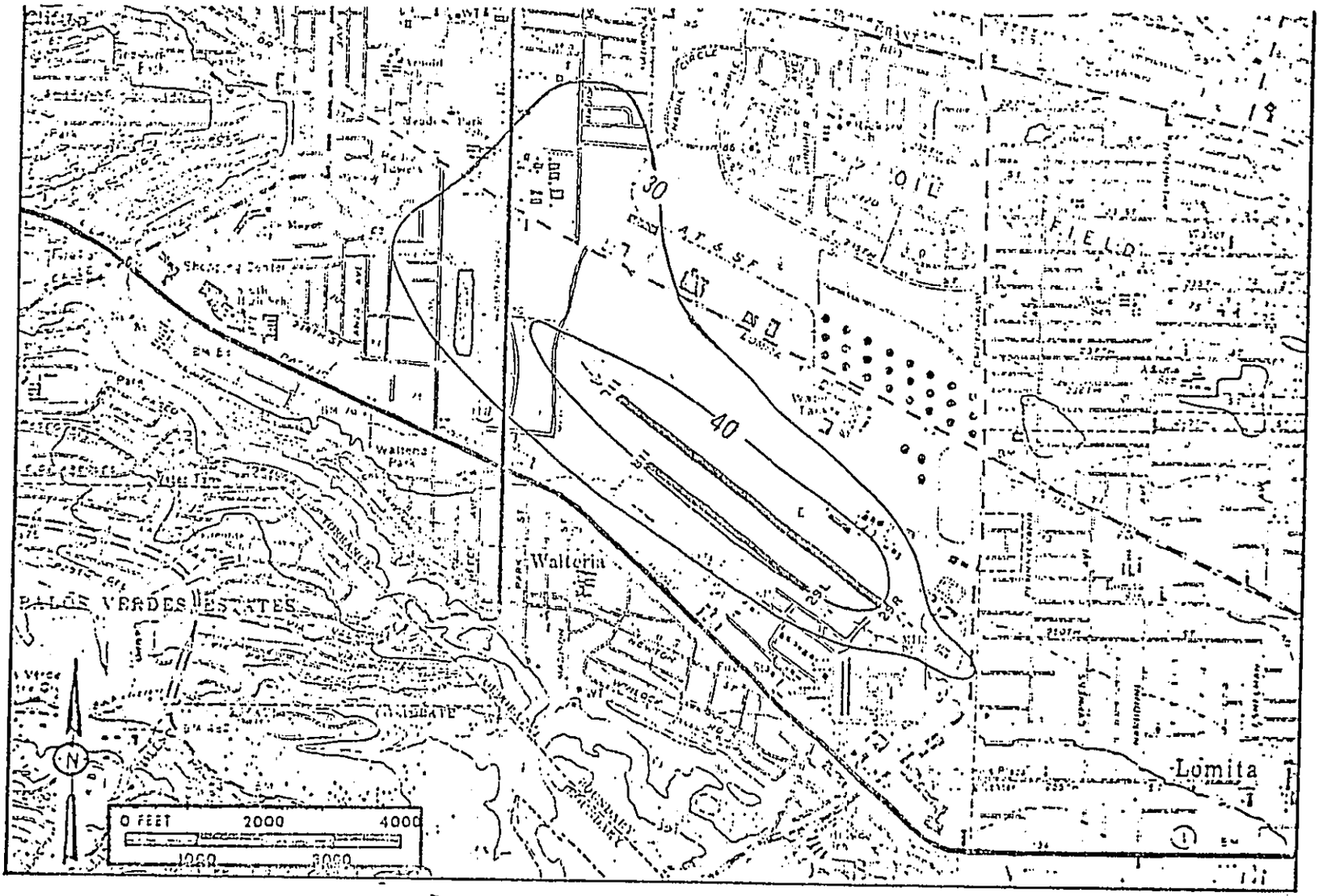


Figure 3.2-2. Hypothetical NEF Contours for a Small Airport

b. Highway Traffic Data – Many times Average Daily Traffic (ADT) counts are indicated on a road map with ADT values given for points along the roadway. An example of such a map is presented in Figure 3.2-3. In the map of Torrance, California in this figure, Crenshaw Boulevard represents an active street. From the northernmost point to the southernmost point, the ADT counts are as follows: 29,400; 33,700; 43,400; 46,700; 34,100; 40,900; 25,700; 30,700; 26,700; 19,700. These traffic flow counts were taken at various places on Crenshaw Boulevard and are indicated on the map.

STEP 3 – Update the City Map(s)

Using the data on land use, construction, and demolition, pinpoint areas of the city which have undergone recent construction changes – both new building and demolition. You may need to refer to the data about these areas when plotting the noise zone boundaries.

STEP 4 – Consider Noise Zone Codes

Code numbers have been assigned to the noise zones and are listed in Table 3.2-1. These numbers represent a very approximate ranking of assumed noise levels for the zones such that the lowest code number represents the quietest zone and the highest number represents the noisiest zone. The noise environment in each noise zone will be influenced by a variety of noise sources. However, any household in the city can be assigned to only one zone. Logically, then, the type of noise source that has been assumed to have the greatest noise impact determines the definition of the zone. For example, a railroad through-route may cross a minor roadway. The households adjacent to the roadway and railroad are exposed to both types of noise; however, since the railroad (code 13) is assumed to have a greater noise impact than the roadway (code 08 or 10), then the area will be plotted as a railroad zone.

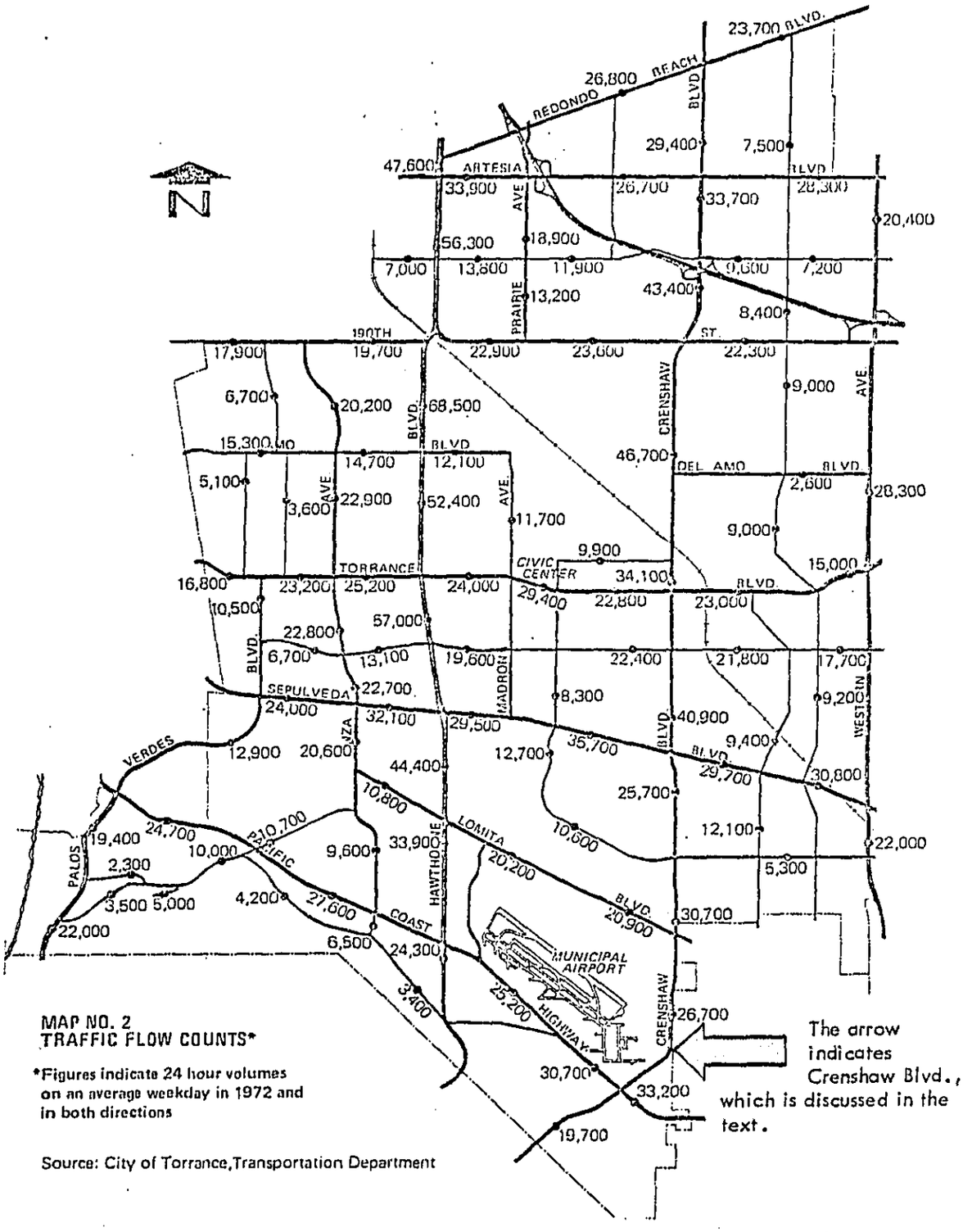


Figure 3.2-3. Typical Traffic Flow Map Showing Average Daily Traffic Counts (ADT).

The logical way to plot zones, then, would be to plot the noisiest zone first, the next noisiest second, and so forth, through the quietest. Generally, the instructions for defining zones follow this logic in STEPS 5 through 12 below. However, in the cases of roadway and airport zones, explanations are given for plotting the same types of zones in a single step (i.e., all roadway zones – Major A and B, Minor Low Volume and High Volume, and Highways – in one step; both airport zones – A and B – in one step). The instructions are presented in this manner because it is the easiest method of explanation. However, once you have a general idea for plotting the zones, you can proceed to do this most logically; i.e., defining zones in order from noisiest to quietest.

In addition to having a unique code number, each noise zone must be assigned a unique color code. It might become difficult to establish as many as 16 unique colors. Therefore, you might consider obtaining a large set of colored pencils, or using a combination of materials (e.g., crayons, pencils, felt pens, etc.).

STEP 5 – Estimate and Plot Stationary Source Noise Zones

The definition of any stationary source noise zone is optional and therefore should only be considered if the investigation of a particular noise environment is very important. Examples of noise sources which may be the basis of a stationary source noise zone are: refineries, power plants, major construction sites, sewage plants, race tracks, sports stadiums, or railroad yards. A minimum of a few residential blocks must be affected by the noise source and it must be a more or less permanent one; that is, in the area for approximately a 1-year period. If such a source exists, however, do not automatically define a noise zone around it. Only if the source is assumed to have an impact on a residential area, and the community is interested in assessing this impact, then consider it a noise zone.

If a stationary source noise zone is to be established, define it by establishing an area of influence around the noise source. Plot the noise zone(s) on the census maps by estimating the boundaries according to the following procedures:

a. On the map, locate the stationary noise source(s) which will be considered.

b. Determine the noise zone boundary by making a site visit to identify the approximate area of audible influence. Starting from several points around the noise source perimeter, walk or travel directly away from the source into the affected surrounding areas until the sounds from the source appear to be masked about half the time by sounds produced in the area such as traffic in local streets, children at play, etc. The location where this occurs marks one point on the noise zone boundary. Perform an adequate number of these "walk-away" tests (normally, between four and eight) to sufficiently define a smooth noise zone boundary for the source. All tests should be performed over a short period of time, during nonpeak traffic hours and normal weather conditions, and when the noise source is audible to at least a normal degree.

NOTE: It is possible that during a "walk-away" test, a roadway or highway noise zone will be encountered within which sounds from the stationary source are completely drowned out. If this occurs, be sure to continue the test on the far side of the roadway noise zone to check whether the noise from the stationary source becomes dominant once again as the roadway noise fades. If this is the case, the stationary noise zone will consist of areas on either side of the road. If not, the stationary source noise zone will merely stop when it meets the roadway noise zone. Similarly, "acoustical shadow areas" will be encountered where a tall building or other large object acts as a noise barrier to shield a small area from the noise source. If such an area is entered during the test, continue past the shielding object for a distance of about five times its height to determine if the source noise becomes dominant beyond the shadow area. Include any such shadow areas in the stationary source noise zone.

c. Using the colored pencil which corresponds to the code assigned to Stationary Source Noise Zones, plot the boundaries for the noise zone on the census maps. If an area has had a significant complaint history for the source but the procedure in b. fails to incorporate it, adjust the boundaries to include the area.

STEP 6 – Estimate and Plot Airport Noise Zones

Plot the zones around airports to follow the patterns of conventional airport noise contours. The actual boundary of the zone must follow the local streets that are nearest the contour so that the boundary does not split a block. It may cross large open spaces that do not contain residences. Normally, two airport noise zones will be established by following the procedures.

a. For each airport, review the available independently prepared airport noise contours to determine whether the L_{dn}, NEF, CNEL, or CNR system is used. If more than one system of contours is available for an airport, the L_{dn} contours are preferred, followed by NEF and CNEL. Use CNR contours only if these are the only ones available for a particular airport. The same system need not be used for all airports influencing the study area.

b. For the airport noise contour system being used, plot individual noise zone boundaries following the contour lines around each airport on the study base map as follows:

L_{dn} 75 and L_{dn} 65, or
NEF 40 and NEF 30, or
CNEL 75 and CNEL 65, or
CNR 110 and CNR 100.

If only the lower numbered contour line is shown, plot a boundary along that line only. If all of the contours given for an airport which fall outside the airport boundary have values less than L_{dn} 65, NEF 30, CNEL 65, or CNR 100, then no airport noise zones need be considered.

Similarly, if the airport is so small that an EIS has not been required, and no contours exist, it is not necessary to consider the airport noise influence in the survey. Airport contours and noise zones may be plotted across vacant land areas.

c. Indicate the areas bounded by these contours to be either an Airport Noise Zone A or an Airport Noise Zone B, based on Table 3.2-2, regardless of the type of land use or other noise zones covered.

Table 3.2-2

Airport Noise Zone Criteria

Airport Noise Contour	Airport Noise Zone
Greater than:	
L_{dn} 75	Airport Noise Zone A
or NEF 40	
or CNEL 75	
or CNR 110	
Between:	
L_{dn} 65 and L_{dn} 75	Airport Noise Zone B
NEF 30 and NEF 40	
CNEL 65 and CNEL 75	
CNR 100 and CNR 110	

One color should be assigned to indicate all Airport Noise Zone A areas and another to show all Airport Noise Zone B areas when plotting around all airports. An example of plotted airport noise zones is shown in Figure 3.2-4, based on the NEF contours shown in Figure 3.2-2.

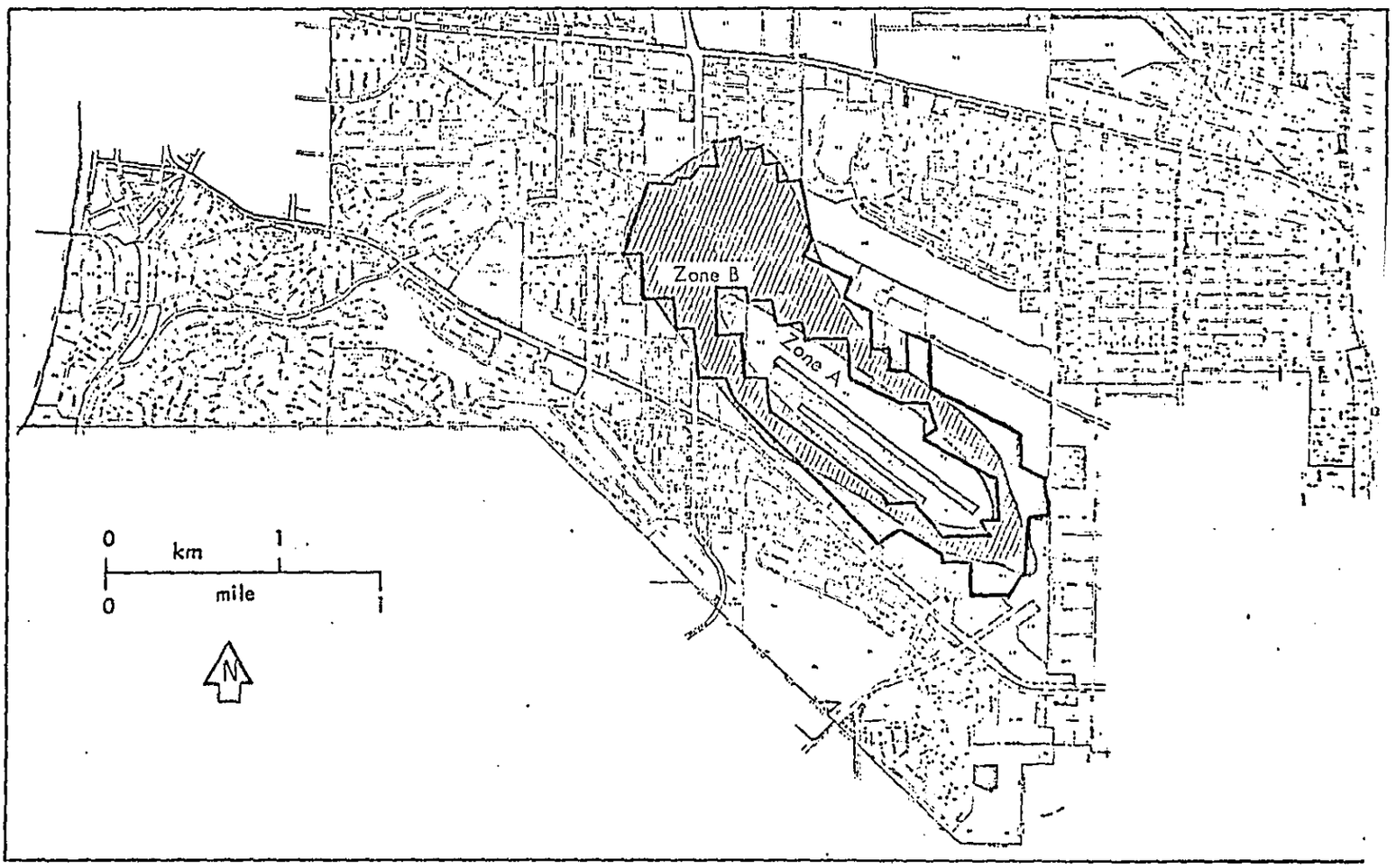


Figure 3.2-4. Example Plot and Labeling of Airport Noise Zones Based on the Hypothetical Data Shown in Figure 3.2-2

STEP 7 – Estimate and Plot Railroad Noise Zones

Railroad noise zones will be plotted along either side of a railroad through-route. Depending on the number of operations on the through-route, the width of the noise zone that will be plotted on either side of the railroad tracks will vary.

a. Review the data obtained in Section 3.1.1 to determine the number of day and night operations for each railroad route. If several parallel tracks run along close together for a distance, consider this length of several tracks as one route. Remember, daytime should be taken as 7AM to 10PM and nighttime as 10PM to 7AM. If the only operations data available were for different but similar time periods, such as 6AM to 9PM, etc., these data may be used instead in the following steps.

b. For each route, calculate the equivalent number of operations, N, which is equal to the number of daytime operations plus 10 times the number of nighttime operations:

$$N = N_{day} + 10\,N_{night}.$$

c. The noise zone area around each railroad route will consist of a strip of land following along the route and extending a certain width to each side of the track. Determine the width of the railroad noise zone for each railway from Table 3.2-3.

For example, if there are an average of two daytime operations and five nighttime operations, the equivalent number of operations, N, is

$$N = 2 + 10 \times (5) \approx 52.$$

Thus, from Table 3.2-3, the railroad noise zone half-width (track to outer edge) is 152 meters (500 feet). The plotting of this zone is shown for a portion of an example community in Figure 3.2-5.

Note that if N is less than 5, no railroad zone need be considered for that route.

Table 3.2-3

Railroad Noise Zone Width from Track

Equivalent Number of Train Operations $N = N_{day} + 10N_{night}$	Railroad Noise Zone Width from Track Centerline, in meters (feet)
< 5	No Railroad Zone
5 to 7	31m (100')
8 to 10	46m (150')
11 to 16	61m (200')
17 to 19	76m (250')
20 to 35	92m (300')
36 to 50	122m (400')
51 to 80	152m (500')
81 to 140	183m (600')
141 to 250	244m (800')
251 to 400	305m (1000')

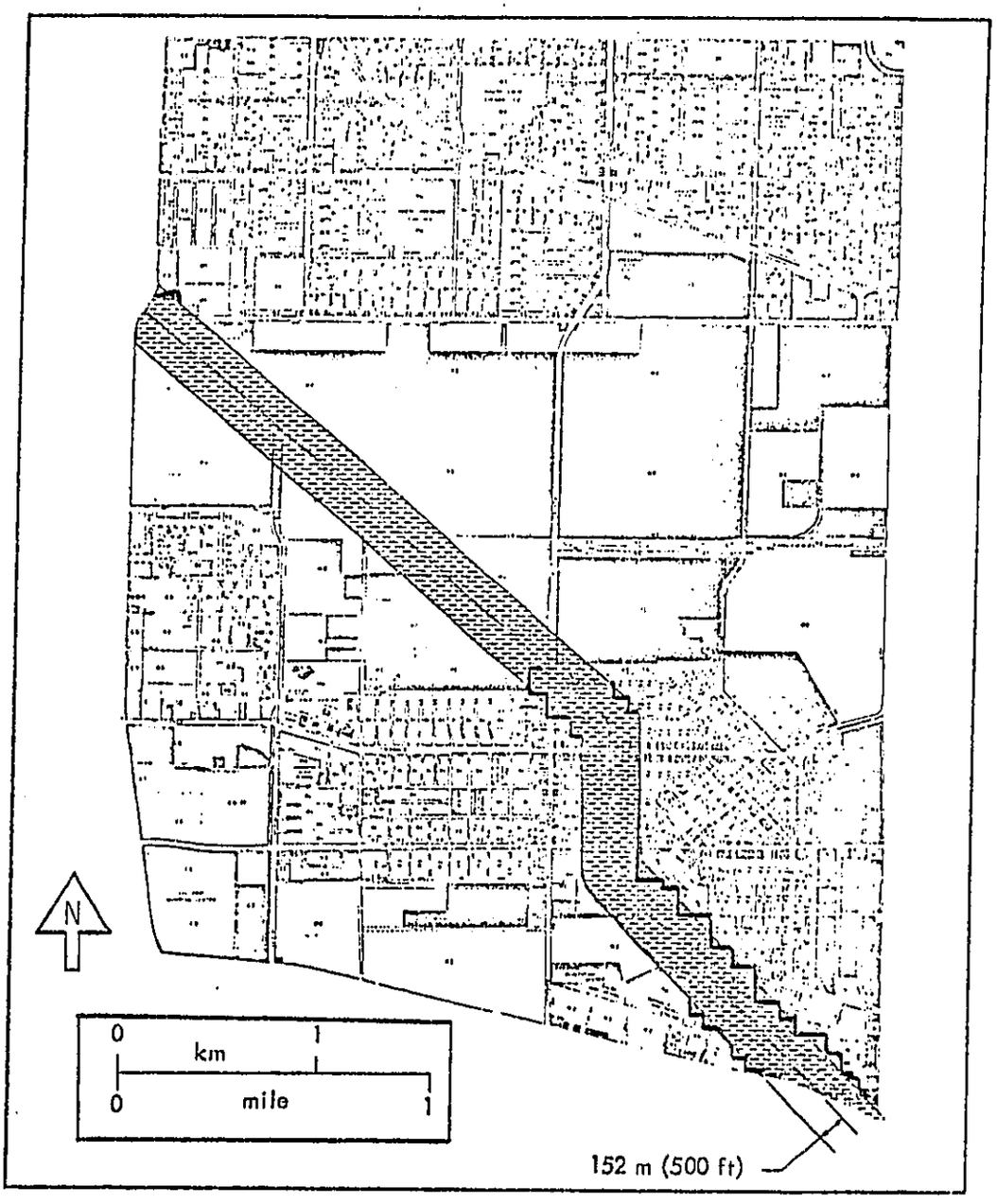


Figure 3.2-5. Example Plot of Railroad Noise Zone

d. Plot a railroad noise zone along each side of each route regardless of adjacent land use. However, do not extend the railroad zone into regions already covered by an airport or stationary source noise zone.

It is likely that in many instances, the boundary for the zone will not fall on a natural boundary such as a street or alley. However, you may extend the boundary up to a distance less than or equal to the width determined in item c. so that it corresponds to a natural boundary. To the extent this can be done, it will facilitate the sampling procedures in Sections 3.3 to 3.6. If the zone cannot be expanded a distance great enough to meet a natural boundary, then plot the width determined in item c.

STEP 8 – Estimate and Plot Central Business District (CBD) Noise Zone

Establish the boundaries of a Central Business District (CBD). For this noise zone, the boundaries must be delineated along streets so that only entire blocks are designated in the CBD. Use the following guides to establish zone boundaries, relying on your understanding of the city to determine where CBD activities do or do not occur:

a. Consider the list of CBD characteristics:

1. Tends to be the approximate center of the urban area.
2. Intensive land use - little vacant or public land.
3. Highest land values.
4. Highest concentration of multi-story buildings (including tallest).
5. Highest daytime population.
6. High concentration of:

- Offices - including headquarters of establishments.
- Retail businesses (not wholesale or commercial storage).

- Theaters
- Hotels
- Services (finance, insurance, etc.)
- Public and organizational type buildings.
- Multi-story parking structures or high-density parking lots.
- Older cities - established small manufacturing firms.
- Buildings with transient residents.

7. Wide diversity of shops, goods, and services.
8. High traffic flows.
9. Center of city's mass transportation.

b. Locate on the map the (most likely) central area which incorporates these characteristics. It may be necessary to travel to some sections of the city to make a determination of the boundaries for the CBD. In general, if blocks which are near the boundary have at least one-half CBD type land use, include them in the CBD. In addition, pockets within the CBD which have little CBD land use, but which are clearly surrounded by CBD land use (e.g., a park), should be included in the CBD. However, do not include strip commercial areas extending outside the CBD along roads. Determine the boundaries for the CBD along streets.

c. Plot the boundaries for the CBD noise zone on the map, using the appropriate color code. If the unlikely situation arises in which the CBD, as it is defined, incorporates an already established noise zone (airport, railroad, or stationary source), then do not superimpose the CBD zone over these previously defined zones.

STEP 9 – Estimate and Plot Roadway Noise Zones

Roadway noise zones will be drawn along each side of Minor Roadways, Major Roadways, and Highways.

- For purposes of this survey, Minor Roadways are considered to have Average Daily Traffic Counts $4000 \leq ADT < 36,000$

  Low Volume: $4000 < ADT < 12,000$
  High Volume: $12,000 \leq ADT < 36,000$

- Major Roadways are considered to have $ADT \geq 36,000$
- Highways are limited access roads such as tollways or freeways

Note: The ADT count often varies along different segments of the same roadway so that some segments of a street may constitute a major roadway and other segments may be a minor roadway. However, ADT counts are normally given for points rather than for segments of streets. Therefore, if it is necessary to distinguish between minor and major roadway segments of a street, use intersections with major crossroads which appear on the traffic flow map as the boundaries for the segments.

a. Locate on the survey map the two groups of minor surface roadway segments for which traffic data indicate ADT between 4,000 and 12,000 vehicles per day, and between 12,000 and 36,000 vehicles per day. Further, identify the portions of these roads that are not yet included in noise zones, or are within or adjacent to vacant land use areas. Frequently, many roadways in the 4,000 vehicle per day range have not undergone ADT measurements. For the purpose of this zone identification, it is only necessary to locate those roadways for which ADT data are available.

b. Plot sections of the minor roadway noise zones along each side of the portions of these roads where the zone would cover as yet unzoned or vacant areas. The zones should not be plotted over areas already covered by an airport, railroad, stationary source, or the CBD zone.

Designate separately the zones for roads with ADT from 4,000 to 12,000 vehicles per day, and from 12,000 to 36,000 vehicles per day. The noise zone along the former will be called the minor roadway low volume noise zone, and the latter will be named the minor roadway high volume noise zone. For each zone type, the zone width on each side of the road should equal the average distance from the pavement to the far end of the adjacent residential property along the road, or 61 meters (200 ft), whichever is less. Plot these areas on the map, using the color codes assigned to Minor Roadway Low Volume and Minor Roadway High Volume zones.

c. Locate on the base map all major surface roadways for which traffic data indicate ADT greater than 36,000 vehicles per day, and identify the portions within or adjacent to vacant or as yet unzoned land. Two separate zones will be plotted around the major roadways, but neither should be plotted over areas covered by an airport, railroad, or the CBD noise zone.

d. Plot the first major roadway noise zone adjacent to each portion of these roadways as was done in item b. above. These zones should be plotted in an assigned color and collectively referred to as major roadway noise zone A.

e. Immediately outside of each major roadway noise zone A, plot a second zone in a different color. This outside zone should begin at the boundary of zone A and extend a sufficient distance from the road to include the second row of residences and their full lot depth, but not more than an additional 61 meters (200 ft). These collective areas should be referred to as major roadway noise zone B.

f. On the base map, locate the portions of all limited access highways within or adjacent to as yet unzoned or vacant land.

g. Plot a highway noise zone adjacent to each side of these highway sections where the zone will cover residential or open land, and does not interfere with an airport, railroad, or the CBD noise zone. The zone width on each side of the highway should equal the average distance from the pavement to the far end of the adjacent residential property along the highway but should not exceed 244 meters (800 ft). These areas should be plotted with the assigned color to indicate the collective highway noise zone.

h. Review the code numbers assigned to the roadway zones in Table 3.2-1 to be sure that the roadway zones have been defined in keeping with the instructions in STEP 4. That is, be sure that the zone with the highest assumed noise level covers zones with lower assumed noise levels.

STEP 10 – Estimate and Plot the Commercial Noise Zone

a. Determine the regions of commercial land use by examining maps of existing land use and any additional land use data. If necessary, use a land use zoning map, but with caution, since it may not reflect actual land use due to vacant land, zoning changes, etc.

b. To establish the boundaries of a commercial noise zone, identify all areas which have this actual land use and which are not included in the CBD. If such an outlying location consists of a normal sized block, half or more of which is devoted to commercial use, and the remainder is predominantly residential, then assign the entire block to the commercial noise zone. If less than half the block is commercial, and the remainder is residential, you will assign this block to one of the residential zones discussed in STEP 12 below. Use the unique color code to plot the commercial zone and color in these areas of the map which have not previously been covered by stationary source, airport, railroad, or roadway zones.

STEP 11 – Estimate and Plot the Industrial Noise Zone

a. Determine the regions of industrial land use by examining maps of existing land use and any additional land use data. If necessary, use a land zoning map, but with caution, since it may not reflect actual land use due to vacant land, zoning changes, etc.

b. To establish the boundaries of the industrial zone, identify all areas which have this actual land use and which are not included in the CBD. As with the definition of the commercial zone, if a block or parcel of land is half or more than half devoted to industrial activity, and the remainder is residential, include the entire parcel in the industrial zone. If less than half is industrial, you will assign the parcel to one of the residential zones. Using the assigned color code, plot the boundaries of the industrial noise zone and shade the areas on the map. Do not color in areas which have been previously defined by stationary source, airport, railroad, roadway, or commercial zones.

STEP 12 – Estimate and Plot the Residential Noise Zones

The areas on the map which have not been included in the noise zones already plotted will be almost entirely subject to residential or public use, or they may be vacant. Since all sections of the city must be colored, residential zones will be defined, and the public and vacant lands will be included in the Residential Low Density Zone.

a. Determine the locations of residential land use by examining the available maps and land use data.

b. Review in detail the population density data discussed in Section 3.1.1. Establish the following zones using these population density guidelines.

Residential Low Density Noise Zone: 0 to 2000 people per square mile (0 to 770 people per square kilometer or 0 to 3 people per acre)

Residential Medium Density Noise Zone: 2000 to 6000 people per square mile (770 to 2320 people per square kilometer or 3 to 9 people per acre)

Residential High Density Noise Zone: 6000 to 18,000 people per square mile (2320 to 6950 people per square kilometer or 9 to 28 people per acre)

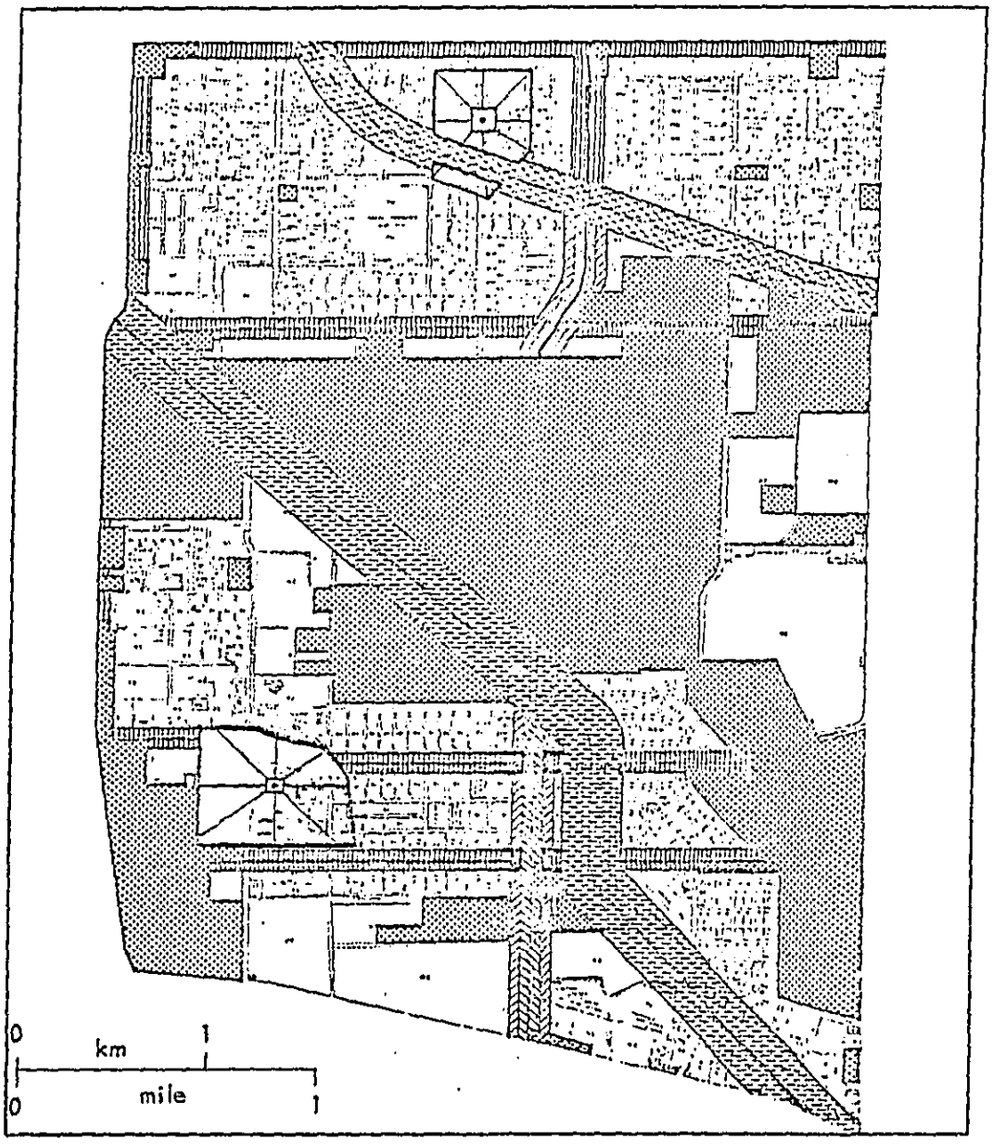
Residential Very High Density Noise Zone: Over 18,000 people per square mile (over 6950 people per square kilometer or over 28 people per acre).

The intent of these guidelines is to assist in separating the residential areas of the city into noise zones having unique and individual characteristics. Other boundaries that may be used for this purpose would consist of discontinuities that have occurred naturally within the city, such as between single family dwellings adjacent to a section of high-rise, multi-family units, or topographical separation. Thus, establish criteria for the different residential noise zones based on a combination of these unique local conditions as well as the numerical population guidelines.

In the event that numerical population data for small regions of the city are not available, but a density map based on qualitative statements of density, such as "low," "medium low," etc., has been prepared, use this qualitative map along with other knowledge of the area to outline distinctive noise zones with population differences.

c. Having identified the regions for the residential noise zones, shade the areas of the map with the appropriate colors. The residential zones will not cover any of the previously plotted noise zones. Additionally, shade all vacant and public lands with the same color that is used for the Residential Low Density Noise Zone.

The map of the city should now appear as in Figure 3.2-6, with all sections appropriately colored.



Major Roadway Zone A
Major Roadway Zone B
Minor Roadway Zone - Low Volume
Stationary Source Zone
Highway Zone
Railroad Zone
Commercial Zone
Blank Residential Noise Zones

(Note: For simplification, vacant areas have not been shown in this figure.)

Figure 3.2-6. Example Plotted Noise Zones

3.2.2 Definition of Areas

Areas

By dividing the city into geographical areas, it will be possible to analyze the characteristics and attitudes of residents from any area, and to compare areas. Since this will be an extremely useful tool in studying the data gathered from the survey, it is important to designate the areas as meaningfully as possible.

The survey is designed such that between five and seven areas may be defined. However, one of the areas is already defined; it consists of the Central Business District. This same geographical center must be considered an "area" and, therefore, an additional four to six areas may be designated.

Procedures for Plotting Area Boundaries

The following instructions describe how to define and plot areas of the city. Gather the data discussed in Section 3.1.2. Using the maps (and photos, if available) to give a visual illustration, the information will be reviewed in light of the instructions in order to determine the areas.

STEP 1 – Review Data

a. Planning and Development Data - Determine whether any existing planning offices or development programs have defined areas of the city for analysis or planning purposes. If these exist, it is strongly recommended that you incorporate them into the sample. Consider the number of areas which may be defined (four to six), to determine how the existing definitions fit the requirement.

b. Population Data - Review the information on how the population of the community is distributed. In areas outside the CBD, look for sections with high or low density. (Levels corresponding to "high" or "low" density will vary from city to city, although peripheral areas will normally be less dense.) Consider the age distribution to delineate

pockets of younger and older residents. Also look at where single and married persons tend to live. In addition, note whether there are any ethnic neighborhoods or areas.

c. Socioeconomic Data - Determine which areas are occupied by higher and lower income residents. Also consider the distribution of groups with different educational levels throughout the city. In addition, if the information is available, distinguish where different occupational groups tend to reside - professionals, blue collars and industrial workers. Certainly, in many cases, these three types of groupings will tend to overlap.

d. Land Use Information - The single most important consideration regarding land use is the distinction between a central, more commercial, densely populated area and the outlying sections of the city which are more residential and less densely populated. In addition, however, within the outlying areas, note the distribution of single and multiple dwelling units and try to determine the areas where one type dominates over the other.

e. Topographical and Ecological Data - Note major features of the environment which might serve as natural boundaries, distinguishing areas from one another. These might be lakes, rivers, hills, etc. Beach communities, for example, might be distinguished from other areas.

STEP 2- Estimate and Plot Areas

One area has already been defined - the CBD. The exact boundaries for the CBD Noise Zone define the CBD Area. Therefore, the instructions for defining areas apply to the sections of the city outside the CBD. Between four and six additional areas may be determined. If areas have already been established by a community development or planning office, and there are between four and six (or they can be consolidated into four to six areas), then use these area definitions. Otherwise, follow the instructions in this step.

a. Review the information gathered about the city to determine which sections outside the CBD have common characteristics. Trying to take into account as many factors as possible, distinguish areas which are more or less internally homogeneous and which differ from one another in some meaningful ways. Use residential population density as a major criterion. Large areas having densities that are internally fairly uniform but that differ significantly between areas should be noted. The amount of density differences which may be judged significant will depend on an understanding of local conditions, and may be modified by other factors such as neighborhood age, types of structures, typical lot size or typical land value. Also consider the age, sex, marital status, socioeconomic, and ethnic characteristics of the population distribution. In addition, note portions of the city characterized by industrial or other nonresidential use. Finally, topographical features should be considered. Large residential areas that possess a distinctive nature by virtue of elevation or separation by hills, rivers, or other large topographical boundaries should be noted. If a meaningful review of the data does not suggest areas for analysis, then consider the simple model in Figure 3.2-7 in which the CBD is distinguished from four outlying areas which equally divide the periphery. You might use a similar model. However, attempt to achieve a balance of populations among the areas which you define. This is more important than a spatially balanced division.

b. Draw the boundaries of the areas on the census tract map, making sure that every part of the city is designated to one of the areas. It might be easiest to first sketch the boundaries on a city map which is on a single sheet of paper, and then transfer them onto the several census maps.

NOTE: There is one rule for defining areas. Area boundaries must fall along streets, and therefore incorporate whole blocks. No block may be split between areas.

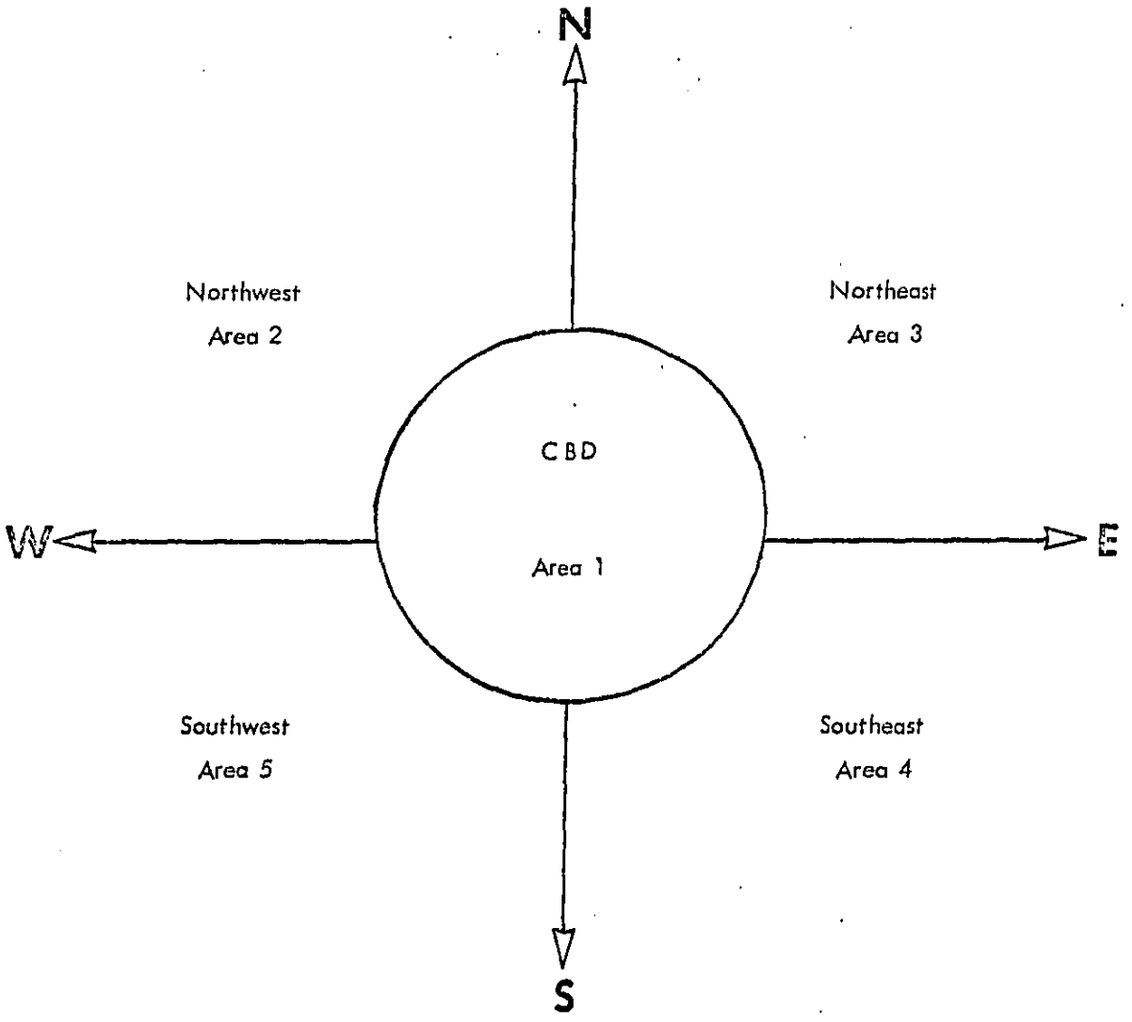


Figure 3.2-7. A Simple Model for Designating Areas: the Central Business District and Four Outlying Areas

STEP 3– List and Code Areas

a. Assign names to the areas you have defined. The names must have no more than 16 characters (a space between words counts as one character). These names will appear on the data printout from the computer whenever area is considered in the analysis of the results. Therefore, try to make the names as descriptive as possible. You may, for example, use spatial names such as Central, East, West, and so forth.

b. Also assign a one-digit code number from 1 to 7 to each area. Area 1 is the CBD. Carefully consider how to assign the rest of the numbers since the computer will consistently give back information in sequential order. That is, in a list of information about areas, Area 1 is listed first, Area 2 second, and so forth. In addition, any table which includes information about areas will present the data in the same logical order. Hence, if you wish to make comparisons between particular areas, it would be reasonable to assign them successive numbers.

c. Finally, assign a unique color code to each area. These color codes must be different from the colors used to code noise zones, although only one color code is needed for the CBD.

3.2.3 Matching City Blocks to Noise Zones and Areas

STEP 1– Review Census Data

Familiarize yourself with the map of census tracts and the "Block Statistics" book.

The Map

The map divides the city into sub-areas, called tracts. Figure 3.2-8 shows an example. Each tract has its own unique number (e.g., tracts are numbered 1, 2, and 3 in the illustration). Furthermore, every tract consists of a number of city blocks and each of these blocks is given a three-digit number. For example, in tract number 3, the first block is numbered 101 and the second is numbered 102 and so on. The census bureau has adopted the convention of numbering the first block of every tract with the same number, 101, so that there is more than one block in the city with that number. Therefore, to identify any block in the city, you need to know both the number of the census tract in which it is located, and its own block number; for example, tract number 3, block number 101. The map of census tracts for the city will cover every block which existed when the most recent census was taken.

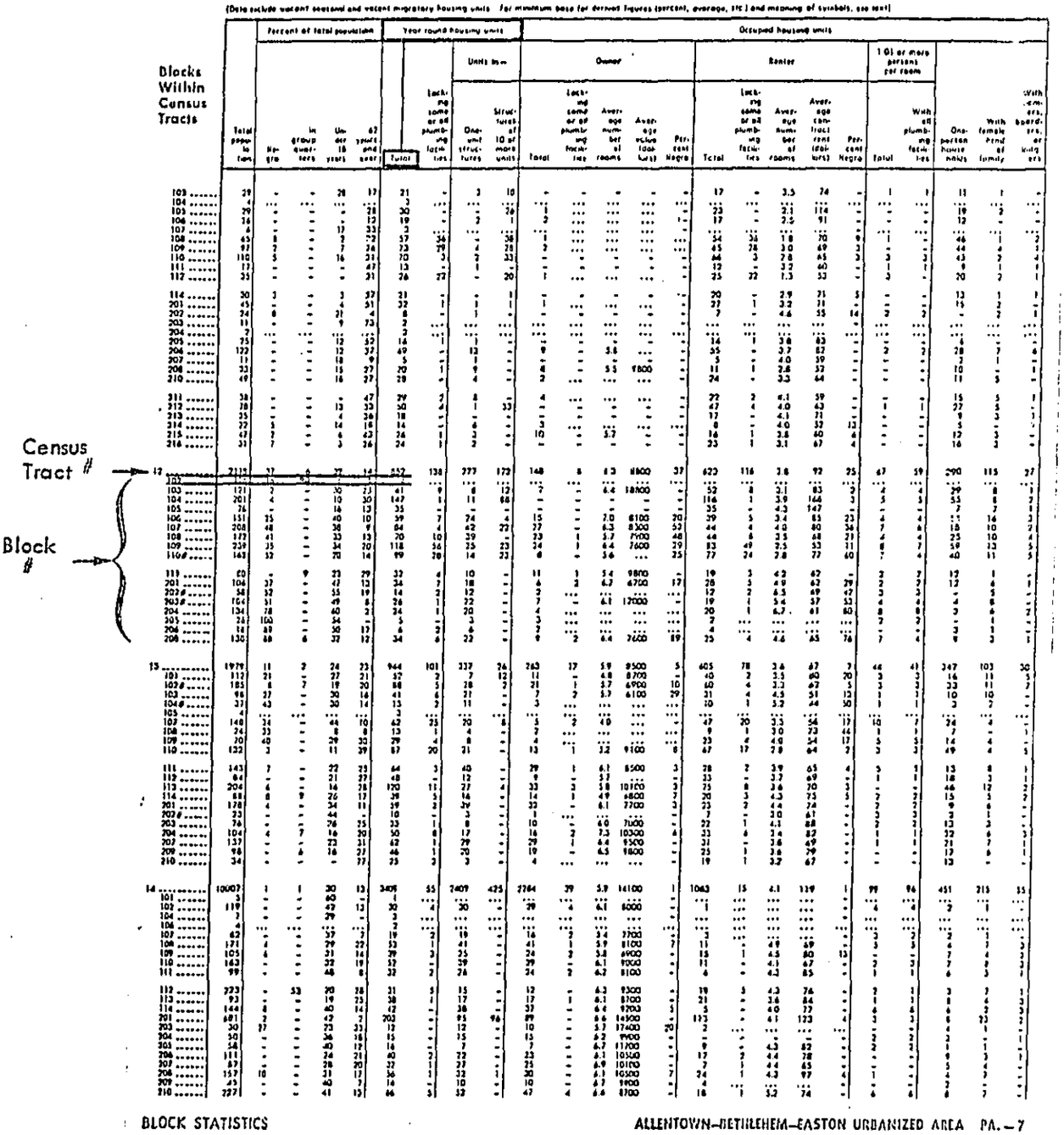
The Block Statistics Book

Become familiar with how the Block Statistics Book is organized. Every tract in the city is listed in order from the tract with the lowest number to the one with the highest number. Every block within a census tract is listed in order from the block with the lowest number to the one with the highest. The tract and block numbers appear in the left-hand margin of each page. Figure 3.2-9 illustrates a page from the Block Statistics Book.

The Block Statistics Book gives various information about every tract and block in the city. In order to accurately read the information from the book, use a ruler. Otherwise, it is very easy to make errors. Having to correct mistakes later is always more time-consuming than doing the work carefully and conscientiously the first time.

Figure 3.2-8. Example Census Tract Map

Table 2. Characteristics of Housing Units and Population, by Blocks: 1970—Con. Lehigh County, Pa.



BLOCK STATISTICS ALLENTOWN–BETHLEHEM–EASTON URBANIZED AREA PA.—7

Figure 3.2-9. Example Block Statistics Book

The only column with which you need to be familiar in order to take the sample is the column called "Year-round housing units -- Total." This column lists the number of "housing units" (called households in this workbook) which was counted in the most recent census for every census tract and for every block within a census tract. For census tract #12, in Figure 3.2-9, there were 852 households; for block #102 in tract #12, there were 4 households. If the number of households for each block of census tract #12 were added, the total would be 852.

STEP 2- Match Blocks to Areas and Noise Zones

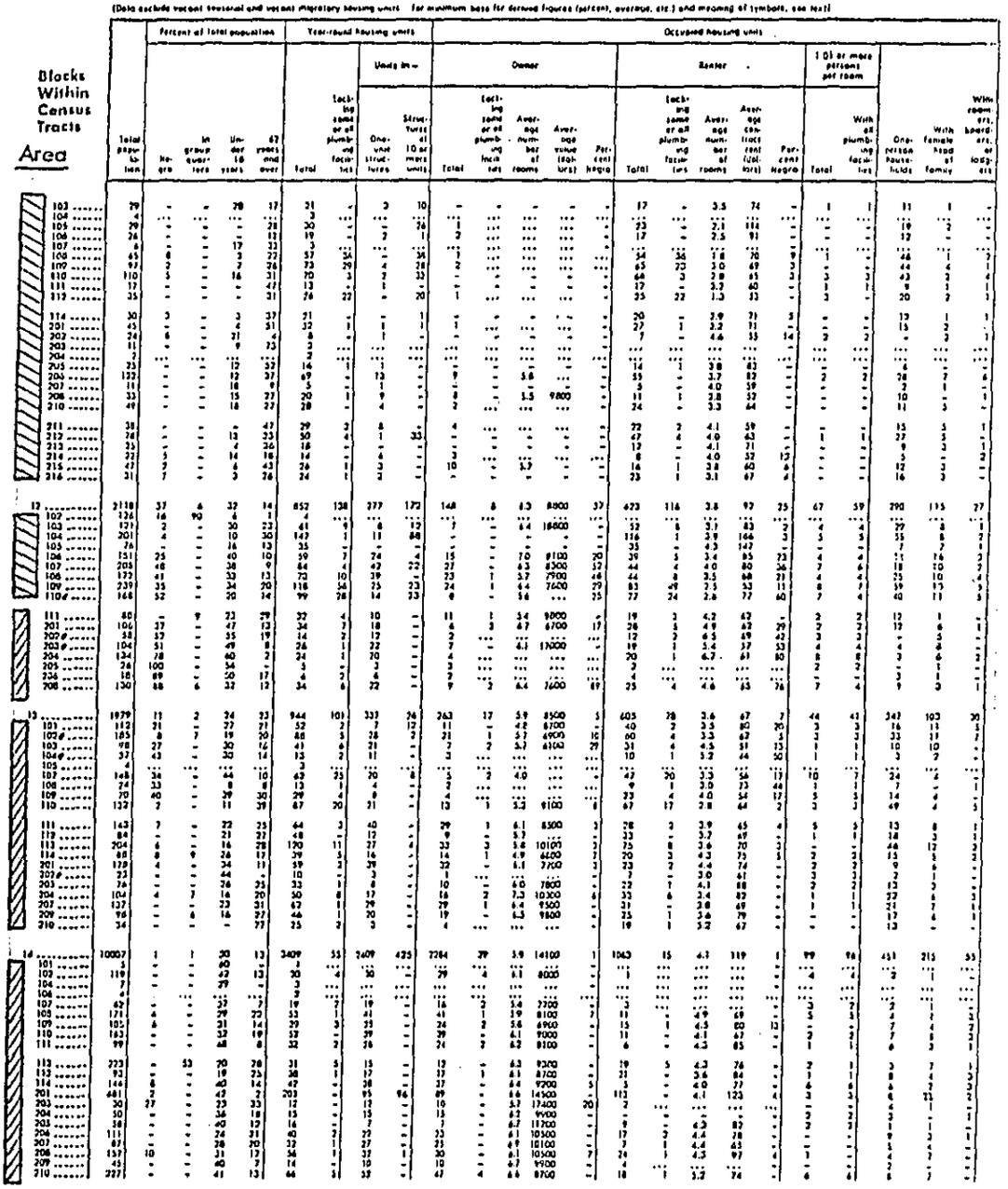
This procedure involves taking the list of blocks in the Block Statistics Book and color-coding each block in the city with two different color codes - one for the Noise Zone in which it falls, and one for the Area in which it falls.

a. Match Blocks to Areas

Looking at the census tract maps, notice the pattern in which the tracts are numbered. You will see that consecutively-numbered tracts are grouped in certain geographic sections. In an orderly fashion, beginning with one Area of the city, locate the census tracts in that Area in the Block Statistics Book. For every block which falls in that Area, take the colored pencil corresponding to the Area color code and mark the column to the left of the block number in the Block Statistics Book. See Figure 3.2-10 for an illustration. Each block has only one Area color code.

This procedure will be repeated for every Area of the city until each block of each census tract has an Area color code. However, it will probably be more efficient to color-code the Noise Zones for the blocks in each Area while you are color-coding the Areas. So, instead of proceeding to the next Area, follow the instructions for Noise Zone color-coding and complete this task for the first Area. Then proceed to the next Area, color-code the Area and then color-code the Noise Zones for that Area, and so forth for all Areas.

Table 2. Characteristics of Housing Units and Population, by Blocks: 1970—Con. Lehigh County, Pa.



BLOCK STATISTICS — ALLENTOWN–BETHLEHEM–EASTON URBANIZED AREA PA.—7

Area Codes

— Yellow — Blue

Figure 3.2-10. Example Color-Coding Census Blocks with Area Codes

b. Match Blocks to Noise Zones

Beginning with the first census tract in an Area, determine for every block listed in that tract the Noise Zone (or Zones) in which the block falls. In some cases, an entire tract may fall into the same Noise Zone. Or a tract may be split into several zones. In other cases, a single block is split so that the section of the block facing one street falls into one zone and another section facing a different street falls into another zone. Just to the left of the Area color code in the Block Statistics Book, mark every block in the Area with the appropriate colored pencil to indicate the Noise Zone (or Zones) in which the block falls. See Figure 3.2-11 for an illustration. An efficient way to do this might be to first color-code the zone which dominates the tract or Area. For example, if a tract or Area is nearly entirely residential, color-code those blocks first; next, color-code roadways, and so forth.

Repeat the procedure of color-coding Areas and Noise Zones so that each block has been assigned to both the Area and the Noise Zone in which it falls.

Note: If a block appears on the census tract map but is not listed in the Block Statistics Book, list it at the end of the list of blocks for that tract. In the column "Year-round housing units — Total," list the number zero (0).

If an area on the census tract map is not divided into blocks, arbitrarily divide the area into units. If possible, do this along easily recognizable boundaries. Assign identifying numbers to each unit. Using the best data available, estimate the number of households in each unit. (This is required for the procedures in Section 3.3.) You may want to visit the area before dividing it and estimating the households. List the unit numbers and household estimates under the section for that census tract in the Block Statistics Book. If necessary, clip an additional page into the book. Treat these units as blocks for the remainder of the sampling procedures.

Table 2. Characteristics of Housing Units and Population, by Blocks: 1970—Con. Lehigh County, Pa.

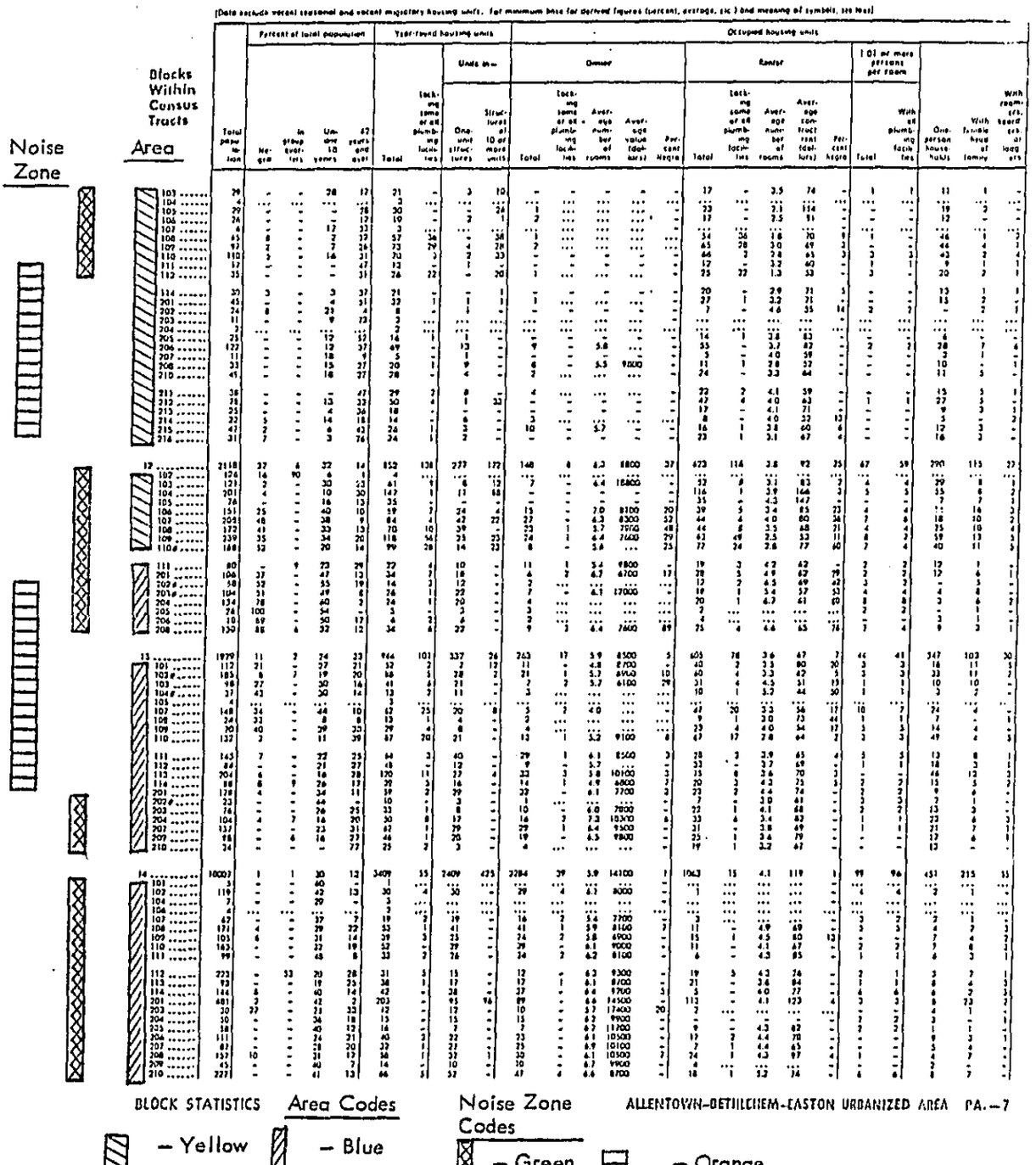


Figure 3.2-11. Example Color-Coding Census Blocks with Noise Zone Codes

To minimize the possibility for error in this procedure, check the work at this stage. Do not continue to Section 3.3 until the matching of blocks to Noise Zones and Areas has been verified.

3.3 Cluster Selection

In this stage of the sampling procedures, 100 clusters (one or more city blocks) will be selected. Forms A, B, and C, which are found in Appendix B, will be needed for the selections. Because the instructions for selection are detailed, most of the explanation in this section will be presented through examples and illustrations.

3.3.1 Listing City Blocks and Assessing MOS (Measure of Size)

Cluster selection requires listing all the blocks in the city on Form A and assessing the measure of size (MOS), or the number of households, for each block. The probability that a block will be selected for the sample is related to the block MOS. Although the actual number of households for selected blocks will be obtained by the lister in the field, the MOS is an estimate based on the most recent census data and it is used for selection purposes.

STEP 1— Transfer Information from the Block Statistics Book

In this step, you will fill in columns 1 and 2 of Form A by listing the census tract and block numbers, and the number of households for each block, as the information is given in the Block Statistics Book.

The listing must be done in a precise order, according to the Noise Zone and the Area in which each block falls. The notations at the top of the worksheet will help keep things in the proper sequence. There is a space for the Noise Zone number, a space for the Area number, and the notation "Page ____ of _____." Since there will be a series of pages of worksheets for each Noise Zone, this notation is used to order the pages for any one zone. For example, if there are 10 pages of the worksheet for a zone, the first page would be numbered "Page 1 of 10," etc.

The blocks will be listed in the following way. All the blocks for Noise Zone 01 (or the lowest numbered zone if Zone 01 is not used) will be listed in one series of worksheets. Next, the blocks for Noise Zone 02 (or the next lowest numbered zone) will be listed, and so forth, until the highest numbered zone is listed.

Within the listing of each zone, however, the blocks must be listed by Area and this must also be done in a precise order. For the first zone listed, list all the blocks in Area 1 first, then the blocks in Area 2, and so forth, until the highest numbered Area is listed. For the second zone listed, list all the blocks in the highest numbered Area first, then the blocks in the next highest numbered Area, and so forth, until Area 1 has been listed. For the third zone, list the blocks in Area 1 first, then the blocks in Area 2, and so forth, until the highest numbered Area is listed (this is the same as for the first zone). For the fourth zone, list Areas in the same manner as for the second zone. This pattern of alternating the order in which the blocks in Areas are listed is repeated until all Noise Zones have been listed.

The rules for the ordering of the listing, then, is as follows. List blocks in order of Noise Zone, from the lowest numbered zone to the highest numbered zone. Within the listing for any one zone, list by Area, but alternate the ordering of Areas systematically: for example, first, Areas 1 to 7; next, Areas 7 to 1; next, Areas 1 to 7; next, Areas 7 to 1, and so forth until all zones are listed.

List the tract and block numbers, in the proper order, for every block in Column 1 of Form A. Go page-by-page through the Block Statistics Book and use a ruler to read the numbers. At the same time that this information is listed in Column 1, the block MOS (found in the column "Year-round housing units -- Total") will be transferred into Column 2. See Figure 3.3-1 for an illustration.

Once all the blocks for the first zone have been listed, repeat the procedure for the rest of the zones until all the blocks for all zones have been listed.

FORM A

CLUSTER SELECTION WORKSHEET

Noise Zone 02

Area 7

Page 1 of 9

Column 1	Column 2	Column 3	Column 4	Column 5	Column 6
Tract & Block #	Estimate of Block MOS	Updated Estimate of MOS	Cumulative MOS	Estimated MOS Range	X
20 - 103	5				
" - 104	4				
" - 105	3				
" - 106	10				
" - 201	121				
" - 202	27				
" - 203	6				
" - 204	10				
" - 205	15				
" - 206	300				
" - 301	15				
" - 302	5				
" - 303	6				
21 - 101	4				
" - 102	30				
" - 103	9				
" - 104	7				

Figure 3.3-1. Example Listing Blocks

The Special Case of a "Split-Block"

If any blocks fell into two or more zones and hence were color-coded with two or more zone colors, this is a case of a "split-block." Each of these blocks must be listed in a special way on Form A. No blocks are split between Areas.

a. The block must be listed for every zone in which it falls and hence may be listed on more than one worksheet.

b. The MOS for that block must also be listed but this requires "splitting" the MOS between the different zones into which the block falls. For example, the households which fall into the Highway Zone must be listed for that zone while those which fall into the Residential Zone must be listed for that zone.

How to split the MOS is really a matter of the best judgment which can be made. However, in general, take into account the location of the block relative to the noise sources and the way in which households are distributed on the block.

Be sure that the total MOS assigned to the different zones for a split-block does not exceed the total number of households for that block.

Before continuing to STEP 2, double-check the work done in STEP 1. If the listing is not correct, it must be redone or all the subsequent work will be in error.

STEP 2— Update the MOS

Since the estimated MOS for a block affects the probability for cluster selection, it should be as accurate as possible. It will probably be necessary to "update" the MOS in many cases, especially if the most recent census was conducted a number of years prior to the time the sample is taken. Updating is done on the basis of information about housing construction or demolition.

Generally, if it is suspected that an area has undergone major changes since the census (by major we mean greater than a 20 percent change in the number of households), then the MOS estimate from the Block Statistics will need to be adjusted. The regional planning office may have annual totals for new residential construction and demolition for each census tract which can be used to estimate housing growth or decline since the census. Pay particular attention to the construction of multi-unit dwellings, especially large apartment complexes. City engineers, tax assessors, or utility companies may also have sources from which to calculate housing changes. Check these sources for information about housing conversions; i.e., any modification on a single-unit dwelling which would indicate that it has become a multi-unit dwelling. Finally, be sure to check for data on housing demolitions from every possible source. Once a total number of additions and subtractions to the MOS listed by the census is established, the updated MOS can be listed in Column 3 of Form A.

If the contacts suggested above cannot provide information about housing changes, two persons should visit the area and make an approximate estimate of the number of households in the block. Do this if necessary because it will make the work more accurate and save time in the long run.

Although an updated MOS will not be established for every block, there must be an entry in Column 3 of Form A for every listed block. In some cases, then, the number from Column 2 will simply be copied into Column 3.

Before continuing to STEP 3, double-check the work done in STEP 2 to verify that it is correct.

STEP 3 – Link "Undersized" Blocks

Blocks with fewer than 15 households are considered "undersized" and must be linked with another block (or blocks). The way in which to link blocks is illustrated in Figure 3.3-2 and is discussed below. There are several guidelines for linking blocks.

a. Only blocks within the same Noise Zone and within the same Area can be linked.

FORM A

CLUSTER SELECTION WORKSHEET

Noise Zone 02

Area 7

Page 1 of 9

Column 1	Column 2	Column 3	Column 4	Column 5	Column 6
Tract & Block #	Estimate of Block MOS	Updated Estimate of MOS	Cumulative MOS	Estimated MOS Range	X
20 -103	5	3			
" -104	4	4			
" -105	3	3			
" -106	10	20 30			
" -201	121	105			
" -202	27	25			
" -203	6	7			
" -204	10	12 19			
" -205	15	15			
" -206	300	320			
" -301	15	16			
" -302	5	5			
" -303	6	6			
21 -101	4	10 21			
" -102	30	30			
" -103	9	9			
" -104	7	7 16			

Figure 3.3-2. Example Linking Blocks

b. Blocks must be linked together so that the total MOS for the linked blocks is at least 15.

c. Whenever possible, link blocks together which are in the same census tract. This will make the lister's and interviewer's work much easier if those blocks are selected.

d. In general, link a block to one listed just above it or just below it on Form A. If necessary, you may link blocks which are not consecutively listed, but do this minimally.

e. If there is a series of consecutive blocks with zero (0) MOS, these must be linked with other blocks. However, do not link these blocks together. As much as possible, link each block with zero (0) MOS to a different block.

f. Once blocks have been linked together they are considered as one cluster for the rest of the sampling procedures.

Look to Figure 3.3-2 for an illustration. When blocks are linked, draw a circle around the MOS figures in Column 3 of Form A for the blocks being linked. Then add together the numbers inside the circle. The sum must be at least 15. Write the sum outside the circle as shown in the examples. This becomes the MOS for the linked block. Draw an 'X' through the circle. Also, draw a circle around the block numbers in Column 1. Do this for every undersized block on the worksheets for each Noise Zone.

Before continuing to STEP 4, double-check the work in STEP 3 to verify that it is correct.

STEP 4– Cumulatively Add the MOS

Combine the worksheets for the different Noise Zones into one pile, placing them in Noise Zone order so that the list for zone (code) 01 is on top, the list for zone (code) 02 is next, etc. Be sure that the listing by Areas is in the correct alternating order, and that all the pages for each zone are in order.

The cumulative addition of MOS will be done using Column 4 of Form A. The numbers from Column 3 will be cumulatively added until an estimate of the total number of households in the city is calculated. The procedure is illustrated in Figure 3.3-3. For the first line only, take the MOS from Column 3 and write it in Column 4. For the next line, and every line thereafter, take the number in Column 3, add it to the last number in Column 4, and write the sum in the next space in Column 4. When you come to the last page of worksheets for the first zone, continue the addition to the worksheets for the next zone and so on, until all the worksheets are completed. The final sum in Column 4 is the estimated number of households in the city.

Before continuing to STEP 5, double-check the work in STEP 4 to verify that it is correct.

STEP 5- Assign "Estimated MOS Range"

An "estimated MOS range" will be assigned to every block (or linked blocks) using Column 5 of Form A. Assigning the range is a way of numbering the households in each block; these numbers will be used when the cluster selection is made (Section 3.3.2).

Figure 3.3-4 illustrates how to assign the "estimated MOS range." The MOS estimate for the first block is 30; therefore, the households are numbered 1-30 and this range is written in Column 5. In the next block, the MOS estimate is 105; therefore, the households are numbered 31-135 (i.e., since the first 30 households are in the first block), and this range is written in Column 5. In the third block, the MOS estimate is 25; therefore, the households are numbered 136-160 and this range is written in Column 5.

Go through each page of the worksheets for all the Noise Zones and assign the "estimated MOS range" for every block (or linked blocks). Before continuing to Section 3.3.2, double-check the work in STEP 5 to verify that it is correct.

FORM A

CLUSTER SELECTION WORKSHEET

Noise Zone 02

Area 7

Page 1 of 9

Column 1	Column 2	Column 3	Column 4	Column 5	Column 6
Tract & Block #	Estimate of Block MOS	Updated Estimate of MOS	Cumulative MOS	Estimated MOS Range	X
20 - 103	5	3	—		
" - 104	4	4	—		
" - 105	3	3	—		
" - 106	10	20 30	30		
" - 201	121	105	135		
" - 202	27	25	160		
" - 203	6	7	—		
" - 204	10	2 19	179		
" - 205	15	15	194		
" - 206	300	320	514		
" - 301	15	16	530		
" - 302	5	5	—		
" - 303	6	6	—		
21 - 101	4	10 21	551		
" - 102	30	30	581		
" - 103	9	9	—		
" - 104	7	7 16	597		

Figure 3.3-3. Example Cumulatively Adding MOS

FORM A

CLUSTER SELECTION WORKSHEET

Noise Zone 02

Area 7

Page 1 of 9

Column 1	Column 2	Column 3	Column 4	Column 5	Column 6
Tract & Block #	Estimate of Block MOS	Updated Estimate of MOS	Cumulative MOS	Estimated MOS Range	X
20 - 103	5	3	—	—	
" - 104	4	4	—	—	
" - 105	3	3	—	—	
" - 106	10	20 30	30	1 - 30	
" - 201	121	105	135	31 - 135	
" - 202	27	25	160	136 - 160	
" - 203	6	7	—	—	
" - 204	10	12 19	179	161 - 179	
" - 205	15	15	194	180 - 194	
" - 206	300	320	514	195 - 514	
" - 301	15	16	530	515 - 530	
" - 302	5	5	—	—	
" - 303	6	6	—	—	
21 - 101	4	10 21	551	531 - 551	
" - 102	30	30	581	552 - 581	
" - 103	9	9	—	—	
" - 104	7	7 16	597	582 - 597	

Figure 3.3-4. Example Assigning "Estimated MOS Range"

3.3.2 Selection of Clusters

STEP 1– Calculate the Cluster Sampling Interval

Use Form B, the Worksheet for Cluster Sampling Interval, to do the calculations for this step. The way in which the sampling interval is used will be explained below. Figure 3.3-5 gives an example of the calculation. Take the estimate for the total number of households in the entire city (the last entry in Column 4 of the last page of Form A) and divide this number by 100. Carry out the division to two decimal places. Call this sampling interval K.

STEP 2 – Split "Oversized" Blocks

Any blocks which have an estimated MOS (Column 3 of Form A) greater than the cluster sampling interval, K, are "oversized" and must be split. How to split oversized blocks is illustrated in Figure 3.3-6. In this example, K is 258.66, and therefore block #20-206 is oversized. There are three considerations in splitting blocks:

a. The block must be split so that the number of households in each section of the block is smaller than the cluster sampling interval K.

b. The block must be split, as much as possible, along natural boundaries or easily discernible boundaries so that it will be possible for the lister to identify a selected section of a block in the field.

c. The splitting of the MOS for the block is a matter of best judgment. Consider the distribution of households on the block and the type of land use in that area.

Once a block has been split, each section should be renumbered as indicated in the example. Each of these sections is considered a unique block so that when clusters are selected, one section of a block may be chosen for the sample, while the other section may not be chosen. In an extreme case, a block may be split into more than two sections.

FORM B-1

WORKSHEET FOR CLUSTER SAMPLING INTERVAL

- Calculate the sampling interval K by dividing the total number of estimated households (i.e., cumulative MOS) by 100:

$$K = \frac{25,866}{100} = 258.66$$

		Additions	Truncated #	
1.	Take the random number R = C1 =	_____	truncate: _____	Locate this number in Col. 5 of Form A. Mark with an X in Col. 6.
2.	Add K to C1: Write K here	+ _____		
	The sum = C2 =	_____	truncate: _____	Locate this number in Col. 5 of Form A. Mark with an X in Col. 6.
3.	Add K to C2: Write K here	+ _____		
	The sum = C3 =	_____	truncate: _____	Locate this number in Col. 5 of Form A. Mark with an X in Col. 6.
4.	Add K to C3: Write K here	+ _____		
	The sum = C4 =	_____	truncate: _____	Locate this number in Col. 5 of Form A. Mark with an X in Col. 6.

Figure 3.3-5. Example Calculating Cluster Sampling Interval

FORM A

CLUSTER SELECTION WORKSHEET

Noise Zone 02

Area 7

Page 1 of 9

Column 1	Column 2	Column 3	Column 4	Column 5	Column 6
Tract & Block #	Estimate of Block MOS	Updated Estimate of MOS	Cumulative MOS	Estimated MOS Range	X
20 - 103	5	3	—	—	
" - 104	4	4	—	—	
" - 105	3	3	—	—	
" - 106	10	20 30	30	1 - 30	
" - 201	121	105	135	31 - 135	
" - 202	27	25	160	136 - 160	
" - 203	6	7	—	—	
" - 204	10	12 19	179	161 - 179	
" - 205	15	15	194	180 - 194	
~~" - 206~~ 206A 206B	~~300~~	~~320~~ 200 120	~~514~~ 394 514	195 - 394 ~~195 - 514~~ 395 - 514	
" - 301	15	16	530	515 - 530	
" - 302	5	5	—	—	
" - 303	6	6	—	—	
21 - 101	4	0 21	551	531 - 551	
" - 102	30	30	581	552 - 581	
" - 103	9	9	—	—	
" - 104	7	7 16	597	582 - 597	

Figure 3.3-6. Example Splitting "Oversized" Blocks

Before continuing to STEP 3, double-check the work in STEP 2 to verify that it is correct.

STEP 3– Choose a Random Start

To begin the selection of clusters, a random number must be selected from the Table of Random Numbers in Appendix C. As illustrated in Figure 3.3-7, the pages of random numbers have 10 rows of groups of numbers, and 10 columns of groups of numbers. Whoever does the selection of a random number will take the last two numbers of the zip code for his or her personal address (e.g., the last two numbers may be 31), and will locate the group of numbers in the row and column that correspond to these numbers. That is, the person will locate Row 3 and Column 1 on the page of random numbers, and in this way, a group of numbers is picked. All the numbers on the page that come before this selected group must be crossed out as indicated in the example. This gives a place to start on the page of random numbers; that is, beginning with the first number in the group, these random numbers will be used whenever a "random start" must be chosen. There are several rules about taking random numbers:

a. Adopt the convention of taking numbers across columns. That is, think of the numbers as a string of numbers and continue reading the numbers into the next group and into the next row; e.g., if looking for a three-digit number, the first digit may be the last number in a row and the second and third digits would be in the next row. Continue in this way through the consecutive pages of the appendix.

b. Zero (0) is a number.

c. Never skip numbers.

d. Whenever a number is read, whether or not it is used for a random start, it must be crossed out.

To begin the cluster selection, take a random number that is between 1 and the sampling interval K. First count the number of digits that K has. In the example of

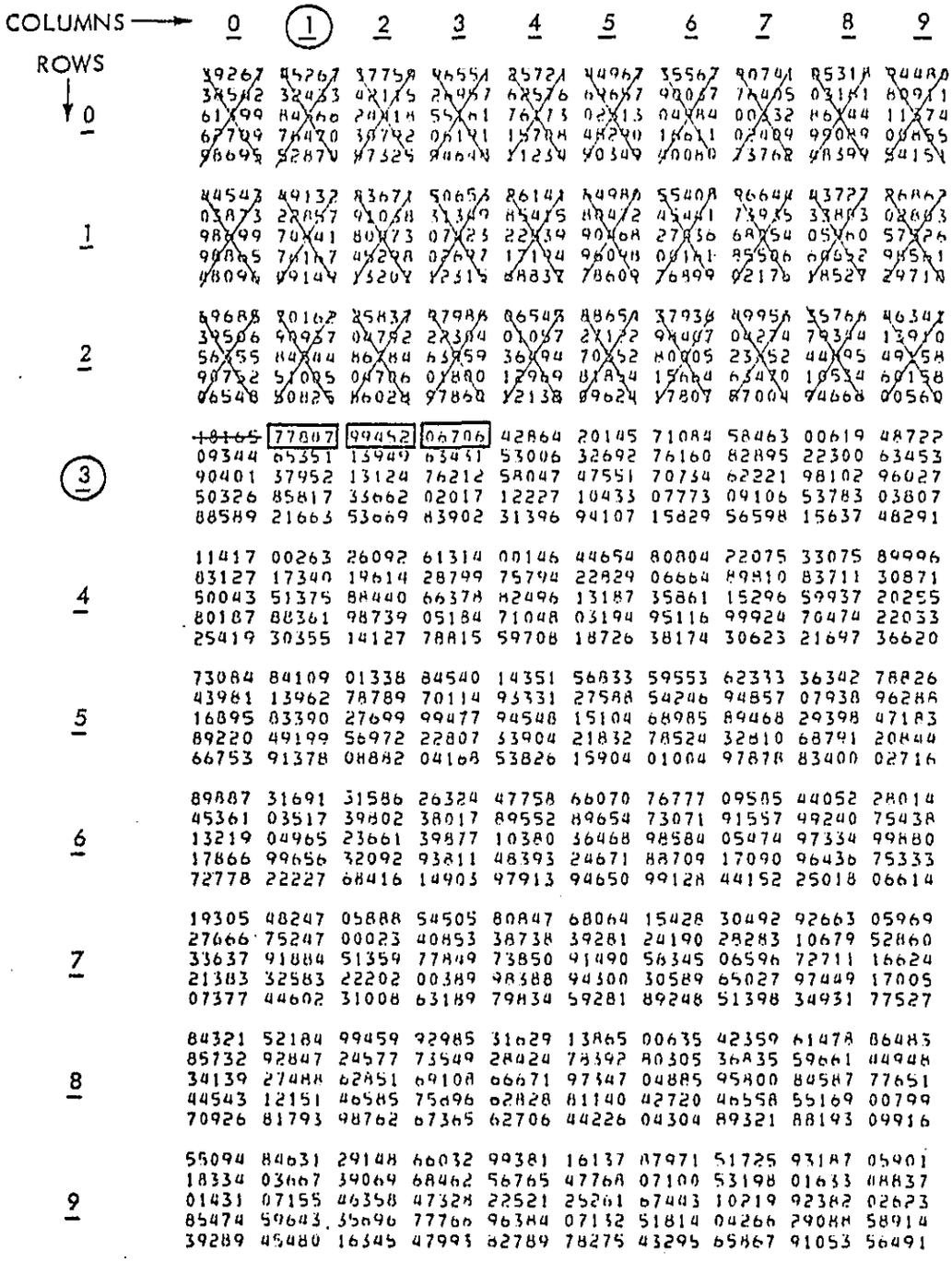


Figure 3.3-7. Example Choosing a Random Start.

Figure 3.3-5, K has five digits (2, 5, 8, 6, 6). Therefore, a random number with five digits that is smaller than 25,866 must be chosen. In Figure 3.3-7, the first five-digit number in Row 3, Column 1, is 77807. However, since K has a decimal place, this number must be read with a decimal place and so it is 778.07. This number is greater than K; 778.07 is greater than 258.66. This five-digit random number cannot be used and it must be crossed out. We must look to the next five-digit number. It is 994.52 and is also greater than K and so it is crossed out. Finally, the next five-digit number, 067.06 (67.06), is between 1 and K. This becomes the random number used to start the selection process.

Once the random start is taken, write the random number in the space indicated on Form B-1. Call the number R.

Before continuing to STEP 4, double-check the work in STEP 3 to verify that it is correct.

STEP 4– Select Clusters

In this step, the process of selecting 100 clusters is presented. In some cases, the cluster which is selected will be a single block; in many instances in a small community, the cluster will be two or more linked blocks; and, in other cases, the cluster will be a section of a block. For convenience, we will use the term cluster to apply to all these possibilities.

Cluster selection requires calculating numbers for selection on Form B, the Worksheet for Cluster Sampling Interval. The selected numbers will be marked on Form A.

The selection of the first cluster is done by taking the random start, R, and "truncating" it to get a selection number. To truncate a number means to "cut off" the number at the decimal place so that it is a whole number. For example, truncating the random number 67.06 gives the number 67. The truncated random number is written on Form B under the column "Truncated #." See Figure 3.3-8 for an illustration. Do not worry if the random start, once truncated, becomes zero (0).

FORM B-1

WORKSHEET FOR CLUSTER SAMPLING INTERVAL

- Calculate the sampling interval K by dividing the total number of estimated households (i.e., cumulative MOS) by 100:

$$K = \frac{25,866}{100} = 258.66$$

	Additions	Truncated #	
1.	Take the random number R = C1 = 67.06	truncate: 67	Locate this number in Col. 5 of Form A. Mark with an X in Col. 6.
2.	Add K to C1: Write K here + _____		
	The sum = C2 = _____	truncate: _____	Locate this number in Col. 5 of Form A. Mark with an X in Col. 6.
3.	Add K to C2: Write K here + _____		
	The sum = C3 = _____	truncate: _____	Locate this number in Col. 5 of Form A. Mark with an X in Col. 6.
4.	Add K to C3: Write K here + _____		
	The sum = C4 = _____	truncate: _____	Locate this number in Col. 5 of Form A. Mark with an X in Col. 6.

Figure 3.3-8. Example Truncating the Random Number

The truncated number is the first number for cluster selection and is located on Form A. In the example, the number 67 is located on Form A by looking in the "estimated MOS range" Column and an 'X' is marked in the last Column – "X". The X indicates that the cluster to which the number has been assigned is selected for the sample. See Figure 3.3-9 for an illustration. Since 67 falls between 31 and 135, block #20-201 is marked for selection. Remember that if a selected cluster is a set of linked blocks, then all the blocks in the linkage are chosen for the sample.

Note: If the truncated random number is zero (0), add the interval K to the random number R (before truncation). Enter this sum on line 1 of Form B and otherwise follow the directions for cluster selection.

The next 99 selections will be done by a systematic calculation of numbers for cluster selection. This requires using several consecutive pages of Form B. Figure 3.3-10 illustrates the calculations. In the column "Additions," the cluster sampling interval K is added to the random number 67.06 (NOT the truncated number 67). This gives a sum C2, 325.72. This number is truncated. The truncated number is written in the column "Truncated #" and this is the second number for cluster selection. Next, the interval is added to the sum C2, 325.72 (NOT the truncated number) and this gives a sum C3, 584.38. This number is truncated and the truncated number is written in the second column. This is the third number for cluster selection. Each truncated number in the "Truncated #" column is a selection number and is located on Form A. An 'X' is marked to indicate that the cluster to which the number has been assigned is selected for the sample.

Study the illustration in Figure 3.3-10 carefully. Be sure that you understand when to truncate numbers and when to add the numbers that are not truncated. Truncated numbers are used only in the "Truncated #" column. In the "Additions" column, numbers are not truncated.

Continue the procedure until 100 selections have been made.

Before continuing to Section 3.3.3, double-check the work in STEP 4 to verify that it is correct.

FORM A

CLUSTER SELECTION WORKSHEET

Noise Zone 02

Area 7

Page 1 of 9

Column 1	Column 2	Column 3	Column 4	Column 5	Column 6
Tract & Block #	Estimate of Block MOS	Updated Estimate of MOS	Cumulative MOS	Estimated MOS Range	X
20 - 103	5	3	—	—	
" - 104	4	4	—	—	
" - 105	3	3	—	—	
" - 106	10	20 30	30	1 - 30	
" - 201	121	105	135	31 - 135	X
" - 202	27	25	160	136 - 160	
" - 203	6	7	—	—	
" - 204	10	12 19	179	161 - 179	
" - 205	15	15	194	180 - 194	
~~" - 206~~ 206A 206B	~~300~~	~~320~~ 200 120	~~514~~ 394 514	195 - 394 ~~195 - 514~~ 395 - 514	X
" - 301	15	16	530	515 - 530	
" - 302	5	5	—	—	
" - 303	6	8	—	—	
21 - 101	4	0 21	551	531 - 551	
" - 102	30	30	581	552 - 581	
" - 103	9	9	—	—	
" - 104	7	7 16	597	582 - 597	X

Figure 3.3-9. Example Making Cluster Selections (page 1)

FORM A

CLUSTER SELECTION WORKSHEET

Noise Zone 02

Area 7

Page 2 of 9

Column 1	Column 2	Column 3	Column 4	Column 5	Column 6
Tract & Block #	Estimate of Block MOS	Updated Estimate of MOS	Cumulative MOS	Estimated MOS Range	X
21 - 105	17	24	621	598 - 621	
22 - 204	220	220	841	622 - 841	
" - 205	5	5	—	—	
" - 206	3	8	—	—	
" - 207	3	3 16	857	842 - 857	X
25 - 101	4	7	—	—	
" - 102	8	10 17	874	858 - 874	
" - 103	10	10	—	—	
" - 104	9	9 19	893	875 - 893	
" - 105	185	185	1078	894 - 1078	
26 - 201	13	10	—	—	
" - 202	9	4	—	—	
" - 203	7	7 21	1099	1079 - 1099	
" - 204	45	45	1144	1100 - 1144	X
" - 205	60	60	1204	1145 - 1204	
" - 206	30	8	—	—	
" - 207	19	29 37	1241	1205 - 1241	

Figure 3.3-9 (continued) - page 2

FORM B-1

WORKSHEET FOR CLUSTER SAMPLING INTERVAL

- Calculate the sampling interval K by dividing the total number of estimated households (i.e., cumulative MOS) by 100:

$$K = \frac{25,866}{100} = 258.66$$

		Additions	Truncated #	
1.	Take the random number R = C1 =	67.06 truncate:	67	Locate this number in Col. 5 of Form A. Mark with an X in Col. 6.
2.	Add K to C1: Write K here	+258.66		
	The sum = C2 =	325.72 truncate:	325	Locate this number in Col. 5 of Form A. Mark with an X in Col. 6.
3.	Add K to C2: Write K here	+258.66		
	The sum = C3 =	584.38 truncate:	584	Locate this number in Col. 5 of Form A. Mark with an X in Col. 6.
4.	Add K to C3: Write K here	+258.66		
	The sum = C4 =	843.04 truncate:	843	Locate this number in Col. 5 of Form A. Mark with an X in Col. 6.

Figure 3.3-10. Example Calculating Cluster Selections

3.3.3 Listing and Numbering Selected Clusters

On Form C, the selected clusters will be listed and assigned cluster numbers. Begin with the first page of Form A and go through all the pages, taking the information for each selected cluster and transferring it to Form C. In Column 1, write the Noise Zone code number for the selected cluster. In Column 2, write the Area code number. In Column 3, write the tract and block number(s) for the cluster. Be sure to list all the blocks for a cluster with linkages. In Column 4, write the "Updated Estimate of MOS" from Column 3 of Form A. See Figure 3.3-11 for an illustration. Once the selected cluster is listed on Form C, it is automatically assigned the "Cluster Number" which is given in Column 5 of the form. This number will be used to refer to the selected cluster from this point through the sampling, field, coding and data analysis procedures.

Double-check the work to verify that it is correct.

NOTE: The sample design will select clusters which represent every Area. However, since there is a larger number of noise zones than areas, and since their definitions are so specific, it is possible that the sample will not include clusters within every single noise zone, or that only a very few clusters will be chosen from a particular zone. This will in no way affect the reliability and accuracy of the survey results.

If, however, there is a pressing reason to obtain data from a noise zone which was not sampled, or to obtain additional data from a zone which was minimally sampled, refer to Appendix D for instructions for taking a special sample. Take this special sample only if the information is crucial. The data gathered on the basis of the survey design will provide a substantial and reliable analysis of community attitudes toward noise in the various noise environments.

FORM C-1

LIST OF SELECTED CLUSTERS

Page 1 of 4

Column 1 Noise Zone	Column 2 Area	Column 3 Tract & Block(s) #	Column 4 MOS	Column 5 Cluster #
01	1	4-102	20	001
01	1	6-305	21	002
01	2	9-206	15	003
01	3	13-303, 304, 305	21	004
01	4	15-102A	110	005
01	6	31-405, 406	25	006
02	7	20-201	105	007
02	7	20-206A	200	008
02	7	21-103, 104	16	009
02	7	22-205, 206, 207	16	010
02	7	26-204	45	011
02	6	30-401	50	012
02	5	18-201, 202	18	013
02	4	14-102	35	014
02	3	11-201, 202, 203	16	015
02	2	7-408	28	016
02	2	8-103	60	017
02	1	3-206	45	018
03	1	3-504	90	019
03	3	12-201, 202	28	020
03	4	14-501	38	021
03	5	17-305, 306, 307	16	022
03	6	29-208	26	023
04	7	36-301, 302	15	024
04	6	29-101, 102	31	025

Figure 3.3-11. Example Listing Selected Clusters

3.4 Listing Households

This section will discuss how to prepare for listing operations, how to conduct lister training, and how to manage and complete the listing procedures. Instructions will be given on how to use Forms D, E, F, and G, and the Listing Handbook, in Appendix E.

Begin the listing operations by obtaining the materials which are listed in Section 2.4. Make certain that the materials are ready when they are needed; training materials, for example, should be prepared in advance so that listers may study them before the training session.

The five listers will be required to attend a 1-1/2 day training session and the listing procedure should take no longer than 2 weeks. It is advisable to have a training staff of two to three persons, and to obtain as many assistants as possible to help prepare maps and listing forms.

Be sure to carefully read the Listing Handbook.

3.4.1 Preparation of Maps and Listing Forms for Selected Clusters

Locate each selected cluster on a detailed street map of the city. If possible, refer to an aerial photo to give more precise details. For each cluster, prepare a map on Form D. First list the identifying streets, or boundaries, of the cluster. Then sketch the block(s) which is (are) within the boundaries and designate any block segment(s). Finally, indicate all the areas in the cluster which are to be listed by marking an 'X' where the lister should begin, and arrows to show how to proceed. Do this in a very precise manner so that the lister has the correct instructions. Generally, for a simple block, mark an 'X' in the most northwest corner of the block and use arrows to indicate the clockwise direction. However, the instructions will be more complex in the case of linked blocks (contiguous or non-contiguous), or in the case of a block segment or segments. In the case of linked blocks, be sure to indicate the order in which the blocks are to be listed by assigning each block a number on the map. In the case of a block segment(s), the instructions should clearly indicate which areas to

list and which not to list. The Listing Handbook provides illustrations for listing five different types of clusters (Figures E-1 through E-5). Study these carefully. Figure 3.4-1 illustrates how to prepare a cluster map for a simple block.

In addition, a Listing Form (Form F) and the appropriate number of continuation pages must be prepared for each cluster. On page F-1 indicate the cluster #, page numbers, and the lister's name. Use the estimated MOS from Form C to determine how many pages of Form F will be needed for each cluster; however, it is good to provide extra space in case the actual number of households is greater than anticipated. Indicate the cluster # and page numbers on the continuation pages.

3.4.2 Lister Training

Prepare for Lister Training

Prepare copies of the Listing Handbook for each lister and assign them to listers before the first day of training. Have them read the book and study the instructions carefully while the staff prepares for the sessions. Obtain lister ID cards or badges, letters of identification, and extra copies of Forms D, E, and F for the training procedures.

The training team should begin their preparation by discussing the Listing Handbook instructions page by page. Then two areas should be chosen for practice listing -- one simple block, and one more complicated area (either linked non-contiguous blocks, or blocks with alleys, etc.). The staff should prepare maps (Form D) and Listing Forms (Form F) for the blocks, and proceed to the areas to list the designated households. While in the areas, the team should also make sketches of the areas on the sketch sheet (Form E). After completing the listing, the staff should discuss the procedures and problems encountered, and prepare copies of these practice materials to present during the training session. In addition, select several blocks which can be listed for training purposes. Be sure that you do not choose areas selected for the sample for any practice procedures.

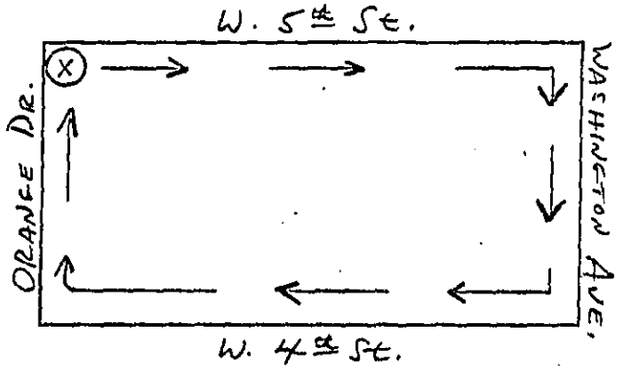
FORM D

IDENTIFYING STREETS AND MAP OF SELECTED CLUSTER

Cluster # 024

Surrounding Streets: ORANGE DR.
W. 5th St.
WASHINGTON AVE.
W. 4th St.

Lister DAVID JONES



Place an 'X' on the most northwest corner and an arrow indicating the clockwise direction.

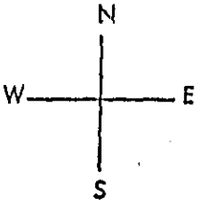


Figure 3.4-1. Example Lister's Map

Training – Day 1

The morning session for Day 1 should be spent in the office. Begin by carefully going over the instructions given in the Listing Handbook. Make sure that the listers have read and understood the handbook, that they realize the necessity for precise and thorough work, and that they are familiar with the purposes of Forms D, E, and F. Use the practice materials prepared to illustrate the listing process. Discuss and answer questions.

In the afternoon, the staff and all listers should locate a selected area on the city map, and proceed to the area to list the households. Perform the entire listing as a team, alternating the role of lister, and discussing the process as it is underway. Return to the office and discuss the practice listing.

Send the listers home and ask them to continue to study the instructions.

Training – Day 2

When the listers arrive, assign each of them an area to practice listing and provide them with the forms they will need. Send them into the field and plan to have them return in sufficient time to discuss with each of them how they did the listing, answer questions, and correct errors. In reviewing the work of the listers at this point, be sure to emphasize the most crucial aspect of listing – thoroughness. It is absolutely critical that the listers use initiative and diligence in finding every single household in the cluster. The Listing Handbook provides the listers with clues and tips for doing this; however, they will have to be industrious in developing their own methods for locating households. Stress these issues of thoroughness, persistence, and ingenuity when giving feedback on practice work.

In the afternoon, the listers will be given their assignments and they can begin to list the households on selected clusters.

3.4.3 Management of Listing Operations

Assignment of Selected Clusters to Listers

At the first assignment, give approximately three clusters to each lister. As the operations proceed, you can assign more clusters at a time. When giving out the assignments, discuss the locations of the clusters with the listers to be sure they know where they are going. Use the maps and aerial photo for assistance.

The assignments must be logged on the Listing Log Sheet (Form G). Column 1 indicates the cluster number; Column 2 gives the lister's identification (name, or initials, or number, etc.); and Column 3 indicates the date on which the assignment was given. Record the information in Columns 2 and 3 when giving assignments. Figure 3.4-2 illustrates the use of the Log Sheet.

Management Issues

The listing operations must be carefully supervised to ensure that the procedures are done correctly. The first management issue is making certain that listers locate the correct area, and they understand the instructions for listing. You will probably receive many calls and questions about how to find the assigned area.

The second issue is checking and validating the work to make sure that it has been done both thoroughly and correctly. You will need to spot-check each lister occasionally, especially in the early stages, to review the work. Additionally, go over the forms for each cluster as they are brought in so that problems and errors can be cleared up promptly.

The third issue is organization. The listing for each cluster must be logged in Column 4 of the Log Sheet. After the work has been carefully checked, Column 5 of the Log Sheet should be marked. Figure 3.4-2 illustrates how to record these procedures. In addition, keep track of any sketches provided by the listers on Form E so that you may give more precise information to interviewers.

FORM G-1

LISTING LOG SHEET

Page 1 of 4

Column 1	Column 2	Column 3	Column 4	Column 5	Column 6	Column 7
Cluster #	Lister	Logged Out	Logged In	Checked	# of Households	# of Selections
001	S. Brown	5/24	5/25	✓	18	
002	S. Brown	5/24	5/26	✓	23	
003	S. Brown	5/24	5/25	✓	34	
004	S. Brown	5/24	5/26	✓	8	
005	S. Brown	5/24	5/27	✓	51	
006	S. Brown	5/24	5/28	✓	14	
007	S. Brown	5/24	5/25	✓	32	
008	S. Brown	5/24	5/28	✓	19	
009	S. Brown	5/24	5/26	✓	24	
010	S. Brown	5/24	5/27	✓	20	
011	B. Davis	5/25	5/26	✓	35	
012	B. Davis	5/25	5/26	✓	18	
013	B. Davis	5/25	5/27	✓	17	
014	B. Davis	5/25	5/28	✓	10	
015	B. Davis	5/25	5/26	✓	45	
016	B. Davis	5/29	5/30	✓	34	
017	B. Davis	5/29	6/2	✓	19	
018	B. Davis	5/29	6/2	✓	28	
019	B. Davis	5/29	6/1	✓	21	
020	B. Davis	5/29	5/30	✓	13	
021	L. Rossi	5/26	5/28	✓	28	
022	L. Rossi	5/26	5/28	✓	32	
023	L. Rossi	5/26	5/27	✓	37	
024	L. Rossi	5/26	5/27	✓	19	
025	L. Rossi	5/26	5/28	✓	15	

Figure 3.4-2. Example Listing Log Sheet

The final task of the listing operation is to record the total number of actual households on each cluster. Go through the Listing Forms for each cluster, take the total number of households and write it in Column 6 of the Log Sheet on the line for that cluster. See Figure 3.4-2 for an illustration. This information will be used in the next stage of the sample selection procedures. Column 7 of the Log Sheet will be filled in after the household selections are made in Section 3.5.

3.5 Household Selection

This section provides instructions for the selection of households for interviewer contact. Forms F and H will be used for this procedure. For each cluster, a sampling interval for household selection will be calculated on the basis of the expected number of households for that cluster (the updated MOS measure). The sample is designed to select seven households from each cluster. However, the number of selections will be greater or less than seven if the actual number of households listed for the cluster is greater or less than expected. This variation in the number of selections is a feature of the sample design which adjusts for housing unit construction or demolition.

3.5.1 Calculation of the Household Sampling Interval

(This procedure is followed for each of the 100 clusters)

For each cluster, prepare a copy of Form H, using information from Form C which lists the selected clusters. Indicate the cluster number on Form H, and the "Expected Number of Households" which is the MOS measure. Calculate the household sampling interval S by dividing the MOS, called 'X' by 7. See Figure 3.5-1 for an example. S may be rounded to one decimal place to make calculations easier. Calculate the 100 different sampling intervals for the 100 clusters.

3.5.2 Selection of Households

(This procedure is followed for each of the 100 clusters)

STEP 1– Calculate the Approximate Number of Selections

If the actual number of households listed in the field is greater or less than the expected number by at least the size of S for that cluster, then the number of selections for the cluster will be greater or less than seven. It is possible to calculate the approximate number of selections that will be made for any cluster (approximate because the random start can mean a difference of plus or minus 1 selection). From the Listing Log Sheet (Form G) take the actual number of households for each cluster and write it on Form H for that cluster in the space indicated. Divide this number, called 'Y', by S to give N.

Figure 3.5-1. Example Calculating Household Selections

FORM H-1

WORKSHEET FOR HOUSEHOLD SAMPLING INTERVAL

Cluster # 003

EXPECTED NUMBER OF HOUSEHOLDS (from Column 4 of Form C)	ACTUAL NUMBER OF HOUSEHOLDS (from Column 6 of Form G)
X = 20	Y = 34

- Calculate the sampling interval S:

$$S = \frac{X}{7} = \frac{20}{7} = 2.85$$

- Round this number to 1 decimal place:

S = 2.9

- Calculate the approximate number of household selections N:

$$N = \frac{Y}{S} = \frac{34}{2.9} = 11.7$$

		Additions	Truncated #	
1.	Take the random number R = H1 =	1.0	truncate: 1	Locate this number in Col. 2 of Form F. Mark with an X in Col. 1.
2.	Add S to H1: Write S here	+2.9		
	The sum = H2 =	3.9	truncate: 3	Locate this number in Col. 2 of Form F. Mark with an X in Col. 1.
3.	Add S to H2: Write S here	+2.9		
	The sum = H3 =	6.8	truncate: 6	Locate this number in Col. 2 of Form F. Mark with an X in Col. 1.
4.	Add S to H3: Write S here	+2.9		
	The sum = H4 =	9.7	truncate: 9	Locate this number in Col. 2 of Form F. Mark with an X in Col. 1.

Figure 3.5-1. Example Calculating Household Selections (Continued)

WORKSHEET FOR HOUSEHOLD SAMPLING INTERVAL

		Additions	Truncated #	
	H4 =	9.7		
5.	Add S to H4: Write S here	+ 2.9		
	The sum = H5 =	12.6	truncate: 12	Locate this number in Col. 2 of Form F. Mark with an X in Col. 1.
6.	Add S to H5: Write S here	+ 2.9		
	The sum = H6 =	15.5	truncate: 15	Locate this number in Col. 2 of Form F. Mark with an X in Col. 1.
7.	Add S to H6: Write S here	+ 2.9		
	The sum = H7 =	18.4	truncate: 18	Locate this number in Col. 2 of Form F. Mark with an X in Col. 1.
8.	Add S to H7: Write S here	+ 2.9		
	The sum = H8 =	21.3	truncate: 21	Locate this number in Col. 2 of Form F. Mark with an X in Col. 1.
9.	Add S to H8: Write S here	+ 2.9		
	The sum = H9 =	24.2	truncate: 24	Locate this number in Col. 2 of Form F. Mark with an X in Col. 1.
10.	Add S to H9: Write S here	+ 2.9		
	The sum = H10 =	27.1	truncate: 27	Locate this number in Col. 2 of Form F. Mark with an X in Col. 1.

Figure 3.5-1. Example Calculating Household Selections (Continued)

WORKSHEET FOR HOUSEHOLD SAMPLING INTERVAL

		Additions	Truncated #	
	H10 =	27.1		
11.	Add S to H10: Write S here	+ 2.9		
	The sum = H11 =	30.0	truncate: 30	Locate this number in Col. 2 of Form F. Mark with an X in Col. 1.
12.	Add S to H11: Write S here	+ 2.9		
	The sum = H12 =	32.9	truncate: 32	Locate this number in Col. 2 of Form F. Mark with an X in Col. 1.
13.	Add S to H12: Write S here	+ 2.9		SELECTION STOPS HERE.
	The sum = H13 =	35.8	truncate: ~~35~~	Locate this number in Col. 2 of Form F. Mark with an X in Col. 1.
14.	Add S to H13: Write S here	+		
	The sum = H14 =		truncate:	Locate this number in Col. 2 of Form F. Mark with an X in Col. 1.
15.	Add S to H14: Write S here	+		
	The sum = H15 =		truncate:	Locate this number in Col. 2 of Form F. Mark with an X in Col. 1.
16.	Add S to H15: Write S here	+		
	The sum = H16 =		truncate:	Locate this number in Col. 2 of Form F. Mark with an X in Col. 1.

See Figure 3.5-1 for an example. N tells approximately how many household selections will be made for that cluster. You can use this figure to check your work once you have calculated all the selections for the cluster.

STEP 2– Take a Random Start

Following the rules outlined in Section 3.3.2 (STEP 3, a. through d.), take a random number between 1 and S, the household sampling interval. For the random start, begin with the digits just following the numbers used for cluster selection. Call the number R and write it on Form H in the space indicated.

STEP 3– Select Households

The first number for household selection is taken by truncating the random number R. See Figure 3.5-1 for an illustration. The next selections will be done by the same systematic calculation of numbers that was used in Section 3.3.2 for cluster selection. After determining all the selections for the clusters, check the total number of selections with the approximation, N. If you have not calculated N (±1) selections, then you have made an error in the work. Check the additions and correct the mistake.

> Note: If the truncated random number is zero (0), add the interval S to the random number R before truncation. Enter this sum on line 1 of Form H and otherwise follow the directions for household selection.

Each household selection must be marked on the Listing Form for the cluster. In Column 2 of the Listing Form, household numbers are printed. In the example in Figure 3.5-1, the selected household is 1 and the first line is marked in Column 1 of the Listing Form. See Figure 3.5-2 for an illustration of marking the Listing Form. The X in Column 1 indicates that the first household is chosen for interviewer contact. Mark each selected household number on the Listing Form for the cluster.

Before continuing to STEP 4, double-check the work in STEP 3 to verify that it is correct.

FORM F-

HOUSEHOLD LISTING FORM

Cluster # 003

Page 1 of 3

Lister A. Brown

LIST ONLY THOSE HOUSEHOLDS INDICATED BY ARROWS ON THE CLUSTER MAP.

(If an address is unclear, write a good description.)

Column 1	Column 2	Column 3	Column 4	Column 5	Column 6	Column 7
X	Household #	Street #	Apt. #	N/S/E/W	Street Name	Ave/Street/Drive
X	1	1690		W	5th	Street
	2	1678		W	5th	Street
X	3	1672		W	5th	Street
	4	1660		W	5th	Street
	5	1650		W	5th	Street
X	6	1644		W	5th	Street
	7	1632		W	5th	Street
	8	1626		W	5th	Street
X	9	1608		W	5th	Street
	10	1600		W	5th	Street

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Figure 3.5-2. Example Household Listing Form

FORM r

HOUSEHOLD LISTING FORM

Cluster # 003

Page 2 of 3

Column 1	Column 2	Column 3	Column 4	Column 5	Column 6	Column 7
X	Household #	Street #	Apt. #	N/S/E/W	Street Name	Ave/Street/Driv
	11	494			Washington	Avenue
X	12	472			Washington	Avenue
	13	448			Washington	Avenue
	14	432			Washington	Avenue
X	15	420 ½			Washington	Avenue
	16	418			Washington	Avenue
	17	1693		W	4th	Street
X	18	1685	1	W	4th	Street
	19	1685	2	W	4th	Street
	20	1685	3	W	4th	Street
X	21	1657		W	4th	Street
	22	1641		W	4th	Street
	23	1633		W	4th	Street
X	24	1629		W	4th	Street
	25	1625		W	4th	Street

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Figure 3.5-2. Example Household Listing Form (Continued)

FORM F

HOUSEHOLD LISTING FORM

Cluster # 003

Page 3 of 3

Column 1	Column 2	Column 3	Column 4	Column 5	Column 6	Column 7
X	Household #	Street #	Apt. #	N/S/E/W	Street Name	Ave/Street/Drive
	26	1601	1	W	4th	Street
X	27	1601	2	W	4th	Street
	28	403			Orange	Drive
	29	417			Orange	Drive
X	30	421	1		Orange	Drive
	31	421	2		Orange	Drive
X	32	445			Orange	Drive
	33	471			Orange	Drive
	34	483			Orange	Drive
	35					
	36					
	37					
	38					
	39					
	40					

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For Office

Figure 3.5-2. Example Household Listing Form (Continued)

STEP 4 — List the Number of Household Selections

When preparing the materials for interviewer contacts to the selected households, it will be useful to have a list of the number of household contacts to be made for each cluster. It is convenient to list this information on Form G, the Listing Log Sheet. For each cluster, record the number of household selections in Column 7 of the Log Sheet.

Once the households have been chosen, the sample selection is not complete. A single adult from each household will be chosen for interview through a "random selection" method which minimizes bias. The Respondent Selection Labels attached to each questionnaire are used for the procedure. The method for selection is discussed in detail in the Interviewer Handbook in Appendix G.

3.6 Preparation of Interview Cluster Kits and Letters of Introduction

This section gives instructions for preparing all the field materials which interviewers will use to locate the selected households and conduct the interviews. Maps must be prepared, labels must be organized, the questionnaires must be labeled and precoded, and other materials must be readied. An Interview Cluster Kit can then be assembled for each cluster. In addition, Letters of Introduction must be addressed so that they can later be mailed to selected households in advance of the interviewer contact.

The work described in this section is primarily a task of assembling and preparing materials. The instructions present a systematic method for organizing and carrying out the procedures.

3.6.1 Preparation of Interview Cluster Kits

STEP 1– Organize Materials

Organize the following materials which you already have for each cluster:

- Map of the Selected Cluster (Form D)
- Lister's Sketch of the Selected Cluster (Form E)
- Listing Form (Form F)

These materials will be used to prepare the Interviewer's Cluster Map (Form I) for each cluster.

All the interviewing materials (Appendix F) will be needed for the kits. The Respondent Selection Labels are included in Appendix F. They are to be printed on small gummed labels (ones that peel off easily) which will fit into the appropriate square on the first page of the questionnaire; i.e., no larger than 2 inches by 4 inches. The labels are called 01 through 12. You will notice that some of the labels are identical. Nevertheless, the labels must be printed in equal quantities. In addition, be sure to have the appropriate numbers of the remaining interviewing materials – Respondent Handcards, Informed Consent Statements, Call-Back Cards, and Thank-You Cards.

Finally, you will need Letters of Introduction and envelopes for mailing to each selected household.

STEP 2 – Prepare Respondent Selection Labels

A label will be assigned to each questionnaire in a systematic fashion such that label 01 will go on the first questionnaire; label 02 on the second; label 03 on the third; and so forth, through label 12; label 01 will go on the thirteenth questionnaire, etc. Therefore, once the labels have been printed in equal quantities, they must be placed in order from 01 through 12, then the next 12, and so forth until all the labels are ordered. Assemble the labels in 12 separate piles. Then take one label from each pile, in order, and reassemble them.

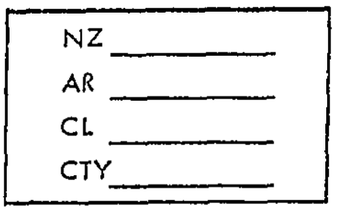
The Listing Log Sheet (see Columns 1 and 7, Form G) lists the number of households which will be contacted for each cluster. This, then, is the number of questionnaires and labels which will be prepared for the cluster. In order, from cluster 001 through 100, count out the necessary labels for each cluster. Put a paper clip or rubber band around each group of labels and attach a slip of paper which indicates the cluster number to which the set of labels is assigned. Once the labels for a cluster are banded, the count for the next cluster begins with the very next label. By grouping the labels in this way, the work of preparing questionnaires can be allocated to different staff members, and the preparation of cluster kits can proceed in any order.

STEP 3– Prepare Questionnaires

Questionnaires should be prepared for each of the 100 clusters, one cluster at a time. Keep the questionnaires for each cluster in the same order from the first through final procedure in STEP 3.

a. First, place a selection label on each questionnaire. Take the labels for that cluster and attach them, in order, to the questionnaires for the cluster.

b. Second, code sample properties on each questionnaire. On page i of the questionnaire there is a box like this:



The NZ stands for the Noise Zone code number. The AR stands for the Area code number. The CL stands for the cluster number. The CTY stands for the city number; that is, each city conducting the survey is assigned a unique number by the Environmental Protection Agency. Write the NZ number as a two-digit code; that is, Noise Zone 01 is '01; Noise Zone 02 is '02', and so on. Write the AR number as a one-digit number. Write the CL number as a three-digit number; that is, Cluster 001 is '001', Cluster 045 is '045', and so on. Write CTY as a three-digit number.

c. Third, assign a unique Respondent # or ID # to each questionnaire. This number has five digits. The first three digits are the same as the cluster number. That is, all the ID #'s for the questionnaires in cluster 050 will have the same first three digits — '050'. The last two digits of the ID #, however, are assigned in the following manner. The first questionnaire is numbered '050-01'; the second questionnaire is numbered '050-02'; and so on until all the questionnaires in cluster 050 are numbered. For each cluster, begin assigning the last two digits of the ID# with '01' and continue through the highest number needed. Since the first three digits of the ID# are different for the questionnaires in different clusters, this process of assigning numbers gives each questionnaire, and each respondent, a unique ID number. Write the five-digit number in the space for "Respondent #." Then transfer the numbers into the boxes at the top of

the right-hand column. For example:

	1	2	3	4	5
ID#	0	5	0	0	1

d. Fourth, write the address of the selected household on the questionnaire. Using the information on the Listing Form for each cluster, take the address of the household marked for selection and accurately transfer it into the appropriate space on the front of the questionnaire.

STEP 4 – Prepare Interviewer's Maps

An Interviewer's Map (Form I) must be prepared for each cluster. Using the map which was prepared for the Lister (Form D), and the sketch provided by the lister (Form E), if this was prepared, sketch the cluster and list the identifying streets on Form I. As much as possible, try to determine the approximate location of each selected household and mark each location with an 'X' on the map. Use the actual listing of addresses on the Listing Form to help you do this. Figure 3.6-1 illustrates an interviewer's map prepared for the cluster selections used as examples in Figures 3.4-1, 3.5-1 and 3.5-2. Finally, indicate any detailed information which the lister may have provided for locating the cluster or particular households, or for dealing with any problem situations which the interviewer might come across.

STEP 5– Assemble Interview Cluster Kits

Prepare a kit of materials for each cluster by assembling the following items in a large manila envelope marked for the cluster. The actual number of items will be different for each cluster since the number of household selections varies:

- Questionnaires (one per household)
- Respondent Handcards (one set is sufficient for each interviewer)

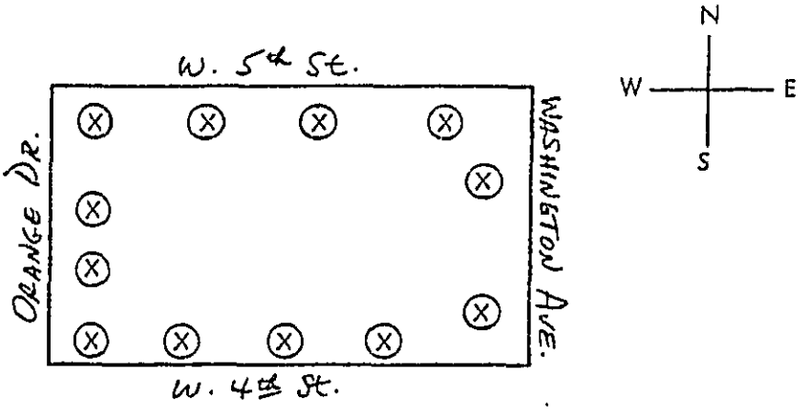
INTERVIEWER'S CLUSTER MAP

Cluster # 024

Surrounding Streets: ORANGE DR.
W. 5th St.
WASHINGTON AVE.
W. 4th St.

Interviewer: ALICE HOLZER ID# 16

The 'X's indicate the approximate locations of the households to contact.



Notes to Interviewer: West 5th St. is a one-way street going west, and West 4th St. is a one-way street going east. The 6th household, 420 1/2 Washington Ave., is behind 418 Washington Ave., above the garage.

Figure 3.6-1. Example Interviewer's Cluster Map

- Informed Consent Statements (one per questionnaire)
- Thank You Cards (one per questionnaire)
- Call-Back Cards (one per questionnaire)
- The Interviewer's Map (Form I)

3.6.2 Preparation of Letters of Introduction

The Letter of Introduction serves to inform the residents of a selected household that they will be contacted to participate in the study. The model for the letter is presented in Appendix B and it should be modified, if necessary, to suit the community. Notifying the residents of the sponsorship of the study, the legitimacy of the interviewers, the scientific method of the collection of information, the confidentiality of responses, and the usefulness of the data, will all result in greater responsiveness in the community. This will be enormously helpful to the interviewers as they conduct the field operations and it will enable you to obtain the maximum response rate for completed interviews.

Letters will be sent approximately a week before the anticipated contact by interviewers, and they will be sent to all selected households in a cluster at the same time. Therefore, it is efficient to prepare the letters by addressing envelopes and stuffing them in advance of the actual time of mailing. Do this now and keep the letters organized according to cluster.

CHAPTER 4

Implementation of the Survey

4.0 INTRODUCTION

We will now discuss the implementation of the survey. Up to this point, you have been preparing for the survey - planning, organizing, obtaining materials, taking the sample, and preparing the questionnaires. It is important that these tasks be completed before the field operation is started because the time demands will be enormous. During the training period and during the first couple of weeks of the survey implementation, a large number of tasks and problems will have to be handled and you will need to be free of other tasks to do these. If you have completed the preparations for the survey, then proceed with the field operation.

The following procedures will be discussed:

1. Selection of Field Personnel;
2. Sending Introductory Letters to Selected Households;
3. Training of Field Personnel;
4. Allocating Household Assignments to Interviewers;
5. Managing the Field Operation;
6. Sorting Out Questionnaires for Editing and Coding;
7. Editing Questionnaires;
8. Validating Questionnaires;
9. Coding Questionnaires; and
10. Preparing Data for Keypunching.

The instructions separate the tasks from one another but many times they will be conducted simultaneously.

4.1 Selection of Field Personnel

It is very important to select good interviewers. Interviewing is a complex task and some people are just better at it than others. Good interviewers generally obtain higher acceptance rates than poor ones, and they tend to obtain more accurate and useful information. Good interviewers have the skills necessary to put a respondent at ease, to make him or her feel that the information obtained will be relevant and beneficial. One of the purposes during the training period will be to teach personnel the skills of being good interviewers. But personality dimensions play an important part as well, and the more carefully the applicants are screened, the more effective the survey implementation will be.

The operation of the survey will involve several different roles: interviewing, editing, validating, and coding. Practically, however, all personnel should be trained at the same time, because they will have to be totally familiar with the questionnaire and the procedures, whether they will be interviewers or not. Therefore, the selection and training of all personnel together will be assumed.

Given the resources of the study, there may not be the choice of selecting from a pool of applicants. Nonetheless, several qualifications should be met. In this way, people who would obviously be inappropriate may be eliminated. Useful information may be gained by reviewing an application form, but also try to talk to each applicant. An example application form is contained in Appendix H.

The application will indicate the following qualifications. First, the person must be at least 18 years of age. A survey is governed by certain legal constraints so that it is necessary to have adults doing the interviewing. Second, the person must be able to read and speak English fluently, and must be able to follow instructions. The completed application form can indicate deficiencies in any of these skills. Note that many of the questions in the application form are from the questionnaire. Third, the applicant should have a valid driver's license

and an available car. Interviewers will have to visit clusters all over the city, at night as well as on weekends, and having constant access to a car is essential. Fourth, the person must be able to give sufficient time for the interviewing assignment. This means that the person must be able to attend the entire 5-day training session plus give at least 20 hours a week for the duration of the study.

It will be necessary, however, to also interview the applicants in order to screen out persons who might be inappropriate. It is difficult in a short interview to pick out "problems" that would affect interviewing, but there are several things to look for. The applicant should enjoy talking to people. You can gain a good idea of a person's ability to communicate after talking to him or her for a while, and certainly after the training period. If someone is very withdrawn and becomes inhibited while interacting with others, he or she will be a bad interviewer and may do more harm to the study than help (as well as costing your organization a lot of money). An applicant must be able to listen carefully to what other people are saying. Thus, if you sense that a person does not listen to others, then he or she will not be a good interviewer.

Pay particular attention to "negative personality traits" - traits which will put a potential respondent on the defensive. When the survey is well underway, you will start to notice certain patterns in your interviewers. You will notice that some interviewers consistently obtain high acceptance rates (e.g. they interview 80%-90% of the respondents they contact), while others have very low acceptance rates (e.g. less than 50%); a certain number of respondents will always refuse to be interviewed, but a good interviewer will obtain higher acceptance rates. The reasons are fairly clear; good interviewers present themselves openly, make the contact person or the respondent feel safe, and make them feel that the interview will be a worthwhile experience. On the other hand, people with "negative personality traits" will put the people they talk to on the defensive and make them less likely

to give an interview or, if they agree, less likely to give accurate and full information. It is difficult to know how to measure applicants with these "negative personality traits", so you will have to rely on your intuition. When talking to an applicant, does the person come over as warm and open? Do you feel comfortable and good when you talk to him or her? Or does the person appear to be closed or make you feel closed? Pay attention to your feelings because they are good guides to what is happening in the interaction.

Another characteristic to consider when talking to applicants is their carefulness. Does the person take care to hear what you are saying, or think carefully when he or she talks? From the training session, you will notice that some interviewers are very careful about reading the questions and recording the answers, while others are careless - they may not read the question accurately, or may paraphrase the question. Carefulness is a very important trait for interviewers since the accuracy of the survey depends on it.

Finally, it may help to have individuals who have had previous experience in interviewing. However, previous experience does not necessarily make a good interviewer; many insensitive persons have been interviewers at one time or another.

The degree to which you can select your applicants will depend, of course, on the resources. However, even if there is not a large choice, do not allow obviously poor interviewers into the field; they may do more harm than good. The screening of personnel will continue through the training period. Some of the applicants will be chosen to be editors, validators or coders, so think in terms of sorting the people into these various tasks. Generally, people who make bad interviewers will also make bad editors, validators, or coders. But there are other grounds for selecting. Some applicants may be competent but may not present themselves very well (e.g., someone who has had a stroke or has a physical disability).

Pay careful attention to people while you are training them. While it is good for trainees to ask questions, if a person continually asks questions or makes "long-winded" statements, this may indicate the need for attention. This type of person will not make a good interviewer. Similarly, people who need constant communication with the training staff during and after sessions will probably not make very good interviewers; a continual need for reassurance may be a sign that the individual cannot work on his or her own. In addition, consider the speed at which people work. People who work too quickly may rush through the job carelessly and, therefore, obtain poor information. On the other hand, people who work too slowly may take so long to complete an interview that they become very expensive (when you cost their output over the length of the survey). Remember, you are working with a "work load" vs. "accuracy" trade-off. You want to complete the survey quickly and you want to keep accuracy as high as possible.

It is desirable to control some of the group characteristics of the interviewing pool. It is a good idea to have a balance between males and females. If there are any sizeable minority groups in the city, try to have minority interviewers to help increase the response rate of the survey. If there are any groups whose mother tongue is not English, then having native-speaking interviewers will be very useful. Check, however, that bilingual interviewers actually speak, read and record the language well.

4.2 Sending Introductory Letters to Selected Households

On the first day of the training session, you will have to complete a task that will be relevant on the last day. In Section 3.6.2 the introductory letter was discussed. The purpose of this letter is to prepare the selected households for the survey, thereby making it easier for the interviewers when they approach the

household. These letters should be sent no later than a week before the interviewers will approach the household. It will be necessary to anticipate when particular clusters will be contacted so that the letters are mailed at the appropriate time. If the letters are sent too early, they are liable to lose their impact.

Before the first day of training, decide which clusters are to be contacted first. Since the training will take five days, interviewers will go out into the field at the end of the fifth day, so that the letters for the first batch of clusters should be sent the first or second day of training. From the attendance on the first day, you can estimate how many interviewers will be available for interviewing at the end of the training period and, therefore, how many clusters will be contacted.

After the first batch of clusters has been contacted, estimate when interviewers will be ready to start new clusters so that more letters can be sent. Generally it will take an interviewer a week to two weeks to finish a cluster. The process of sending introductory letters will be continued throughout the field operation until all clusters have been contacted.

4.3 Training of Field Personnel

One of the major tasks of the survey is the training of interviewers. It is essential that the interviewers, as well as the editor, validators and coders be trained in all aspects of the survey administration so that the data collection and its editing and coding are standardized. For this reason, the training session is a 5-day operation. A shorter training program will only lead to sloppy interviewing and many problems and will cost more in the long run in terms of time and money. Therefore, do not cut down on this period. Each applicant must attend all 5 days of training; otherwise he or she cannot become an interviewer.

Before beginning the training program, become very familiar with the questionnaire and the Interviewer's Handbook (Appendix G). This handbook gives

detailed instructions on the questionnaire structure and interviewing skills, so that this discussion will not be repeated here. You must be thoroughly familiar with the questionnaire in order to teach other people how to use it.

A tentative schedule for the 5 days is as follows:

Day	Major Tasks	Preparation Work at Home
–	—	Read Interviewer Handbook before Day 1
1	General Introduction to Project; Ethics of the Project; Structure of the Questionnaire; Go Over the Questionnaire Break into Small Groups, Pair Off, and Practice One Interview;	
–	—	Re-Read Interviewer Handbook
2	Break into Small Groups; Practice Interviewing All Day with Staff Monitoring Interviews; Aim is to Learn Questionnaire Structure; Turn-in Afternoon's Interviews;	
–	—	Practice Interview at Home on Relative or Friend
3	Practice Interviews from Home Turned-in; Staff Return Yesterday's Questionnaires with Individual Feedback; Introduce Use of Call Record Sheet and Informed Consent Statement; Break into Small Groups; Continue Practice Interviews All Day;	
–	—	Practice Interview with Stranger - not in cluster

Day	Major Tasks	Preparation Work at Home
4	Practice Interviews with Stranger Turned-in; Staff Return Yesterday's Questionnaires with Individual Feedback; Discussion of Expectations; Practice Door-Step Introductions; Continue Practice Interviews;	
—	—	Write Down Feelings About Training Session, Anxieties, Hopes about Going Into Field, Expectations, etc.
5	Discuss Expectations, Anxieties, Hopes; Give Back Yesterday's Questionnaires with Individual Feedback; Give Out Interviewing Assignments; Review Materials in Kit.	

The training schedule is a tight one and involves a great deal of work on both the staff and trainees' part. We suggest that each day be a 6-hour work period in order to accomplish what is necessary. Three goals are emphasized during the training period.

1. Ethics of Research and Professional Behavior.
2. Correct Interviewing Procedures.
3. Good Interviewing Skills.

4.3.1 Ethics of Research and Professional Behavior

There are two basic values which underlie this survey: objectivity and ethical responsibility. It is essential that you accept these values and impart them to the trainees during training.

A commitment to objectivity means that you wish to understand the attitudes of the residents of the community in a scientific and unbiased manner. Whatever the residents of the community think, report these attitudes and opinions accurately,

irrespective of whether they agree with yours or not. The purpose of a public opinion survey is, after all, to obtain information on what the public thinks. You must be absolutely committed to obtaining this information in as accurate a manner as possible.

Practically, this commitment to objectivity has several components. First, respondents are selected as objectively as possible in order to represent the population of the city as a whole. Second, the procedures attempt to reduce bias in interviewing. For example, training is done in order to standardize interviewer procedure, and quality control tests are carried out to minimize errors. All staff, interviewers, editors, validators and coders should be committed to objectively obtaining information.

A commitment to ethical responsibility, on the other hand, is a commitment to professionalism. The individuals who will be interviewed in this study, the respondents, are doing the city a favor by giving their opinions on noise and other community problems. Their rights are a matter. of primary concern. Certain ethical obligations are created for the research staff and you should be explicitly aware of them at all times. The Interviewer Handbook spells these out in greater detail; however, to summarize, there are four basic rights which must be guaranteed to the respondents of your survey:

1. The respondent has a right to have his or her answers kept confidential. No data are released which would permit any respondent to be identified individually. Further, take care that there is no gossip about individuals. Even casual information obtained, expressed without reference to an individual's name, can allow other people to identify the respondent.

2. The respondent has a right to be treated with respect and dignity. A respondent's answer must be accepted openly and honestly by the

research team. The researchers have no right to judge a respondent's answers, to poke fun at an answer, to disagree with an answer, or to misinterpret an answer.

3. The respondent has a right not to be exploited in any way. The interviewer or research staff must not take advantage of a respondent in any way. The respondent is, after all, doing the city a favor by giving his or her time and effort.

4. The interviewers and research staff have an obligation to maintain a professional role during the course of the research. There must be no attempt to contravene the purpose of the survey by providing information or services or becoming involved in the activities of the respondent or his or her family. If for some reason a member of your staff comes into a conflict between the researcher's role and another role (e.g., having to interview a friend or relative), you should intervene in order to maintain the professional relationships.

These four ethical precepts are a set of rules designed to guarantee the rights of the respondents. Giving this protection explicitly will also help to legitimize the survey. If people feel they are being treated with respect and dignity, that their answers are confidential, that the study is legitimate, and that the interviewers and staff will not exploit them, then they will be more willing to participate in the study and will probably be more supportive of the survey and its results. This will help the implementing of the study rather than harm it. Remember that "good will" is an essential part of any research and that a commitment to ethical responsibility is a way of establishing "good will".

4.3.2 Correct Interviewing Procedures

It is essential to continually emphasize that there is one, and only one, correct interviewing procedure. Otherwise, interviewers are liable to get

the idea that they can improvise when they want. In being a bit "disciplinarian" about insisting on correct procedures, you may receive some emotional feedback from trainees while they are learning. However, tight control of procedures will instill RESPECT FOR THE VALIDITY OF THE SURVEY. Therefore, make sure to insist on the absolute correctness of the interviewing procedures.

1. The Call Record Sheet must be filled out correctly. A complete history of all contact attempts should be registered, as well as the correct codes. If a non-interview occurs, pages ii and iii should be filled out completely.

2. There is only ONE correct respondent. The Respondent Selection Label will tell the interviewer whom should be interviewed from the household. There are to be NO substitutions. This means that the interviewers will have to know how to read the selection label as well as how to correctly fill out the roster on page vi.

3. Interviewers must learn to give the Informed Consent Statement after the respondent agrees, and have the respondent sign the form. This is a government requirement that protects the organization from legal vulnerability.

4. Questions should be asked in the exact order in which they are written. No question should be skipped, unless there is a SKIP instruction (Q19, Q24).

5. Interviewers must learn to read the questions EXACTLY as they are written; they are not to improvise or paraphrase. ONLY THE EXACT WORDS SHOULD BE READ. There is one exception to this. When they make their door-step introductions, they can explain themselves in their own words, merely paraphrasing the introduction listed on page v. But aside from this and explaining what the survey is about or answering questions about the survey,

only the exact words should be read. This is essential because trainees often start out paraphrasing questions. They read the question quickly, therefore, they re-phrase it. When this occurs, stop them and point out that they are not reading the words correctly.

a. The A-B questions must be followed correctly (Q5, Q10, Q13). Trainees often have difficulty with these questions. They forget to ask all the items in Part A before they ask a Part B question. They forget to ask Part B when there is a "Yes" answer to an item in Part A. They sometimes skip over an item because they are rushing too quickly, and so forth. You will find that the trainees will have difficulty for a couple of days with these questions because the way they are asked is not "normal English." Insist, however, that they follow the instructions exactly. All the items in Part A must be asked before Part B is asked. If they answered "Yes" to any item in Part A, then Part B is asked only for that item. If they answered "No" in Part A to an item, then Part B is skipped for that item.

6. Interviewers must learn to handle the respondent handcards correctly. The cards are introduced in Q5 (or before Q6 if there are no "Yes" responses to Part A of Q5). The interviewer hands the deck of cards to the respondent and requests that the respondent not turn the cards until told to do so. At the beginning of the appropriate question, the interviewer will ask the respondent to turn to that number (the cards are numbered according to the question numbers). The interviewer should check that the respondent has turned to the correct card. It is important that the cards be used at every interview, again, for consistency purposes.

7. Interviewers must learn to write down probes. For Q3, Q4, Q25 and Q25A they are encouraged to probe the respondents. The exact words used to probe and the respondent's answers must be written. If there is any clarification required for any question, they should again indicate in the margin what was asked and what they said. You should insist on this because the coders will have to have as much information as possible to make a determination. This is particularly true for the open-ended questions (Q3, Q4, Q25, Q25A).

8. Interviewers must learn to complete the Observation Sheet on page 18 after the completion of the interview. They should also record the time that the interview was completed on page 18.

9. Finally, interviewers must learn to edit their questionnaires immediately after the completion of the interview. If this is emphasized during the training session, the practice will become automatic.

4.3.3. Good Interviewing Skills

Good interviewing skills are partly a matter of knowing the questionnaire procedures, but they are also a matter of "style". The way in which the study is introduced and the manner in which the questions are asked will affect the cooperativeness of the respondent. As the interviewers gain self-confidence, they will find that they obtain higher acceptance rates, that they enjoy their interviews more, and that the quality of their information is better. Making sure that the interviewers are thoroughly familiar with the procedures will help to instill confidence at the beginning; they will know what to do.

There are several additional issues. First, there is the pace of the interview. It should be smooth - neither too fast nor too slow. Monitor the trainees during the session and help them develop a smooth pace. Second, there is eye contact and general openness. Some trainees "hide" behind their questionnaires. They don't look the respondent in the face and they don't ask the questions to the respondent, but rather read them to themselves. Point out this behavior to them so they can correct it. Third, there is sensitivity and openness. Different people have different ways of being sensitive and expressing openness, so it's difficult to lay down any rules. However, if a trainee never smiles, nor expresses warmth in his or her voice, this is liable to make a respondent feel uncomfortable. Intervene immediately so that these characteristics are minimized in interviewing.

4.3.4 Training Techniques: Close Supervision in Small Groups

These three goals are pursued through several training techniques. The framework for training is to have all trainees work in small groups, with close staff supervision. In this way, trainees will have a lot of practice in interviewing during the training session, and will be able to receive immediate feedback when mistakes occur. This technique requires you to have several staff members as assistants. The more qualified staff there are, the smaller the groups can be and the closer supervision trainees will be able to receive.

There are two aspects to close supervison. First, there is supervision during the training session. However, because this requires paying attention to several interviewers at once, it is not possible to catch all mistakes. For this reason, the second kind of supervision occurs after the sessions, when the practice interviews are reviewed. In fact, examining the practice questionnaires can be more useful than person-to-person monitoring. Therefore, commit yourself to careful review of the practice interviews.

At the end of day 2, collect the afternoon's interviews and go over them. The next morning the trainees will turn in their practice interviews from home. Examine these during the evening of day 3, as well as the interviews completed in the afternoon. Similarly, on day 4 the trainees will turn in their practice interviews completed with a stranger. Again, go over these on the night of day 4, as well as looking at the afternoon's interviews. Return the corrected questionnaires to the interviewers with comments. This is also a good time for open discussion and questions from the interviewers. This will be the only time to correct interviewers before the training sessions data collection begins. Therefore, it is essential to carefully supervise trainees during this period.

4.3.5 Training Techniques: The Building of Small Group Solidarity

One important aspect of training in groups is the emphasis placed on small group solidarity. A "team" for studying the city is being created and all the trainees should feel part of it. Trainees will have a lot of anxiety about interviewing - being afraid, feeling incompetent, feeling unsure of themselves. However, working in small groups will help generate close contacts, friendships, and a strong group spirit which can minimize anxiety. If people feel part of a group, they will work harder and more carefully, and they will be more attentive to problems. During the first test of this workbook in Allentown, PA., the group solidarity was infectious and the quality of the interviewing was very high. Even the poorer interviewers were pulled along by the group, and in the end became quite good interviewers. Therefore, this aspect of the training session should be given much attention.

4.3.6 Training techniques: Discussing Openly the Anxieties and Expectations of the Trainees

Another important aspect of the training program is to bring the anxieties, hopes and expectations of the trainees out into the open. It is important to do this because

anxieties affect interviewer performance. ..By discussing them openly, the anxieties can be dissipated and participants will find themselves more ;comfortable in the actual interviewing situation. On the other hand, if you don't deal with these feelings, they are liable to surface during the interviews.

What are these anxieties and expectations? There are many common ones. First, there are fears about knocking on doors and talking to strangers. Most people have these fears, and there is a lot of anxiety about this. On Day 4 of the practice session, you can address the issue by role-playing door-step introductions. Second, there are fears about talking to people who are different from oneself - people from different races, from different social classes, even from the opposite sex. If an interviewer has this type of anxiety, a respondent may refuse to be interviewed or else the quality of the information is liable to be poor. Third, there are fears about being rejected - that is, a respondent refuses to be interviewed, or the initial contact person slams the door in the face of the interviewer. A fear of being rejected is liable to translate itself into a "self-fulfilling prophecy"; if one expects to be rejected, then one acts in such a way that one <u>does</u> become rejected. Fourth, there are fears about asking certain kinds of questions. The most obvious, is the question on the respondent's household income (Q26), but there are also fears about asking one's age, employment status, racial background or even occupation. Fifth, and finally, there are fears about just being a poor interviewer. Unless this is resolved, this fear is also liable to be "self-fulfilling".

How can you handle these fears? Some trainees will be open and will confront you immediately at the first session. For example, someone may ask "Do we have to work at night?" (i.e. "I'm afraid to go into certain areas of the city"),

or others will balk at asking income questions. For the majority, however, many of the fears will remain unstated. Trainees will act politely at first, and will not confront you with their fears; they may not admit them to themselves. It is important, therefore, to get at these fears by having at least one session where they are discussed.

The tentative training schedule presented in Section 4.3.7 has a session devoted to discussing these fears (Day 4). Obviously, if they come up beforehand, you should discuss them. There are three reasons, however, for choosing Day 4 for the discussion. First, it will take that long for the fears to surface. Trainees will be excited about the program for the first couple of days and will be more worried about learning the correct questionnaire procedures. Only when they feel comfortable with the questionnaire will they admit their feelings. Second, there should be a substantial amount of group solidarity by this time so that trainees will feel comfortable enough to talk about their feelings. If you try to introduce the subject before this time, you may find that trainees are still too inhibited. Third, and probably most important, the intensity of the training experience will generate a lot of frustration and resentment on the part of the trainees. Be prepared for this and don't worry about it too much. Trainees will resent the strong disciplining of their behavior in going through the interviewing practice, and they may feel "pushed around." Consequently, you are liable to find that by Day 3 and certainly by Day 4, there is a groundswell of feeling pent up within the group. When you introduce the session on expectations, therefore, the trainees are liable to be very ready to express openly their feelings.

The important thing about this session, however, is that it brings fears out into the open. The trainees will find that when they go out in the field, most of

these fears are ill-founded. Most people will accept to be interviewed (consistently over 70%) - people enjoy being interviewed, and most will answer all questions. Further, there are not liable to be any uncomfortable incidents, fewer, perhaps, than would normally occur in everyday life due to the "official" capacity of the interviewers. By discussing their fears, however, they are releasing themselves from certain feelings, and they will find that they are more "free" when they go into the field.

4.3.7 Detailed Discussion of the Training Session

Day 1

The first day will be primarily concerned with orientation. Trainees should have been given the Interviewer Handbook before the first session and told to read it. Introduce the project by explaining its purpose and scope, and its value to the city. Possibly an official of EPA will be present to help put the project into a larger context. Explain the four parts of the EPA Quiet Communities Program (QCP) – social survey, physical noise monitoring, strategy analysis, and noise abatement program. Try to make the trainees feel they are part of an important project that will help improve the quality of life in the city.

After this overview, address the issue of research ethics. Trainees should be aware that they are bound by the two important values of objectivity and ethical responsibility. The orientation session will absorb the morning program. Don't rush through the material, but give the participants time to absorb the information.

From the afternoon of the first day through the end of day 5, the main objective is to teach the trainees about the questionnaire and how to administer it. The best means for doing this is practice. Start by going over the structure of the questionnaire, concentrating on the general sections before examining specific questions.

Explain the different sections: the Call Record Sheet, the Selection Roster and the selection of the respondent, the general orientation to the city (Q1-Q5), the evaluation of public services (Q6), the general rating of health (Q7), the general questions about noise (Q8, Q9), the general impact of noise on the individual (Q10, Q16), the examination of specific noise sources (Q17), the support for a noise control program (Q18-Q21), basic demographic information (Q22-Q29), and an Observation Sheet (B1-B6). Present these sections generally so that the trainees will understand the plan of the questionnaire. Then examine each section by itself, looking at all the questions. Though the trainees will not have learned the questionnaire with this quick discussion, they will have started to become familiar with it.

Break the session into work groups after this general introduction. Divide the participants into small groups and assign one staff member per group. The staff member should lead the group in going over the questionnaire, page by page. If there is still time, have a pair volunteer to be an interviewer and respondent, and have a "mock" interview. If there is still time have another "mock" interview. Finally, tell the trainees to re-read the Interviewer Handbook at home. Tell them to read the questions aloud as questions sound differently when spoken.

Day 2

On Day 2, continue working in small groups. Have another pair of trainees conduct an interview, with the others watching. Do this until every individual has had a chance to either interview or be interviewed. In this way, the trainees will become increasingly familiar with the questionnaire, both from experiencing it and from listening to others.

Split the group up into pairs and have each trainee in the pair interview one another. The staff member should watch and monitor each pair in turn. Don't be too critical at this point, because trainees are very unfamiliar with the material. But do make it clear that they are expected to be as accurate as possible. Continue with this process and have each individual turn in the last interview he or she completed. Give the trainees a blank questionnaire and tell them to go home and interview someone they know.

Day 3

At the beginning of Day 3, the staff should return the corrected interviews from the day before. Emphasize that the comments are designed to help participants learn the questionnaire procedures completely and that they are not being judged on whether they "passed" or not.

Collect the interviews completed from home. Answer any questions and encourage a general discussion about how they felt in administering the questionnaire outside of class. After this discussion, break up into small groups again - different individuals from the day before, and continue to practice giving "mock" interviews. The trainees should utilize the Call Record Sheet and the Informed Consent Statement so that they become familiar with using it. This time the staff should be stricter in monitoring interviews, and should intervene whenever mistakes occur. By now, the trainees should be familiar enough with the questionnaire that they can go through it quickly. Monitoring them carefully, therefore, will ensure that they learn the correct procedures and don't develop any bad habits. Continue with the practice interviews throughout the day, and at the end give them the assignment of interviewing a stranger. Have them turn in their last interviews. They can contact the stranger by either knocking on doors or else going through a friend.

At night, the staff should go over the two interviews turned in by each trainee - the interview from the night before and the last interview of the day. Individual feedback should be given. Staff should pay attention to improvement or lack of improvement from the day before. Trainees who are having special difficulties should be sorted out for special attention on Day 4. Closer supervision can be made on these individuals. Finally, the editor, the two validators, and the four coders should be chosen at this point. On Day 4, these individuals should practice these tasks (see Section 4.7 for editing, Section 4.8 for validating, and Section 4.9 for coding).

Day 4

At the beginning of Day 4, return the corrected questionnaires and collect the interviews from the night before. Ask the trainees how they felt about interviewing a stranger. Try to elicit their feelings, expectations and fears. After this discussion, practice door-step introductions. Encourage them to use their own words in presenting themselves, though they should include all the information. These practices will help bring out underlying feelings, and the staff should be prepared to discuss them. Spend most of the morning on the door-step introductions. Also, give some practice in estimating distance in feet for the Observation Sheet (B3).

In the afternoon, separate the group into the various sections: 1) those who need closer supervision, 2) those who can be left alone, and 3) the editor, validators and coders. For those who will be interviewers, continue with the "mock" interviews, while the office personnel will receive special instructions on their future tasks. Continue practicing all afternoon, and have them turn in their last interview of the day. At home, have them write down on paper their feelings, thoughts and expectations about both the training session and the upcoming inter-

viewing. This will help them concretize their fears and hopes, thereby freeing them of many of these feelings when they go to the field.

At night, staff should again go over the "mock" interviews. If there are any individuals who still don't know the interviewing and questionnaire procedures, select them out for special attention on Day 5. It is important not to let anyone out into the field until he or she is ready.

Day 5

At the beginning, turn back their interviews from the day before. Have them discuss what they wrote the night before and deal openly with any fears that might emerge. After this, select out the group which needs special attention and have the group continue interviewing practice. These people are liable to feel frustrated and have feelings of failure. It is essential to explain, however, that they need a little more work to learn the interviewing procedures completely. Previous experience has shown that people who have difficulty in the training session often turn out to be problematic in the field and these trainees are just not going to work out. Therefore, take care in giving assignments to these people, and you should carefully monitor their work after they have been sent into the field. Though the trainees may feel somewhat rejected by having been selected out, they are liable to be more motivated to learn the questionnaire procedures correctly because they know the staff are watching them carefully.

Start giving assignments to those interviewers who know the questionnaire sufficiently. With the group as a whole, go over the nature of the assignment. Explain that they will be responsible for contacting and interviewing all the households in a cluster. Tell them to telephone the office in case any difficulty appears, or to resolve any ambiguity; it is better if they stop and make a telephone call than make an arbitrary decision that might be wrong. Discourage interviewers discussing problems with each other.

It is important to set up periodic meetings with the interviewers. These will be the times to collect questionnaires, give out new clusters, discuss problems of interviewing, give individual feedback, assess feelings and perceptions, and basically renew the strong group solidarity. Therefore, on this final day of the training period set up an appointment for the interviewers to get together again. Two weeks later would be a good time because they will have just about finished their first cluster, and it will be a good time to consolidate their experiences. Make a point to set up regular meetings.

Next, take each interviewer in turn and give him or her a Cluster Kit, which has already been prepared (Section 4.6). The questionnaires from the cluster are logged on both the Field Log Sheet (Form J) and the Interviewer Log Sheet (Form K) - see Section 4.4.1. Go over the exact location of the cluster with the interviewer so that he or she knows exactly how to get there.

After all interviewers have been given Cluster Kits, have one final meeting to discuss any questions, handle any unfinished tasks, and so forth. Then the training session is finished, and the survey implementation begins.

Much of the work over the next 8 to 10 weeks will be to monitor the field operation. You will be giving out assignments to interviewers, logging out Cluster Kits, logging in questionnaires, monitoring field quality, responding to field problems, sorting out the questionnaires for editing and coding, editing questionnaires, validating interviews, and turning over edited questionnaires to coding. You will probably find that work periods tend to go in peaks. Whenever the interviewers meet as a group, finished questionnaires will be returned and new Cluster Kits must be given out. In between these meetings, some questionnaires will come in and some Cluster Kits will be given out, but the load will be smaller. Instead, you will be

responding to field problems as well as concentrating on editing, validating, and coding.

4.4 Allocating Household Assignments to Interviewers

Interviews are to be done in clusters, and one interviewer will be responsible for all the households to be interviewed in that cluster. This will reduce travel costs and time, as it is relatively easier for the interviewers to handle a block or set of blocks. This is not part of the sampling procedure, however, and can be amended whenever necessity dictates.

Initially, give out only one cluster to each interviewer. After the field operation is underway, you will find that you can give more to more clusters to interviewers. An interviewer may have a few questionnaires left over from previous clusters for which contact attempts are being made. Rather than wait until the entire cluster is finished, whereupon the interviewer is not doing any work in the interim, it is better to give out more clusters. But do this only as the interviewers gain competence in the task.

To do this, you will have to decide beforehand the order in which to give out clusters. This way, it is possible to send introductory letters approximately one week before interviewers visit the household. The easiest solution would be to start with Cluster 001 and work upward until you reach Cluster 100. The problem with this solution, however, is that you are giving out the residential clusters first and waiting for the "noisier" noise zones until later. There is a chance that the quality of the interviewing will change as interviewers gain experience. In addition, since the survey will take approximately two months to complete, the noise environment might actually change because of a change in the seasons. Therefore, the best

solution in giving out clusters is to make sure that there is no systematic bias. Either take the table of random numbers and select the order in which clusters are to be assigned (choose a page; take the first two numbers in your telephone number as the column and row numbers; then taking three digits at a time, select clusters until all 100 clusters have been chosen; if a number comes up a second or third time, then you will obviously disregard it as the cluster has already been chosen), or else divide up your cluster list into fifths (001 - 020, 021 - 040, 041 - 060, 061 -080, 081 - 100) and systematically balance the distribution from each of the fifths.

Determining which clusters go to which interviewers is a less systematic decision. Some of the issues to be considered are: (1) don't assign interviewers to the same neighborhoods in which they live; (2) try to balance travel times across interviewers (e.g. if an interviewer has a short trip for his or her first cluster, then he or she should make a longer trip for the next cluster, and vice versa); (3) try to balance the distribution of males and females for different areas of the city so as to avoid introducing a systematic bias; (4) try to balance the distribution of clusters by socio-economic variables (e.g. no one interviewer should have only middle-class clusters). At the same time, there will be exceptions to these principles: (A) minority group interviewers will be very valuable for interviewing in minority neighborhoods; don't, however, exclusively assign only these types of neighborhoods to such interviewers; (B) some people will be afraid to go into certain neighborhoods (e.g. ghetto areas, poor areas, minority areas); if an interviewer has such fears, respect them for you are liable to have more difficulties by insisting; (C) interviewers with special language skills should be assigned to neighborhoods in which they can use these skills; also, for individual respondents around the city, these specially qualified interviewers should be used; (D) you may have to adjust interviewers according to special circumstances (e.g. some interviewers can't obtain a car on a certain day). The general rule is that no systematic bias should be introduced by

interviewer assignments; just as cluster, households and respondents are selected randomly, so too should interviewers be assigned randomly. Practically, however, you may have to violate this rule occasionally in order to obtain an interview, and since you are dealing with a complex human problem (and not a random mathematical one), tact and flexibility are very important.

It may be necessary to reassign interviewers occasionally. For example, if one particular interviewer has difficulty in obtaining an interview from a particular respondent (for whatever reason), then send another interviewer who may have better luck in obtaining consent. The non-interview checklist on pages ii and iii of the questionnaire should give useful information for making this assessment. You may even need to assign a third interviewer in exceptional cases. However, don't overload interviewers with assignments. Forty interviews should be the maximum number for an individual.

4.4.1 Logging of Questionnaires

Each cluster must be logged on both the Field Log Sheet (Form J) and the Interviewer Log Sheet (Form K). Figures 4.4-1 and 4.4-2 give examples of filling out the forms. By using the forms, it is possible to keep track of questionnaires and interviewers.

The Field Log Sheet (Form J) is organized by cluster. It records the respondent ID number, the date on which the questionnaire was assigned, the Interviewer ID number, the date on which the questionnaire was returned and logged, and the result of the interview – completed (C) or non-interview (N). The Interviewer Log Sheet (Form K) keeps track of the interviewers. The form records the cluster number to which the interviewer has been assigned, the respondent ID number, the date on which the questionnaire was assigned, the date on which the questionnaire was returned, the number of calls that were made on the household, and the result of

FORM J

FIELD LOG SHEET

Page 1 of 2

Cluster # 032

Respondent ID #	Date Assigned	Interviewer ID #	Date Returned	Result: C/N
032-01	6/3	32	6/6	C
032-02	6/3	32	6/15	N
032-03	6/3	32	6/10	C
032-04	6/3	32	6/6	C
032-05	6/3	32	6/15	N
032-06	6/3	32	6/9	C
032-07	6/3	32	6/15	N

Figure 4.4-1. Example Field Log Sheet Filled Out

FORM K

INTERVIEWER LOG SHEET

Page 3 of 6

Interviewer DAVID LOPEZ ID# 32

Cluster #	Respondent ID #	Date Assigned	Date Returned	Number of Calls	Result: C/N
032	032-01	6/3	6/6	1	C
032	032-02	6/3	6/15	5	N
032	032-03	6/3	6/10	4	C
032	032-04	6/3	6/6	2	C
032	032-05	6/3	6/15	4	N
032	032-06	6/3	6/9	3	C
032	032-07	6/3	6/15	5	N

Figure 4.4-2. Example Interviewer Log Sheet Filled Out

the interview attempt - completed (C) or non-interview(N). It is recommended that you use a separate Interviewer Log Sheet each time an interviewer is given a new cluster. This will make it possible to keep track of any interviewer's work on a particular cluster.

4.5 Managing the Field Operation

4.5.1 Monitoring Assignments

One of the major tasks is to monitor the quality of the interviewing. The office personnel (editor, validators, coders) will catch various mistakes that have been made and feedback must be given quickly to interviewers to prevent the same mistakes in the future. At the same time, monitor the overall work of the interviewers. As a general rule, aim for at least a 70% completion rate (that is, 70% of the households contacted should give completed interviews). Ideally, if it is possible to have a higher acceptance rate, this will improve the overall accuracy of the study. Therefore, 70% should be thought of as a minimum acceptance rate.

Periodically check the overall efficiency of the survey. The information on the Field Log Sheet (Form J) makes it possible to calculate an on-going acceptance rate (the number of completed interviews divided by the total number of households contacted so far), and this percentage can be watched over the succeeding weeks. If the rate starts to drop below 70% , diagnose why this is and take corrective action (e.g. interviewers may be getting sloppy or rushing too quickly; a holiday may be approaching; etc.). Discussion of the problem with the interviewers is a good way to analyze the problem.

Similarly, monitor the acceptance rate of individual interviewers from the information on the Interviewer Log Sheets (Form K). Some interviewers get consistently higher acceptance rates than others. Concentrate the effort on improving the acceptance rate of those interviewers who get low acceptance rates, lower than 70%.

Also, monitor the total output of individual interviewers. Some interviewers consistently contact many households, and others contact very few. There is a "work rate" vs "success rate" trade-off. Think of four types. Type I interviewers contact many households and obtain high acceptance rates. Assuming that the quality of the information is good, such people are ideal interviewers. Type II interviewers contact many households but obtain low acceptance rates. In this case, the work rate of these interviewers is good, but for some reason they are getting too many refusals or not making contact with households. You will have to diagnose what the problem is and try to help them. Possibly you will have to slow these interviewers down in order to bring their work rate into balance with others or you may have to talk to them to find out why they are getting too few completions. But it is important that the problem be corrected quickly as a bias is liable to be introduced into the results (i.e. certain clusters have been under-sampled). Type III interviewers contact fewer households but obtain high acceptance rates. These people are generally successful in their attempts, but try to increase their work rate. Examine the time period it takes for them to finish an interview; perhaps they are taking too much time. Look at the Call Record Sheets for their questionnaires to see their work pattern; perhaps they are working too few days a week. Type IV interviewers contact few households and obtain low acceptance rates. In this case, something is definitely wrong and it needs to be investigated. If a solution can't be found, perhaps it would be best to release these interviewers from the study.

4.5.2 Responding to Field Problems

Aside from monitoring the overall work rate and acceptance rate, it will be necessary to respond to various field problems that emerge. Basically, there are three sources of problems: materials, interviewers, and respondents.

Problems with Materials

Problems with materials can occur because an interviewer does not have enough questionnaires or related materials, a page in the questionnaire is missing, or some of the materials have been spoiled. The obvious solution to these problems is to get the materials to the interviewer quickly. Be sure that you change your logs to incorporate these facts (e.g. for a spoiled or incomplete questionnaire, give the same identifying numbers to the questionnaire and record that a substitution was made).

Problems with Interviewers

Problems with interviewers can come up for a number of reasons. Most inquiries from interviewers come up because the interviewer did not understand the rules and procedures of interviewing. For example, the interviewer may call up because he or she cannot locate the correct respondent. The answer must be, "You must interview only that respondent. Do not interview anyone else at that address". Or one member of the household may insist on speaking for another (e.g. a husband who insists on speaking for his wife, where his wife is the respondent). Remind the interviewer that only the chosen respondent can be interviewed. If a household member refuses to allow the respondent to be interviewed (e.g. a husband refusing to allow his wife to be interviewed, a parent refusing to allow a son or daughter to be interviewed), explain to the interviewer "You must interview the respondent and no one else at that house. If the person won't allow the respondent to be interviewed, then you must leave and the interview will be a non-interview". The response in all cases must refer to the rules and procedures of interviewing.

Other kinds of problems have to do with interviewers finding it difficult to go to certain parts of the city. For example, sometimes interviewers object to going to certain areas of the city in the evening (areas with minority groups, areas

which the interviewers think are "high crime" areas, etc.). Sending along an escort may be the best solution. Or an interviewer may suddenly find that his or her car has broken down, and it is impossible to get to a certain place that day. Try to find transportation or else you may re-assign the household to another interviewer. It is quite impossible to list each and every contingency which could come up, so think through each problem as it arises.

Sometimes only sensible advice can solve a problem for interviewers. An interviewer cannot make contact at a household because the residents are away on holiday. Tell the interviewer to ask the neighbors when they will be returning. A particular respondent is sick in the hospital. Tell the interviewer to find out when the respondent will get out. A particular respondent is incapable or is too sick to be interviewed. If there is no chance of recovery in the immediate future, declare the household as a non-interview. The study has been scheduled to finish in 10 days, and a respondent will be available in 2 weeks time; 4 days won't be disastrous in terms of finishing the study. On the other hand, a respondent is abroad and won't be back for 6 weeks, when the study is finishing in 2 weeks. Then you will have to declare the household as a non-interview.

The guidelines are to refer to the basic values of the study-objectivity and ethical responsibility. First, never make a decision which would harm the objectivity of the sample or affect the objectivity of the interviewing process. Second, never make a decision which would be unethical in terms of the professional role of an interviewer.

It may be necessary for you to go out to the field to inspect a situation. For example, if an interviewer is having difficulty getting inside a security building, you may need to telephone or visit the manager of the building in order to get permission to list and interview. A certain amount of flexibility on your part is absolutely essential.

In summary, problems with interviewers are human interaction problems in most cases, and you will have to apply logic, sensitivity, tact, awareness, and openness in solving these problems. Remember, all interaction with interviewers doesn't end with the training session. All information that you gather about interviewers - their errors, weaknesses, strengths - must be communicated back to them. This is a continual process and will help to improve the quality of the interviewing.

Problems with Respondents

Similar problems can occur with respondents. Many respondents are suspicious of being interviewed. They may have fears about being taken advantage of, having something sold to them, having their household looked over for possible burglary, or even robbed in their own home. Because these fears exist, you must emphasize to the interviewers the importance of maintaining an ethical, professional role. If the interviewers are sensitive to respondents, if they show the proper credentials, if they take pains to answer all respondent questions openly and honestly, then in the vast majority of cases no difficulties will occur. The introductory letters sent to the households before the interviewers arrive will also help diminish any suspicion, though householders are still liable to be somewhat cautious.

The Informed Consent Statement will also help legitimize the study. The Informed Consent Statement explains the general purpose of the survey and asks for the participation of the respondent. The respondent is agreeing to participate voluntarily. Two copies of the statement are signed both by the respondent and the interviewer. One copy is given to the respondent and the other is brought back to the office, where you should keep it on file.

Some respondents may require better identification than what the interviewers show. You may have to write a letter to ask for participation in the study.

The respondent may telephone to learn the purpose of the study. Sensitivity to residents' fears on your part will help to keep high interview completion rates and will also help in creating a good image for the study. Respondents talk to other people, after all, and when a cluster has been selected for interviewing, it is possible that neighbors will eventually share their stories. Newspapers may find out about the study as well and may want to do a story. Consequently, it is important to keep an ethical and open public image.

Sometimes one member of the household insists on being interviewed instead of the respondent. In this case, insist that only the respondent can be interviewed, and if the member of the household refuses to allow the interviewer to talk to the respondent, then the household is declared a non-interview. Also, some of the interviewers may get themselves into difficult situations with respondents. Sometimes husbands or wives become jealous of interviewers of the opposite sex talking to their mate. Instruct the interviewers to always sit in a place which, while private, will not incur gossip or possible ill feelings from other members of the household.

Difficulties also occur in making contact with respondents. Security buildings are a case in point. It may be necessary for you to talk to the manager of such a building to gain his or her cooperation in the study. Or interviewers may have difficulty in locating anyone from a particular household. The use of the Reverse Telephone Directory may be useful in looking up a number; don't do this, however, until <u>at least</u> three call attempts have been made on the house. Interviewers may get lazy and may try to do their work by telephone, a behavior which could lower the acceptance rate.

4.6 Sorting Out Questionnaires for Editing and Coding

After questionnaires are returned from the field, a process of sorting occurs, as the questionnaire moves through the various stages of editing and coding. First, the questionnaires must be logged. Then the completed questionnaires are sent to editing while the non-interviews are put aside in a separate pile.

Probably the best way to keep track of the office process is to use large boxes. On the front of the questionnaire there is an editing checklist. As a questionnaire passes from one step to another in the office procedure, the responsible individual dates and initials the questionnaire. If these questionnaires are stored in boxes, the sorting procedure can be kept track of easily as the questionnaires at any one step are always physically isolated from questionnaires at another step. The questionnaires are moved from one box to another as they pass through the office procedure until the end, whereupon they are put back into envelopes according to cluster.

This procedure was used in Allentown and it proved highly successful. Figure 4.6-1 illustrates the process of editing and coding. Eleven boxes are used.

4.7 Questionnaires Edited for Completeness and Consistency

Editing is the process of checking for correct respondent selection and for completeness and consistency of information. One person can edit all the questionnaires. The editor should check for certain sources of error and should attach paper clips for all questions. The editor should write with a colored pencil different from the red color used by the coders.

1. The editor should check that the roster has been filled out correctly and that the correct respondent has been selected for interviewing. If the roster has been incorrectly filled out and a wrong respondent has been selected, the editor should write in colored pencil "incorrect respondent" across the

front, and the questionnaire is invalid. The interviewer must then return to interview the correct respondent.

2. The editor should check for a mistake that might indicate that the wrong respondent has been selected. If on the Roster one person is indicated as the respondent, but there is evidence that another person was interviewed, then this might suggest that the wrong person was interviewed. This evidence might be: a) the person who agrees to be telephoned for validation on page 17 is not the same as the listed respondent, b) the sex of the respondent listed on the roster differs from that checked in B1, or c) the Informed Consent Statement was signed by a person other than the respondent.

3. The editor should make certain consistency checks which while not invalidating the questionnaire might invalidate certain questions.
   a. that the age of the respondent reported in Q22 on page 13 is the same as that reported on the roster. If there is a slight discrepancy, the answer to Q22 will be taken as "real" and the editor should mark on the roster what the age is (without erasing the original reported response).
   b. that the total number of persons in the household (Q29) is equal to or greater than the number of adults in the household.

Any mistakes on these should be marked with a paper clip and noted in colored pencil. These will act as a "flag" for the coders.

BOX SYSTEM FOR SORTING THROUGH OFFICE PROCEDURES

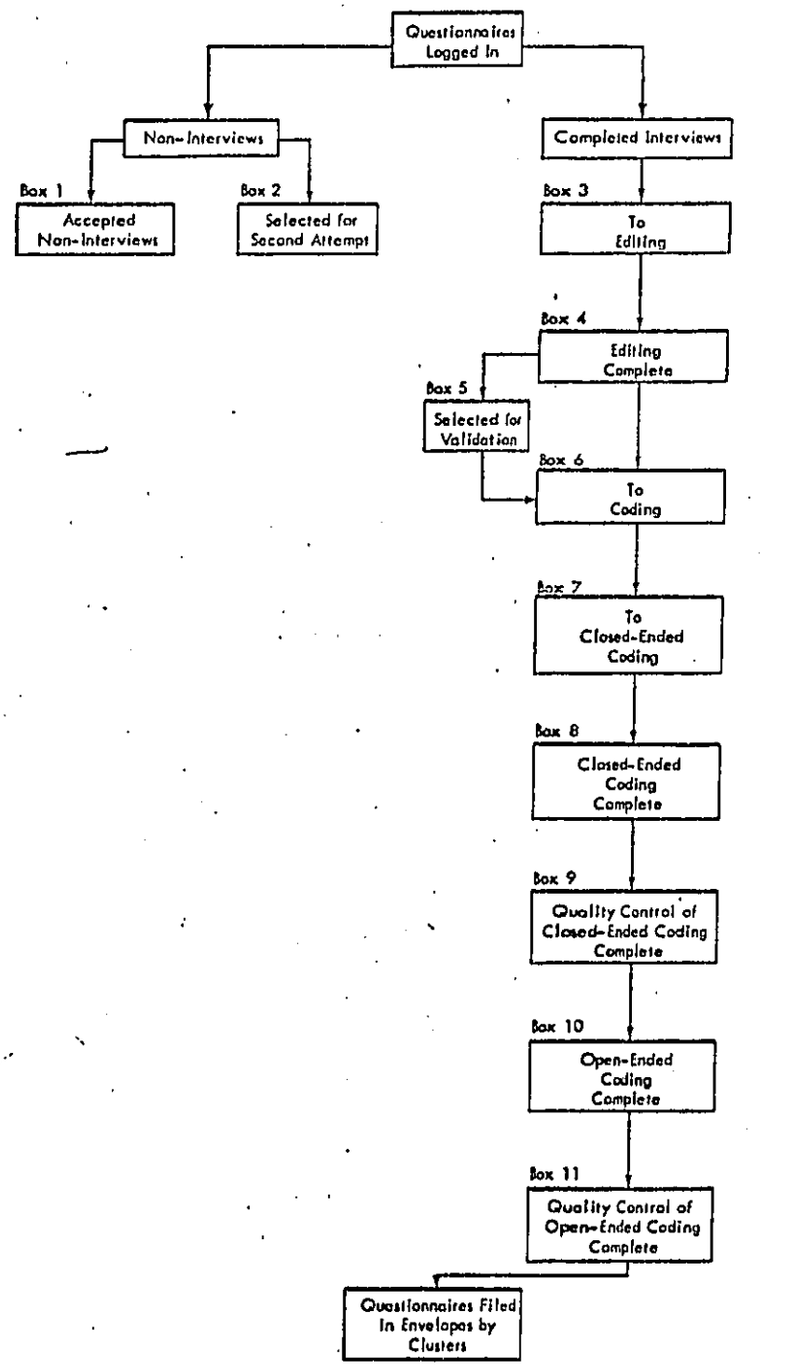


Figure 4.6-1. Example Box System for Sorting Through Office Procedures

4. The editor should check that all instructions have been followed correctly.
   a. that all A-B questions (Q5, Q10, Q13) have been filled out correctly;
   b. that all SKIP instructions (Q19, Q24) have been followed correctly;
   c. the TIME BEGINNING (pg. vii), TIME INTERVIEWED ENDED (pg. 18), INTERRUPTION: # OF MINUTES (pg. 18), and TOTAL # OF MINUTES (pg. 18) have been completed. If not, the editor should calculate the TOTAL # OF MINUTES.

If a mistake has been made, a comment should be made in colored pencil in the left margin and a paper clip should be attached.

5. The editor should examine whether all questions have been completed. For every question which is not completed, and in which nothing is written by the interviewer, a paper clip should be attached and a note in colored pencil made.

These five points are listed on the Editor's Checklist (Figure 4.7-1). You should photocopy this sheet and give it to the editor.

The editor should also pay attention to any irregularity in responses or patterns which might suggest that the interviewer recorded answers incorrectly. Any mistakes by an interviewer should be recorded and communicated to the interviewer. In addition, the editor should be encouraged to make notes on the quality of information presented by the interviewers (e.g. some interviewers' handwriting is difficult to read; some interviewers give too little information on the open-ended questions). The editing role is an extremely important one for not only does it check on the correctness of the respondent selection, but it is the source of extremely valuable feedback to interviewers.

Be Sure to Check for the Following:

1. That the Selection Roster has been correctly filled out and that the correct respondent has been selected. IF the correct respondent has not been selected, write "INCORRECT RESPONDENT" across the front of the questionnaire and contact the Field Director IMMEDIATELY.

2. That the person chosen as the selected respondent is actually the person who was interviewed. Check that:

   a. the person who agrees to be telephoned for verification on p.17 is the same as the selected respondent;

   b. the sex of the respondent listed on the Selection Roster is the same as that checked in B1; and

   c. the Informed Consent Statement was signed by the selected respondent.

   IF there is any problem, contact the Field Director IMMEDIATELY.

3. That there is consistency between several items:

   a. that the age of the respondent as reported in Q22 (p.13) is more-or-less the same as that reported on the Selection Roster. The age may differ slightly because the person who reported on the Selection Roster may not be the same person as the selected respondent. But if the age on Q22 differs from that reported on the Roster, check that this has not altered the order of listing on the Selection Roster.

   b. that the total number of persons in the household (Q29) is equal to or greater than the number of adults living in the household, as reported on the Selection Roster.

   IF there is any problem, contact the Field Director IMMEDIATELY.

4. That all instructions have been followed correctly:

   a. All A-B questions (Q5, Q10, Q13) have been filled out correctly;

   b. All SKIP instructions (Q19, Q24) have been followed correctly; and

   c. The TOTAL # OF MINUTES (p.18) has been correctly calculated.

   Any mistakes on these questions should be marked in colored pencil to the left of the question. Mark the page with a paper clip.

5. That all questions have been completed. For every question which is not complete, make a note to the left of the question in colored pencil and mark the page with a paper clip.

Figure 4.7-1. Editor Checklist

After the editing has been completed, the questionnaires are dated and initialed by the editor and placed in the "Editing Complete" box.

4.8 Validation of Selected Questionnaires

Validation is the process of telephoning the respondent and checking several aspects of the interview. In order to ensure a high quality of interviewing, validation of some questionnaires is done in order to check whether interviewers have followed the correct procedures. The interviewers know that a certain percentage of their interviews will be validated, but they don't know which ones.

Select some of the questionnaires in the "Editing Complete" box for validation. Put them in the "Selected for Validation" box while the remainder will be placed in the "To Coding" box. The criteria for selecting questionnaires depend partly on resources. Ideally, if staff are available, all questionnaires should be validated. Practically, however, this is usually impossible; therefore, the following set of rules can be followed:

1. For each interviewer, all questionnaires from the first assigned cluster should be validated.
2. Ten percent of the remaining questionnaires for each interviewer should be validated (select these randomly).
3. Any questionnaire for which the editor was doubtful that the correct respondent was interviewed should be validated.
4. Any questionnaire for which there are any doubts about the accuracy of the interview should be validated.

Validation is an extremely important step since it helps ensure quality interviewing. Inform the validators that they are to look for discrepancies between reported answers on the questionnaire and what the respondent says over the telephone. They should record discrepancies so they can be communicated to the interviewers.

Form L (in Appendix H) is used for the validation interview. The form is divided into two parts - a telephone call record sheet on which are recorded the attempts to locate the respondent, and eight factual questions which are used for validating against the interviewer's recorded responses. The validator will, therefore, have to prepare these forms before telephoning, so that any differences can be discussed quickly.

The rule for telephoning is to make four attempts to contact the respondent. If after four attempts the respondent still cannot be located, the questionnaire is removed from the validation process (it would be too expensive and would take too long to persist). However, if this happens, and if someone else is at home, have the validator verify that the respondent does live at that address.

The next eight questions are all factual. The first one verifies whether the interview, in fact, took place. Questions 2 through 6 assess answers to factual questions which can be compared to the interviewer's recorded responses. Question 7 assesses whether the interviewer asked the income question and whether he or she used response cards. Finally, Question 8 is another factual question. In addition, any comments the respondent makes about the interview or about the interviewer should be recorded VERBATIM. This is often the most useful information about interviewers and can help you give immediate feedback to them on their interviewing style.

If there are a number of differences between the recorded responses on the original questionnaire and what the respondent told on the telephone, you must assess this. If there are one or two differences, consider this as "random error." People change their answers to questions, even factual ones, or the interviewer may not have heard properly. Accept the original answer as the correct one (unless the respondent

is insistent over the telephone). But if there are more than a couple of differences, find out immediately why. A good rule here is to validate all the completed questionnaires for the particular interviewer to see if there is a systematic bias being introduced (e.g. some interviewers systematically avoid asking income questions). Also, discuss these differences with the interviewer so as to rectify the situation as soon as possible.

If you find that an interview was never completed, even though the interviewer reported it completed, you must, naturally, remove the interviewer from the study and validate all of his or her previous interviews. It is essential to catch any "cheating" immediately.

After validation, the validator dates and initials the questionnaire and places it in the box labeled "To Coding".

4.9 Coding of Questionnaires

4.9.1 Edited Questionnaires Logged by Coding

After a questionnaire has been completely edited and after it has been validated (if it was selected for this), then it is transferred to the "To Editing" box, at which point it is logged in coding. The Coding Log Sheet (Form M), like the Field Log Sheet (Form J), is organized by clusters. This form makes it possible to keep track of which questionnaires have passed to coding, and it can be compared with the Field Log Sheet, which tells which questionnaires to expect. Figure 4.9-1 gives an example of a Coding Log Sheet.

The Coding Handbook (Appendix I) gives detailed coding instructions, and is to be used by all coders. There are some additional points which should be discussed.

FORM M

CODING LOG SHEET

Page 1 of 1

Cluster # 048

Respondent ID #	Interviewer ID #	Date Logged by Coding
048-01	26	7/1
048-09	26	7/1
048-06	26	7/3
048-05	26	7/3
048-02	26	7/3
048-03	26	7/4
048-04	26	7/4
048-07	26	7/4
048-08	26	7/6

Figure 4.9-1. Example Coding Log Sheet Filled Out

4.9.2 Training Session for Coders

The four coders should come out of the same pool as the interviewers and should participate in the same training session (Section 4.3). After the third day, however, the coders should be selected and given special training for two days. The training consists of practice-coding questionnaires; the practice interviews that are being done in the class can be used for the coding.

Give the coders copies of the Coding Handbook and tell them to read it quickly over night. By the next morning, they will have only a general idea of the details, but their experience with the interviewing training should allow them to learn very quickly. Sit down and concentrate on the close-ended questions, explaining how coding involves transferring answers into numeric codes. Continue until coders are familiar with the process; don't introduce the four open-ended questions.

As they complete the coding of practice interviews, go over each questionnaire with them and explain all mistakes. Pay particular attention to sloppy handwriting which is illegible, mis-codes, the coding of "No Answers", and the skipping over of blank spaces. Explain that a keypuncher will have to read the numbers inside the boxes so that the numbers written there must be legible.

After a day of practicing, take two of the four coders and start them on the open-ended coding, while the other two coders continue with the closed-ended questions. Because open-ended coding involves looking up a code in the Coding Handbook, the two coders should concentrate their efforts only on the open-ended coding. The two other coders should code exclusively closed-ended questions. This is important because coders must get into a kind of 'mental set' to code; if they change tasks, this 'set' is broken and many mistakes will occur.

4.9.3 Open-ended Coding

The greatest difficulty in open-ended coding is trying to fit answers into

the defined categories. This will require some interpretation in that the coders will have to understand the meaning of a response in order to fit it into the closest category. But it is important that you do not convey to the coders that they can be loose in fitting responses into categories. They should try to judge what the meaning of a response is, and to which category it belongs; they should not try to read any extra meaning into a response. This is liable to be particularly relevant for the occupational questions (Q25, Q25A). There are 14 general occupational categories which cover major occupational sectors of the economy. Listing 14 categories simplifies the analysis of occupations, but it does involve some over-simplification; if each and every occupation were to be coded, the list would extend to almost a thousand individual occupations. The coders will have to learn what the general categories are, and what types of occupations fall within them; then when a particular occupation is encountered in Q25 and Q25A, they should be able to judge fairly accurately to which group the occupation belongs. Only if they cannot fit an occupation into a general group should the miscellaneous category be used (code '15' in the occupational classification). If you really get stuck, use the list of occupations that the U.S. Census Bureau uses from which many of the general categories were taken.

With Q3 and Q4, there are both general categories and specific codes within these categories. But the basic principles are the same. The coders must learn the meaning of each of the general categories, and then try to fit the answer into the category which fits closest. Only if the categories cannot fit should the various miscellaneous categories be used.

In all cases, the coders - whether closed-ended or open-ended, should always refer to the Coding Handbook when they have a problem. Also, when you make quality control tests on them, continually refer to the handbook. Do this in

order to establish the pattern of looking up the correct answer in the handbook if a problem is encountered. DO NOT encourage the habit of guessing. If coders don't know the answer to a problem, and if they can't find it in the handbook, then they should ask questions rather than make arbitrary interpretations.

4.9.4 Quality Control of Coding

The best way to do quality control of coding during the field operation is to check each and every questionnaire. While this seems like an enormous work load, it is the only way to guarantee good quality in coding. You will find that literally dozens of different types of mistakes occur. Even coders who are extremely thorough and competent will make occasional mistakes. It is important to realize that small mistakes can hurt the reliability of your results. Remember, the computer program is "dumb" in the sense that it can only read numbers. If a number is incorrectly recorded, then the machine will accept this as readily as if the number was correct. A quality control computer program has been designed to check for gross errors, but small ones cannot be checked. Errors, even small ones, can seriously distort the information, so it is important to minimize their impact if not eliminate them altogether. Therefore, accept the responsibility of checking each and every questionnaire in order to reduce mistakes.

Quality control checking follows the sequence of coding. After a questionnaire has been logged by coding, it is placed in the "To Closed-Ended Coding" box (box 7). From there, the coders responsible for closed-ended coding take it and code the closed-ended questions. They then place the questionnaire in the "Closed-Ended Coding Complete" box (box 8). Take the questionnaire out of this box and check it. Change any mistakes that occur by erasing the wrong answer and writing the correct one in the right-hand margin of the questionnaire, in red pencil. Keep track of

mistakes in order to give feedback to the particular coders. After the quality control of the closed-ended questions, place the checked questionnaire in the "Quality Control of Closed-Ended Coding Complete" box (box 9). From there, the open-ended coders take it and code the open-ended questions, placing it in the "Open-Ended Coding Complete" box (box 10). At this point, you will then check the open-ended questions, afterward placing it in box 11 - "Quality Control of Open-Ended Coding Complete". Later, place the questionnaire in its cluster envelope for final storing. At each step in this process, the box on the front of the questionnaire is initialed and dated at the appropriate spot.

4.9.5 Management of Coding

You will find that coding tends to work in cycles. For the first two weeks of the field operation, there will be few questionnaires to code. After the first meeting, interviewers will return with completed questionnaires and the coders will have much work to do immediately. After a week or so, however, the work load will drop off until another batch of questionnaires is returned. If there are regularly scheduled meetings with the interviewers, the questionnaire return cycle will probably occur throughout the study. This may pose a problem, however, depending on the financial arrangements with the coders, because there will be days when the coders have little work to do. If possible, schedule coders to work only three days a week, and the work may be spread out more evenly.

4.9.6 Final Check

After all the questionnaires have been coded and checked, one last quality control check on all the questionnaires should be made. Though this will be an exhausting three or four day operation, it is the only way to catch mistakes and, thereby, guarantee the overall quality of the results.

4.10 Keypunching of Data for Analysis

Finally, the information from the questionnaires is keypunched on to common 80-column computer cards. The questionnaire has been designed so that a keypuncher can punch directly from the form, following the right-hand margin. Contact a local keypunching firm and explain the nature of the task. Many keypunch organizations are unfamiliar with this type of work, so it is important to completely explain the format.

1. There are four computer cards per questionnaire.
2. All cards start with the respondent ID number. Many keypunch machines are capable of automatically punching in the respondent ID number on each card (columns 1 through 5). Be sure to check this possibility as it will help reduce punching errors.
3. The START and END of each card is indicated in the right-hand margin.
4. The card number is recorded at the top right-hand corner - the circled number.
5. The number directly above each block indicates the column number on the card in which that number should be verified.

Most keypunch organizations can complete this task in a couple of days. If you arrange the task a few weeks beforehand, it will be possible to get the punched cards within a week after submitting them.

Be sure that the punched cards are verified. Verification is basically the re-punching of the cards in order to check for mistakes. This is essential to reduce keypunching errors. It is important to request this verification since many keypunch organizations will not do it unless asked.

Be sure to have the keypunch organization produce two duplicate copies of the decks to insure against loss or damage to the original deck. This is a very easy process which takes 5-10 minutes.

4.11 Preparation of Physical Monitoring Data for Analysis

If the physical monitoring survey has been taken, you will also prepare the acoustical data for analysis. It may be that this physical data will not become available for a considerable time after the interviewing is complete. It might, therefore, be decided to analyze the social survey data first. For this reason, the physical data is being prepared on a separate data deck from the social survey data, and will be added to the analysis computer program by the systems programmer.

The physical data will give noise levels in terms of day-night sound level (L_{dn}) for each cluster. That is, each cluster that has been selected will have a unique noise level associated with it, and it is assumed that all residents in cluster 001 are exposed to roughly this level. For example, cluster 001 may have an L_{dn} of 64 dB while cluster 002 may have an L_{dn} of 73 dB. It is assumed that all residents in cluster 001 are exposed to 64 dB while all residents in cluster 002 are exposed to 73 dB. While this may not be strictly true, greater accuracy would require placing a microphone in front of each household separately; the value obtained is considered to be a valid approximation.

The data for assigning noise levels to each cluster come from three sources. First, for the airport and railroad zones, noise levels are calculated using noise prediction methodologies (see Section 4.2 for airport zones and Section 4.4 for railroad zones in the Acoustical Survey Manual). That is, for all clusters assigned to airport or railroad zones, you will use simple arithmetic procedures to calculate a single L_{dn} value for each of the noise zones (two airport, one railroad). Then, all clusters within airport or railroad zones will be assigned the single value for that zone.

Second, for all other clusters, 20-minute measurements have been carried out and a special optional computer program available from EPA will have reduced the data into an estimate of L_{dn} for each cluster. Figure 4.11-1 gives an example of the type of printout that will be produced. It is important to realize, however, that the physical monitoring site location numbers will not normally correspond to the cluster numbers. The physical monitoring sampling framework measures at all cluster sites,

NOISE ZONE: R

7-DAY SITE STATISTICS

	SITE	LDN	LEQ	L1	L10	L50	L90	L99	STD. DEV.	L10-LEQ	L1-LEQ
	CI. 001 1	43.2	40.6	43.9	42.4	40.0	38.2	37.8	1.5	1.9	3.3
*	CI. 002 2	68.7	66.0	77.3	69.3	58.7	51.6	48.7	6.8	3.4	11.3
	CI. 003 3	62.7	60.1	68.0	65.9	53.2	49.0	44.9	6.2	5.8	7.9
*	CI. 007 7	55.9	51.8	58.2	53.9	48.6	42.8	41.6	3.9	2.1	6.4
	CI. 011 11	51.0	49.7	56.7	53.1	46.8	34.9	33.6	6.8	3.5	7.0
	15	60.7	58.7	69.5	62.3	52.1	49.0	48.1	5.3	3.6	10.8
	18	57.3	57.1	69.3	57.8	51.3	34.8	33.1	9.9	.7	12.2
	22	61.7	58.8	67.8	61.3	53.6	48.8	47.6	5.3	2.6	9.0
	23	61.3	12.8	14.7	13.6	12.5	11.2	10.9	1.0	.8	1.9
	26	70.5	67.9	75.9	72.3	62.4	54.5	52.2	6.9	4.5	8.0
	28	68.8	68.6	75.2	73.3	66.6	45.4	44.4	11.3	4.7	6.6
	29	61.0	58.3	70.5	56.4	51.9	48.9	48.3	4.0	-1.9	12.2
	CI. 004 4	54.8	54.2	61.6	59.1	51.3	39.1	38.1	7.7	4.8	7.4
	CI. 005 5	82.3	81.9	93.7	83.5	71.7	61.3	60.1	9.1	1.6	11.8
	CI. 006 6	65.3	61.7	72.6	64.4	58.7	53.4	52.1	4.2	2.7	10.9
	CI. 008 8	77.2	73.6	79.7	77.4	72.2	65.2	64.1	4.4	3.9	6.1
	CI. 009 9	67.6	64.0	75.1	65.7	60.5	54.4	53.7	5.4	1.7	11.1
*	CI. 010 10	82.0	78.4	91.2	73.7	62.0	60.4	60.0	7.9	-4.7	12.8
	CI. 012 12	58.9	58.6	67.9	62.8	55.4	34.9	32.6	11.1	4.2	9.2
	13	56.8	53.6	63.2	57.0	50.9	43.3	42.1	5.4	3.4	9.6
	14	64.1	60.5	65.9	64.7	58.3	54.4	52.3	3.8	4.2	5.4

*Indicates 24-hour data available for these sites.

Figure 4.11-1. Example Computer Printout of Acoustical Measurement Data Reduction Program Showing Correspondence of Physical Monitoring Sites with Social Survey Clusters

but also at a number of other sites. In the physical monitoring program, sites are labeled by noise zone, so that the numbers may not correspond to the cluster numbers. You will go through the computer output and mark the corresponding cluster number adjacent to the physical monitoring site numbers. Figure 4.11-1 gives examples of how cluster numbers are matched to physical monitoring site numbers. In this example, the numbers tend to correspond, but this won't always be the case. For example, cluster 001 corresponds to site R1; cluster 002 corresponds to site R2; cluster 003 to R3, and so forth. However, sites R13, R14, R15, R18, R22, R23, R28 and R29 do not have corresponding survey clusters associated with them. For each cluster corresponding to a measurement site, the estimated L_{dn}, rounded off to a whole number, will be taken for the noise level at the cluster. In the given example, cluster 001 has an L_{dn} of 43.2, which, when rounded off, becomes 43; cluster 002 has an L_{dn} of 68.7 which, when rounded off, becomes 69; cluster 003 has an L_{dn} of 62.7 which, when rounded off, becomes 63, and so forth. A half decibel or more is always rounded up.

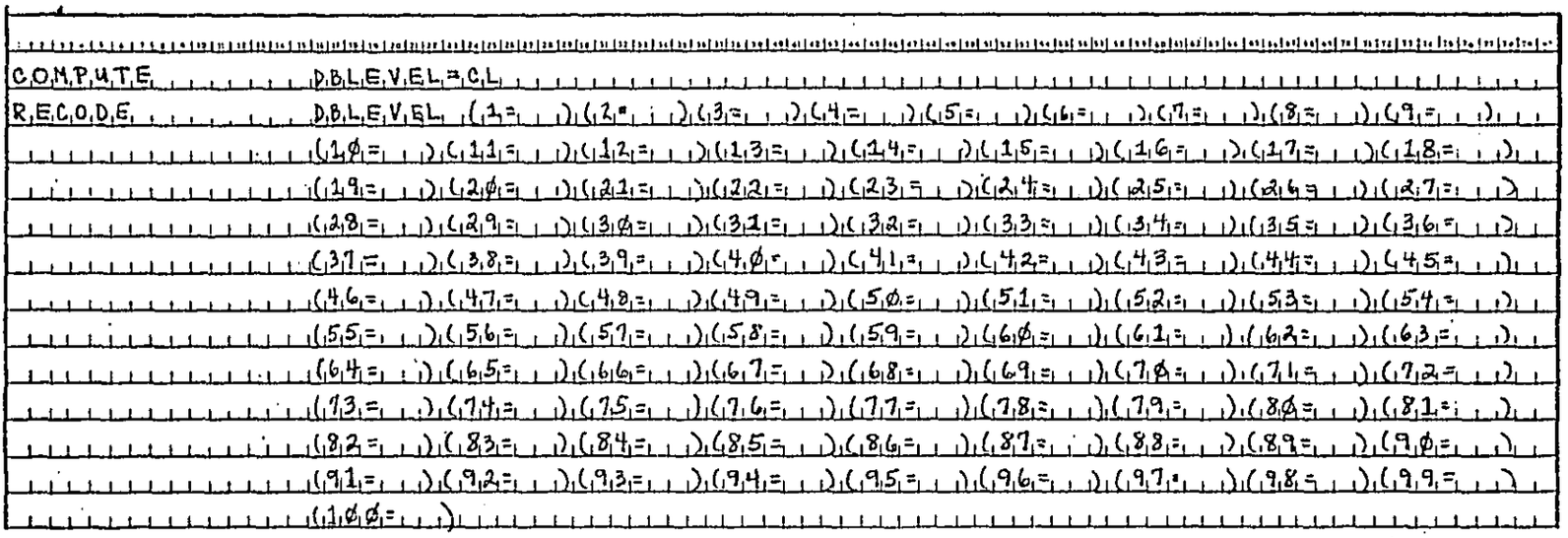
Third, the physical monitoring team may also have decided to take 24-hour measurements at some of the sites. Since 24-hour measurements are more accurate than 20-minute measurements, the values obtained for these sites should be used instead of the values printed from the 20-minute measurements. In the above example, 24-hour measurements have been taken at sites R2 (corresponding to cluster 002), R7 (corresponding to cluster 007), and R10 (corresponding to cluster 010). The values for the 24-hour measurements at these sites, therefore, should be used instead of the values on the computer printout (the 24-hour values are not shown here, but the 20-minute values on the printout are crossed out).

At the conclusion of this procedure, you should have a list which gives a unique L_{dn} (in whole numbers) for each and every cluster. The list should look like this:

Cluster #	L_{dn}
001	43
002	69
003	63
004	55
005	82
006	65
.	.
.	.
.	.
.	.
.	.
100	75

4.11.1 Preparing the Physical Data Deck

After you have compiled the list of L_{dn}'s for each cluster, it is an easy task to prepare the data deck for analysis. Figure 4.11-2 gives a computer coding form which you will fill out, tear off, and give to a keypuncher to punch. All the necessary information is already coded on the form with the exception of the noise levels for each cluster. You will write in the L_{dn} values in the appropriate two spaces for every cluster. If we take the above list as an example, on the card marked "RECODE..." where it says "DBLEVEL," for '(1 =)' you will write '43' in the two columns, for '(2 =)' you will write '74' in the two columns, and so forth. Each of the expressions inside the parentheses match the L_{dn} values with the associated cluster number. Cluster 001 (written as '1' on the computer form) has an L_{dn} value; cluster 002 has an L_{dn} value, and so on through cluster 100 which also has an L_{dn} value. Be sure that you enter an L_{dn} value for every cluster, and be sure that your handwriting is legible.



NOTE: LETTER "O" IS WRITTEN "O"
NUMBER ZERO "0" IS WRITTEN "Ø"

Figure 4.11-2. Computer Coding Form for Physical Monitoring Data

After you have finished filling out the form, tear it out, and give it to a keypunch operator who will punch these cards and verify them. Then, wrap a rubber band around the punched deck and submit it to EPA along with your survey data card deck. The computer analysis program will now be able to incorporate the actual physical noise levels into the analysis of the survey data to determine the relationship between the residents' attitudes and the actual noise levels to which they are exposed.

Additional information regarding the Acoustical Measurement Survey and the data reduction computer program is available in separate manuals from EPA.

CHAPTER 5

Analysis of the Data

5.1 Overview of Computer Programs

The survey data will be reviewed and analyzed in three stages. A different type of computer program, with a unique purpose, is used at each stage. These are: the Cleaning Program; the Variance Program; and the Statistical Package for the Social Sciences (SPSS) Program. Details of these programs are available in a separate manual from EPA.

5.1.1 Cleaning Program

The cleaning program was devised to check the data for obvious errors, and for consistency. The basic way in which the program works is to read through the numbers punched in every column of every computer card submitted for analysis. For each column, a range or set of numbers is specified. These are the possible numbers which may have been coded for that column; for example, Column 10 of Card 01 must be punched with a number between 1 and 7 since the number in this column indicates AR (Area Number), and there can only be 1 to 7 areas. The program, then, checks for any numbers besides 1 through 7, since these would indicate an error. These specifications have been set for every single column of every card in the data deck. Additionally, the program checks that information is consistent. For example, Column 22 of Card 01, which indicates Total # on List, must always be equal to or greater than Column 23 of Card 01, R (Respondent) # on List. If this is not the case, then there is a coding or punching error.

Having gone through the data deck, the program will list the locations of all errors -- the respondent ID number and the column which is in error -- so that the type of error can be determined -- keypunching, coding, or other (e.g., cards out of order, etc.). Then the problem can be investigated, often involving a referral to the original questionnaire. Finally, the errors can be corrected.

The data will be re-checked by the cleaning program to verify the correction of mistakes. Only when the deck is determined to be completely "clean," that is, when it meets all the specifications and has no errors, will the data proceed to the second stage of analysis.

5.1.2 Variance Program

The variance program calculates a measure of variability for particular sample characteristics (e.g., age, health), and attitudinal variables (e.g., evaluation of public services). It is calculated by the following formula:

$$\sigma^2 = \left(\frac{1-F}{n^2}\right)\left(\sum_c \left[(X_{2c} - Rn_{2c}) - (X_{2c-1} - Rn_{2c-1})\right]^2\right)$$

In the above equation, X denotes a respondent's score on a variable, R denotes the mean of the variable, n denotes the total number of respondents, c denotes the total number of clusters which had respondents, n_c denotes the number of respondents within the c^{th} cluster, and F is the sampling fraction defined by $(F = \frac{700}{MOS})$. The measure is obtained in order to check the precision or consistency of data which is gathered using the method of "cluster sampling." Cluster sampling is done because it is efficient in terms of cost and time; however, it tends to add to sampling variability. This effect is expected to be minimal. In the pre-test in Allentown, for example, the variability was approximately 4%; that is, the sample provided estimates which were consistent with one another within a plus or minus range of 4%. The variance program, then, calculates the variability for the sample so that the exact effect of cluster sampling is known.

5.1.3 SPSS Program

The "statistical package" is a program which has the capability to generate statistics which are most interesting and most meaningful for attitudinal data. For example, frequency distributions can be generated, and the mean, standard deviation, variance, and so forth, are calculated. Two-variable tables can also be generated, and the chi square statistic presented. More complex multivariate analysis, such as regressions and stepwise regressions, are also available in the statistical package. According to the schema for data analysis presented in Section 5.3, specific distributions, tables, and regression analyses will be generated.

5.2 List of Variables

This section presents a list of the variables derived from the questionnaire. There are two types of variables: basic and complex. A basic variable relates to a single item on the questionnaire – either a question, a precoded item such as card number, or an item from the checklist on the last page of the questionnaire. A complex variable, on the other hand, is a combination of a set of basic variables, and is computed by an arithmetic calculation such as adding the values of variables together, or squaring the value of a variable.

In the following lists, the variables are presented sequentially to correspond to the numerical order of questions on the questionnaire. The "Variable Name" is the name given to the variable in the SPSS program. In addition, a "Variable Label" is assigned to each variable, and provides more information to describe the variable. Therefore, whenever a variable is analyzed in the SPSS program, its Variable Name and Variable Label are used to identify it.

5.2.1 List of Basic Variables

Question Number	Variable Name	Variable Label
Precoded	ID	Respondent Identification Number
Precoded	NZONE	Noise Zone
Precoded	AREA	Residential Area of the City
Precoded	CLUSTER	Cluster Number
Precoded	CITY	City
Precoded	LABEL	Respondent Selection Label Number
Call Record Sheet	CALLS	Number of Calls to Make Contact
Call Record Sheet	CMPDAY	Day of Interview Completion
A3	QA3A	Number of Adults on List
A3	QA3B	Respondent Number on List
A3	QA3C	Reported Sex of Respondent

Question Number	Variable Name	Variable Label
A3	QA3D	Reported Age of Respondent
1	Q1 or YRSRES	Years of Residence in Area
2	Q2 or EVALAREA	General Evaluation of Area
3	Q3A	First Area Like - Specific
3	Q3B	Second Area Like - Specific
3	Q3C	Third Area Like - Specific
4	Q4A	First Area Problem - Specific
4	Q4B	Second Area Problem - Specific
4	Q4C	Third Area Problem - Specific
5a	Q5A	Severity of Traffic Problem
5b	Q5B	Severity of Polluted Water Problem
5c	Q5C or NOISPROB	Severity of Noise Problem
5d	Q5D	Severity of Crime Problem
5e	Q5E	Severity of Run-Down Area Problem
5f	Q5F	Severity of Unclean Air Problem
5g	Q5G	Severity of Parking Problem
5h	Q5H	Severity - Inadequate Low-Income Housing
6a	Q6A	Evaluation of Quality of Schools
6b	Q6B	Evaluation of Police Protection
6c	Q6C	Evaluation of Fire Protection
6d	Q6D	Evaluation of Recreation Facilities
6e	Q6E	Evaluation of Garbage Collection
6f	Q6F	Evaluation of Hospitals and Health
6g	Q6G	Evaluation of Public Transportation
6h	Q6H	Evaluation of Street Maintenance
6i	Q6I	Evaluation of Sewage and Drainage
6j	Q6J	Evaluation of General Pollution Control
6k	Q6K or NSECONTL	Evaluation of Noise Control

Question Number	Variable Name	Variable Label
7	Q7 or HEALTH	Rating of Overall Health Condition
8	Q8 or QUIET	Quietness or Noisiness of Area
9	Q9 or ANNOY	Overall Annoyance to Noise
10a	Q10A	Noise Interference During Sleeping
10b	Q10B	Noise Interference During Conversing
10c	Q10C	Noise Interference During Reading
10d	Q10D	Noise Interference During Resting
11a	Q11A	Morning
11b	Q11B	Afternoon
11c	Q11C	Evening
11d	Q11D	Nighttime
11e	Q11E	All the Time
11f	Q11F	Noise Never Annoys
12	Q12	Noise Affects Physical-Emotional Health
13a	Q13A	Noise Affects Headaches
13b	Q13B	Noise Affects Tiredness
13c	Q13C	Noise Affects Irritability
13d	Q13D	Noise Affects Hearing Loss
13e	Q13E	Noise Worsens Existing Health Problems
14	Q14	Accustomed to Noise
15a	Q15A	Use Soundproofing
15b	Q15B	Close Doors-Windows
15c	Q15C	Use Radio-TV-etc.
15d	Q15D	Wear Earplugs
15e	Q15E	Change Sleeping Quarters
15f	Q15F	Considered Moving
15g	Q15G	None of these

Question Number	Variable Name	Variable Label
16a	Q16A	Complain to Neighbor
16b	Q16B	Contacted Official
16c	Q16C	Took Legal Action
17a	Q17A or TRAFFIC	Annoyance to Traffic
17b	Q17B or MTRCYCLE	Annoyance to Motorcycles
17c	Q17C or TRUCKS	Annoyance to Trucks
17d	Q17D or BUSES	Annoyance to Buses
17e	Q17E or AUTOS	Annoyance to Automobiles
17f	Q17F or HIGHWAY	Annoyance to Highways or Freeways
17g	Q17G or RECRLVHC	Annoyance to Recreational Vehicles
17h	Q17H or GRBGETRK	Annoyance to Garbage Trucks
17i	Q17I or EMERGVHC	Annoyance to Emergency Vehicles
17j	Q17J or ENTMTCTR	Annoyance to Entertainment Centers
17k	Q17K or PETS	Annoyance to Pets or Animals
17l	Q17L or NBRHOMES	Annoyance to Neighbors' Homes
17m	Q17Mor AIRCONDT	Annoyance to Air Conditioners
17n	Q17Nor GRDNEQPT	Annoyance to Lawnmowers-Garden Equipment
17o	Q17Oor JETS	Annoyance to Jet Airplanes
17p	Q17P or SMLPLANE	Annoyance to Small Airplanes
17q	Q17Q or HCOPTERS	Annoyance to Helicopters
17r	Q17R or TRAINS	Annoyance to Trains
17s	Q17S or CONSTRCN	Annoyance to Construction Noise
17t	Q17T or COMINDUS	Annoyance to Commerce-Industry Equipment
17ua	Q17UA	Annoyance to First Other Noise Source
17ub	Q17UB	Annoyance to Second Other Noise Source
18a	Q18A	Manufacturer
18b	Q18B	Operator-User
18c	Q18C	Local Government

Question Number	Variable Name	Variable Label
18d	Q18D	State Government
18e	Q18E	Federal Government
18f	Q18F	No One Responsible
19	Q19	Community Should Have Noise Control
19a	Q19A	Nothing Can Be Done About Noise
19b	Q19B	Not Bothered Enough By Noise
19c	Q19C	Not the Responsibility of Community
19d	Q19D	Too Costly
20	Q20	Extra Taxes for Noise Control Program
21a	Q21A	Make Noise Sources Quieter
21b	Q21B	Community Planning and Zoning
21c	Q21C	Building Codes
21d	Q21D	Curfews
21e	Q21E	Fines
21f	Q21F	Barriers
21g	Q21G	Traffic Planning
21h	Q21H	Public Information Campaign
22	Q22 or AGE	Age of Respondent
23	Q23 or EDUCLVL	Educational Level of Respondent
24, 24a	Q24	Present Employment Status
25, 25a	Q25	Occupation
26	Q26 or INCOME	Yearly Household Income
27	Q27	Racial Heritage of Respondent
28	Q28 or OWNER	Ownership Status of House or Apartment
29	Q29	Number of Persons in Household
Calculated	TIME	Time of Interview in Minutes
B1	QB1 or SEX	Sex of Respondent
B2	QB2	Building Capacity

Question Number	Variable Name	Variable Label
B3	QB3 or STRTDIST	Distance from Building to Street
B4	QB4	Construction Type of Building
B5	QB5	Sex of Interviewer
B6	QB6	Language of Interview

IF PHYSICAL MONITORING IS CONDUCTED, THERE IS ONE ADDITIONAL VARIABLE.

Physical Monitoring	DBLEVEL	Noise Level

5.2.2 List of Compound Variables

Variables Making Up Compound	Variable Name	Variable Label
Q10 through Q10D	ACTIVITY	Noise Interference During Activities
Q12, Q13A through Q13E (standardized)	HLTHPROB	Noise Impact on Health
Q5A, Q5B, Q5D through Q5H	URBPROB	Severity of Major Urban Problems
Q6A through Q6K	PUBSERV	General Evaluation of Public Services
Q15A through Q15E	PREVENT	Number of Personal Preventive Actions
Q16A through Q16C	COMPLNT	Public Complaints Made
Q19, Q20, Q21 (standardized)	SUPPORT	Support for Noise Control Program
Q9	HIGHLY	Percentage Highly Annoyed

IF PHYSICAL MONITORING IS CONDUCTED, THERE IS ONE ADDITIONAL VARIABLE.

DBLEVEL	DBLVLSQR	Noise Level X Noise Level

5.3 Levels of Analysis

The data analysis provides information on three levels. The first level presents data on the city as a whole. The second level presents data comparing the areas of the city with one another, while the third level looks at the interrelationship between various factors affecting individuals. Therefore, from the first level of analysis, you will know what the city as a whole feels about noise; from the second level, you can say how the different areas vary from one another; and from the third level, you can look at why people have the perceptions and attitudes they do.

5.3.1 The Analysis Schema

The method for handling the data is a causal path schema in which an assumed set of hypotheses is linked to form a chain reaction. The first link is assumed to influence the second link, which is assumed to influence the third link, and so forth.

The schema is a set of hypotheses which simplifies analysis by imposing order on the data. Consider that in this questionnaire, there are more than 100 variables. If each variable were compared with every other, there would be more than 20,000 comparisons; if a table were presented for each comparison, there would be more than 20,000 tables. The impossibility of handling this information is apparent. By imposing a schema, however, the amount of information to interpret is considerably simplified. While the schema gives considerable information, it is not as complex as a total output of the questionnaire data would be.

Within each link in the chain, the hypothesis is analyzed in three ways. First, simple description. This involves the individual variables and their distributions, means and standard deviations. Basic information about the city is provided (e.g., what do the residents think? What range of answers do they give?) Second, tabular description. Selected relationships between variables are explored. Normally, this is done by looking at tables comparing two variables (cross-tabulations). This tells something about the way one variable changes in relation to another (e.g., how does annoyance change in the various areas of the city? How does a person's health

condition affect their annoyance to noise?). Finally, for every link in the chain, a third level of analysis is provided to give more detailed and more accurate information, multi-variate description. This involves a number of multiple regression equations.

In a multiple regression analysis, a number of independent variables is assumed to influence a dependent variable. This analysis takes the form of

$$y = a_1x_1 + a_2x_2 + a_3x_3 + \ldots a_nx_n + C + e$$

where

$a_1 \ldots a_n$ are regression coefficients,

$x_1 \ldots x_n$ are variables,

C is a constant, and

e is the error term.

For example, consider the determinants of noise annoyance. How much is annoyance due to the actual physical noise level around an individual's residence? How much is it due to the individual's age (older persons may be more sensitive)? How much is it due to the individual's educational background (e.g., a more educated individual may be more aware of the problems of noise)? A regression equation having all three of these possible causes (physical noise level, age, and education) as independent variables and annoyance as the dependent variable facilitates this analysis. It will tell how much each of the individual variables contributes to the overall annoyance in relation to the other variables. It may be the case, for example, that the physical noise level is the dominant variable and the social variables are unimportant. Or that age may be extremely important, but that education is not. Certainly, then, the interpretation of the results is complex. To simply the analysis, a stepwise regression procedure is used in which only the most significant independent variables are brought into the equation – one step at a time. Thus, only the most salient explanatory factors are identified.

5.3.2 The Causal Path Model

The analysis utilizes 11 conceptual groups. Each of these is ass'gned a symbol for identification.

1. Properties of the Noise Environment (NOISE)
   - a. Noise Zone
   - b. Noise Level (if physical monitoring is complete)
2. Characteristics of the Population (CITYPOP)
   - c. Residential Area of the City
   - d. Residential-Housing Characteristics of the Population
   - e. Social Characteristics of the Population
3. General Health Characteristics of the Population (HEALTH)
   - f. Rating of Overall Health Condition
4. Perception of the Noise Environment (QUIET)
   - g. Quietness or Noisiness of the Area
5. Perceptions of Problems in the Area (PROBLEMS)
   - h. Perception of Noise as a Problem
   - i. Perception of Urban Problems
6. Evaluation of the Area (EVALUATE)
   - j. General Evaluation of the Area
   - k. Reasons for Liking the Area
   - l. Evaluation of Public Services
7. Extent to Which Noise Affects Residents (EFFECTS)
   - m. Extent to Which Noise Interferes with Activities
   - n. Extent to Which Noise Affects Health Conditions
   - o. Extent Accustomed to Noise
   - p. Most Annoying Time Period

8. Annoyance to Noise (ANNOY)

   q. Overall Annoyance to Noise

9. Noise Sources Which Are Annoying (SOURCES)

   r. Annoyance to Specific Noise Sources

10. Measures Taken to Reduce Noise (MEASURES)

   s. Preventive Actions Taken

   t. Public Complaints Made

11. Support for a Noise Control Program (SUPPORT)

   u. Willingness to Support Noise Control

Some of the groups have sub-groups which are discussed shortly. The 11 groupings are used in the causal path model, but group 9 is also analyzed separately. Groups 1, 2, and 3 are defined as the ultimate independent variables in the model. They are assumed to be "given" conditions and are not explained; that is, the noise environment, the residential area of the city, and residential-housing characteristics, the social characteristics, and the general health condition of the respondent are considered properties of the individual, independent of noise impact and perception of noise. While there are interrelationships between these givens, for the purpose of the analysis, they are assumed to be independent predictors of noise perception and impact.

The causal chain operates in the following way. The first three (1,2,3) groups affect the individual's perception of how quiet or noisy the area is (group 4). These four groups, in turn, affect the individual's perception of problems in the area (group 5), which all in turn influence the individual's evaluation of the area (group 6). These six groups then combine to affect the individual's health and activities (group 7). These seven groups combine to influence the annoyance to noise (group 8). Specific noise sources that might affect individuals are analyzed at this point. On the basis of this information, it is possible to understand how the first

eight groups plus the specific sources influence preventive measures taken by the individual (group 10). Finally, the 10 groups (including group 9) combine to influence the individual's support for a noise control program (group 11). Figure 5.3-1 illustrates the causal chain. The model is cumulative in that effects become additive.

For example, the following relationships are suggested by the model. First, the individual's background characteristics – his or her residential and housing characteristics (CITYPOP), his or her health condition (HEALTH), as well as the actual noise environment in which he or she lives (NOISE) – affects the individual's perception of the noise environment (QUIET). The individual items making up the background characteristics – items a through f – are tested against how quiet or noisy the individual perceives the area to be. In the multiple regression model, the question "How much do these three groups (1,2,3) explain the individual's perception of noise?" is explored. The assumption is that characteristics of the individual partly account for the individual evaluation of the area and sensitivity to noise.

Second, the model suggests that the perception of problems in the area (PROBLEMS) is a product of the individual and residential characteristics of the respondent (NOISE, CITYPOP, HEALTH), as well as due to the perception of the noise environment (QUIET). The model tests the assumption that the perception of noise (QUIET) influences the perception of problems (PROBLEMS) by introducing QUIET as an independent variable to predict PROBLEMS. Subsequently, the evaluation of the area (EVALUATE) is assumed to be a product of all the previous products; that is, people will evaluate the area positively or negatively depending on how noisy it actually is (NOISE), how noisy or quiet they perceive it to be (QUIET), how many other problems they perceive in the area (PROBLEMS), and their own particular background and residential characteristics (CITYPOP, HEALTH).

The model proceeds in a similar manner through the 11 groups. Finally, then, it argues that support for a noise control program (SUPPORT) is a function of the noise environment in which the individual lives, the background and health characteristics of the individual, the residential and housing characteristics, the perception of the

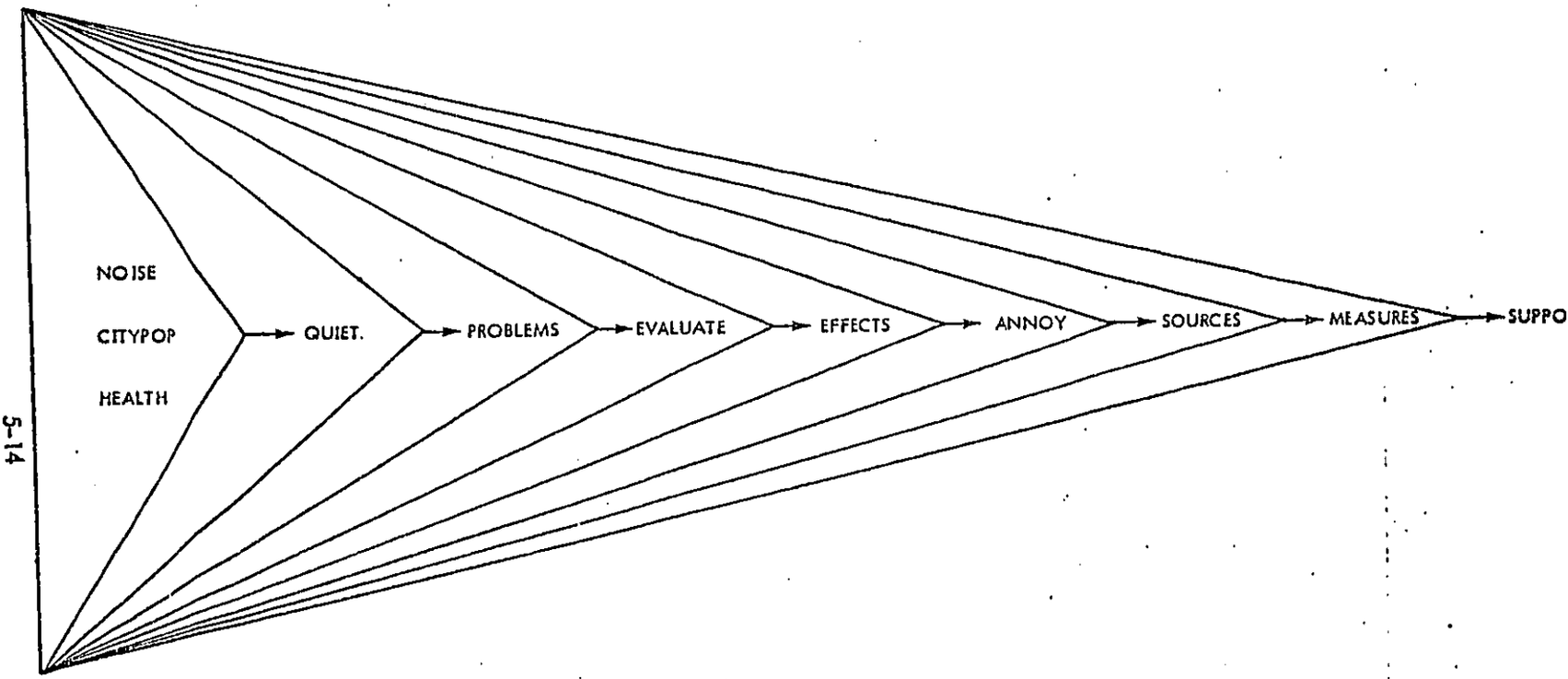


Figure 5.3-1. A Causal Path Model of Noise Perception and Impact

noise environment, the perception of problems in the environment, the evaluation of the area, the extent to which the individual is affected by noise, the annoyance reaction to noise, and the extent to which preventive measures have been taken to reduce noise.

5.3.3 Specific Variables Making Up Conceptual Areas

The 11 conceptual groups outlined in Figure 5.3-1 are actually a set of variables which incorporate the entire questionnaire. Many of the variables are examined only by themselves. Others are brought into the multiple regression equations. Some new variables are created by combining several variables. Each of these 11 groups is discussed below. A variable is referred to by its "Variable Name" given in the list of variables in Section 5.2. At the end of each discussion, those variables used in the multiple regression models are defined; they are called indices.

Properties of the Noise Environment (NOISE)

This group is made up of three variables. Before physical monitoring is completed, there is only a crude measure of the noise environment – the noise zone (NZONE). The zones are numbered so that higher numbered zones are assumed to have higher average noise levels and thus the codes provide a rough measure of noise environment. However, if physical monitoring data is available, the noise environment can be assessed more accurately. In this case, each cluster will have a unique day-night noise level - L_{dn}. This information will be brought into the analysis as a variable called DBLEVEL, Noise Level.

If DBLEVEL is defined, however, an additional variable is also created. This is DBLVLSQR, or Noise Level X Noise Level. This is based on the assumption that the individual's perception and reaction to noise are not a linear function of the actual noise level, but rather a curvilinear relation (increasing in a quadratic manner with exposure to noise). Thus, a quadratic component is defined to test the assumption.

For cross-tabulations, only the linear component is used. For multiple regressions, however, both the linear and quadratic variables are used. (Note that if physical monitoring is not complete, NZONE is used in regressions, but it is not squared.) These two indices are used in the regression analysis:

Note: The computer program uses the variable name DBLEVEL in regressions whether or not physical monitoring data are available. If the data are not available, DBLEVEL takes the value of NZONE for each case and the variable DBLVLSQR is not computed.

1. Noise Level (DBLEVEL)
2. Noise Level X Noise Level (DBLVLSQR)

Characteristics of the Population (CITYPOP)

This group is made up of three sub-groups: the residential area of the city, the residential-housing characteristics, and the social characteristics of the residents.

Residential Area of City

Since areas typically differ from one another, especially as they affect residents, this gives greater insight into the distribution of noise and the social reactions to it. This variable – the residential areas of the city (AREA) – is used in the cross-tabulations to contrast with various reactions to noise; it is not used in the multiple regression models.

Residential-Housing Characteristics

This sub-group is made up of two finer sub-divisions: the residential status of the respondent, and the housing characteristics of the respondent. The residential status is one variable – the years of residence in the area (Q1 or YRSRES). This variable is used for both cross-tabulations and for the multiple regression models.

The housing characteristics of the respondent are measured by four variables: (1) the ownership status of the house or apartment (Q28 or OWNER); (2) the number of families living in the residential building (QB2); (3) the distance from the building to the street (QB3 or STRTDIST); and (4) the type of construction of the building (QB4). The ownership status (OWNER) and the distance from the building to the street (STRTDIST) are used in both the cross-tabulations and the multiple regression analysis, whereas the other two variables are used in cross-tabulations only.

Therefore, three indices are used in multiple regression models:

1. Years of Residence in Area (YRSRES)
2. Ownership Status of House/Apartment (OWNER)
3. Distance from Building to Street (STRTDIST)

Social Characteristics

This sub-group has two subdivisions: the demographic characteristics of the residents, and the socio-economic characteristics of the residents. The demographic characteristics are measured by the age (Q22 or AGE), sex of the respondent (QB1 or SEX), racial heritage (Q27), and the size of the household (Q29). Sex is coded as a dummy variable (females are scored '1' and males are scored '0'). AGE and SEX are brought into the multiple regression models, as well as used in cross-tabulations.

The socio-economic characteristics are measured by the educational level (Q23 or EDUCLVL), the employment status (Q24A), the occupation of the respondent (Q25, Q25A), and the income level of the household (INCOME). Educational level and income are used in the multiple regression models.

Therefore, there are four indices which are used in the multiple regression models:

1. Age of Respondent (AGE)
2. Sex of Respondent (SEX)
3. Educational Level (EDUCLVL)
4. Yearly Household Income (INCOME)

General Health Characteristics (HEALTH)

This group is made up of a general question asking for an evaluation of the respondent's general health condition (Q7 or HEALTH). It is used in the multiple regression models and is, therefore, an index:

1. Rating of Overall Health Condition (HEALTH)

Perception of the Noise Environment (QUIET)

This group consists of one variable assessing the quietness or noisiness of the area in which the respondent lives (Q8 or QUIET). The variable is scored so that "Very Quiet" is high, and "Very Noisy" is low; it is used in both cross-tabulations and multiple regression equations.

1. Quietness or Noisiness of Area (QUIET)

Perception of Problems in the Area (PROBLEMS)

This group is made of up three sub-groups: (1) a list of problems which the respondent mentions spontaneously (Q4A, Q4B, Q4C); (2) severity of noise as a problem (Q5C or NOISPROB); and (3) the severity of certain major urban problems: Traffic Congestion (Q5A), Polluted Water (Q5B), Crime (Q5D), Run-Down Area in Need of Improvement (Q5E), Unclean Air (Q5F), Parking (Q5G), and Inadequate Low-Income Housing (Q5H).

The first sub-group – list of problems – is presented as a list giving the relative frequencies of the various problems. This list is presented in the Coding Handbook. The second sub-group – severity of noise as a problem – is used in both cross-tabulations and in multiple regression models. The third sub-group – an index of the severity of urban problems (except for noise) – is defined by taking the average evaluation of severity for the seven items making up the index (Q5A, Q5B, Q5D, Q5E, Q5F, Q5G, Q5H or URBPROB). Thus, two indices are defined:

1. Severity of Noise Problem (NOISPROB)
2. Severity of Major Urban Problems (URBPROB)

Evaluation of the Area (EVALUATE)

This group is made up of four sub-groups: (1) a general evaluation of the area (Q2 or EVALAREA), (2) a list of reasons for liking the area (Q3A, Q3B, Q3C), (3) the evaluation of several public services: Quality of Schools (Q6A), Police Protection (Q6B), Fire Protection (Q6C), Recreation Facilities (Q6D), Garbage

Collection (Q6E), Hospitals and Health Facilities (Q6F), Public Transportation (Q6G), Street Maintenance (Q6H), Sewage and Drainage (Q6I), General Pollution Control (Q6J), and (4) Evaluation of Noise Control (Q6K or NSECONTL).

The list of reasons for liking the area is presented in tabular form, giving the frequencies of different reasons; the codes are presented in the Coding Handbook. The general evaluation of the area is used as an index in the multiple regression models. Also, an index of the evaluation of various public services is defined by taking the average evaluation for the 10 public services (Q6A - Q6J or PUBSERV). The evaluation of noise control is a separate index. Therefore, there are three indices:

1. General Evaluation of Area (EVALAREA)
2. Evaluation of Public Services (PUBSERV)
3. Evaluation of Noise Control (NSECONTL)

Extent to Which Noise Affects Residents (EFFECTS)

The group is made up of four sub-concepts: (1) the extent to which noise interferes with activities (Q10A - Q10D or ACTIVITY); (2) the time period during which noise is most annoying (Q11A - Q11F); (3) the extent to which the respondent has become accustomed to noise (Q14); and (4) the extent to which noise affects health conditions (Q12, A13A - Q13E or HLTHPROB).

The first sub-group, ACTIVITY, is made up of four variables indicating interference with (a) Sleeping, (b) Talking or Listening to the Radio, (c) Reading, and (d) Resting. The second sub-group is one question which assesses the most annoying time period, Q11. The third sub-group assesses the extent to which the respondent has become accustomed to noise, Q14. The fourth sub-group assesses whether the respondent perceives noise as affecting his or her health (Q12) and five particular symptoms which might be impacted: Headaches (Q13A), Tiredness (Q13B), Irritability (Q13C), Hearing Loss or Difficulties (Q13D), and Causing an Existing Health Problem to Worsen (Q13E). These six latter variables are combined to form an index of general health effects caused by noise (HLTHPROB).

There are two indices, therefore, which are used in the multiple regression models:

1. Noise Interference During Activities (ACTIVITY)
2. Noise Impact on Health (HLTHPROB)

Annoyance to Noise (ANNOY)

This group is made up of one variable assessing the degree of annoyance to noise in the area (Q9 or ANNOY). It is calculated in two ways: (1) as a seven-point scale, and (2) as a dummy variable whereby 'Tremendously' or 'Highly' Annoyed are scored as '1' and other scale points as '0'. The first use (ANNOY) assesses the overall annoyance reaction and is used as an index in the multiple regression equations. The second use calculates only the percentage who are highly annoyed (or more); it is used in cross-tabulations where the percentage of highly annoyed is a more sensitive variable of noise impact. Thus, there is one index:

1. Overall Annoyance to Noise (ANNOY)

Specific Noise Sources Which are Annoying (SOURCES)

In Q17, the respondent is given a list of 20 noise sources and is asked to rate how annoying each source is. The responses give a specific analysis of the types of noise sources that may be impacting the residents. It is presented in cross-tabulations in order to understand how sources vary according to area and according to noise zone. All 20 sources (TRAFFIC to COMINDUS) are also used in subsequent multiple regression equations.

Preventive Measures Taken to Reduce Noise (MEASURES)

This group is made up of two sub-groups: (1) preventive measures taken personally to reduce noise (Q15A through Q15F or PREVENT), and (2) public complaints made (Q16A through Q16C or COMPLNT). The first sub-group is made up of a list of several preventive measures which may have been taken to reduce noise: Using Insulation or Soundproofing (Q15A), Closing Doors (Q15B), Masking Noise with a Radio or TV (Q15C), Wearing Earplugs (Q15D), Changing Sleeping Quarters (Q15E), and Considered Moving (Q15F). An index is made up from these six variables – Number of Personal Preventive Actions (PREVENT).

The second sub-group lists three possible public complaints that might have been made: Complaining to a Neighbor About Making Too Much Noise (Q16A), Writing, Telephoning or Visiting an Official (Q16B), and Initiating Legal Action (Q16C). These three items are combined into an index – Public Complaints Made (COMPLNT).

There are, therefore, two indices which are used in the multiple regression models:

1. Number of Personal Preventive Actions (PREVENT)
2. Public Complaints Made (COMPLNT)

Support for a Noise Control Program (SUPPORT)

This group is made up of five sub-groups: (1) which body should be responsible for reducing noise (Q18); (2) whether the respondent supports a noise control program (Q19); (3) why the respondent feels there should not be a noise control program, if he/she does not want one (Q19A); (4) the willingness to pay extra taxes for a noise control program (Q20); and (5) a list of possible noise control options: Making Noise Sources Quieter (Q21A), Community Planning and Zoning (Q21B), Building Codes (Q21C), Curfews (Q21D), Fines for Making Too Much Noise (Q21E), Barriers (Q21F), Traffic Planning (Q21G), and Public Information Campaign (Q21H).

Three items are combined to form an index of support for a noise control program (SUPPORT): whether the respondent supports a noise control program, the willingness to pay extra taxes for a noise control program, and the number of possible noise control options that the respondent wants.

There is, therefore, one index used in the multiple regression models:

1. Support for Noise Control Program (SUPPORT)

5.3.4 The SPSS Output: Specific Frequency Distributions, Cross-Tabulations, and Regressions

The data output is ordered according to the 11 groups.

Group 1: Properties of the Noise Environment (NOISE)

1. Distributions:
   a. NZONE
   b. DBLEVEL (if physical monitoring is complete)

Group 2: Characteristics of the Population (CITYPOP)

1. Distributions:
   a. AREA
   b. AGE
   c. SEX
   d. EDUCLVL
   e. Employment Status (Q24)
   f. Occupational Group (Q25)
   g. INCOME
   h. Racial Heritage (Q27)
   i. YRSRES
   j. OWNER
   k. Household Size (Q29)
   l. Building Capacity (QB2)
   m. Construction Type (QB4)
2. Cross-Tabulations:
   a. AREA x NZONE
   b. AREA x AGE
   c. AREA x EDUCLVL
   d. AREA x Employment Status (Q24)

e. AREA x Occupational Group (Q25)

f. AREA x INCOME

g. AREA x YRSRES

h. AREA x Household Size (Q29)

Group 3: General Health Characteristics (HEALTH)

1. Distributions:

   a. HEALTH

2. Cross-Tabulations:

   a. HEALTH x AREA

   b. HEALTH x DBLEVEL (if physical monitoring is complete)

Group 4: Perception of the Noise Environment (QUIET)

1. Distributions:

   a. QUIET

2. Cross-Tabulations:

   a. QUIET x AREA

   b. QUIET x DBLEVEL (if physical monitoring is complete)

Group 5: Perception of Problems in the Area (PROBLEMS)

1. Distributions:

   a. List of Specific Problems (Q4A, Q4B, Q4C)

   b. NOISPROB

   c. Other Urban Problems (Q5A, Q5B, Q5D, Q5E, Q5F, Q5G, Q5H)

2. Cross-Tabulations:

   a. List of Specific Problems (Q4A, Q4B, Q4C) x AREA
   b. NOISPROB x AREA
   c. NOISPROB x HEALTH
   d. URBPROB x AREA

Group 6: Evaluation of the Area (EVALUATE)

1. Distributions:

   a. EVALAREA
   b. List of Reasons for Liking Area (Q3A, Q3B, Q3C)
   c. Rating of Public Services (Q6A - Q6J)
   d. NSECONTL

2. Cross-Tabulations:

   a. EVALAREA x AREA
   b. EVALAREA x QUIET
   c. List of Reasons for Liking Area (Q3A, Q3B, Q3C) x AREA
   d. Rating of Public Services (Q6A - Q6J) x AREA
   e. NSECONTL x AREA
   f. NSECONTL x NOISPROB

Group 7: Extent to Which Noise Affects Residents (EFFECTS)

1. Distributions:

   a. Four Activities (Q10A - Q10D)
   b. Time Period (Q11)
   c. Accustomed to Noise (Q14)
   d. Noise Affects Health (Q12)
   e. Five Symptoms Caused by Noise (Q13A - Q13E)

2. Cross-Tabulations:

   a. Noise Affects Health (Q12) x AREA
   b. Noise Affects Health (Q12) x AGE
   c. Noise Affects Health (Q12) x SEX
   d. Noise Affects Health (Q12) x Occupational Group (Q25)
   e. Noise Affects Health (Q12) x HEALTH
   f. Noise Affects Health (Q12) x Accustomed to Noise (Q14)
   g. Four Activities (Q10A – Q10D) x DBLEVEL (if physical monitoring is complete)

Group 8: Annoyance to Noise (ANNOY)

1. Distributions:

   a. ANNOY
   b. HIGHLY

2. Cross-Tabulations:

   a. ANNOY x AREA
   b. ANNOY x NZONE
   c. ANNOY x Construction Type (QB4)
   d. ANNOY x QUIET
   e. ANNOY x Noise Affects Health (Q12)
   f. ANNOY x Accustomed to Noise (Q14)
   g. HIGHLY x DBLEVEL (if physical monitoring is complete)

Group 9: Specific Noise Sources Which Are Annoying (SOURCES)

1. Distributions:

   a. All 20 Noise Sources (TRAFFIC to COMINDUS)
   b. Other Noise Sources Mentioned (Q17UA, Q17UB)

2. Cross-Tabulations:

   a. All 20 Noise Sources (TRAFFIC to COMINDUS) x AREA
   b. All 20 Noise Sources (TRAFFIC to COMINDUS) x NZONE

Group 10: Preventive Measures Taken to Reduce Noise (MEASURES)

1. Distributions:

   a. Preventive Actions (Q15A - Q15G)
   b. Public Complaints Made (Q16A - Q16C)

2. Cross-Tabulations:

   a. Preventive Actions (Q15A-Q15G) x AREA
   b. Preventive Actions (Q15A-Q15G) x Accustomed to Noise (Q14)
   c. Public Complaints Made (Q16A-Q16C) x AREA

Group 11: Support for a Noise Control Program (SUPPORT)

1. Distributions:

   a. Body Responsible for Reducing Noise (Q18A - Q18F)
   b. Community Should Have Noise Control (Q19)
   c. Why No Noise Control (Q19A-Q19D)
   d. Extra Taxes for Noise Control Program (Q20)
   e. List of Noise Control Options (Q21A - Q21H)

2. Cross-Tabulations:

   a. Community Should Have Noise Control (Q19) x AREA
   b. Community Should Have Noise Control (Q19) x Occupational Group (Q25)
   c. Community Should Have Noise Control (Q19) x INCOME
   d. Community Should Have Noise Control (Q19) x AREA
   e. List of Noise Control Options (Q21A - Q21h) x AREA

Group 12: Multiple Regression Models

All multiple regression models use a "stepwise" procedure where only the most significant variables are brought into the equation. If physical monitoring is not complete, DBLEVEL assumes the value of NZONE for each case and DBLVSQR is not computed.

3. Multiple Regression Models

	Dependent Variable	Independent Variables
a.	DBLEVEL	AGE, SEX, EDUCLVL, INCOME, YRSRES, OWNER
b.	HEALTH	DBLEVEL, DBLVLSQR, AGE, SEX, EDUCLVL, INCOME, YRSRES, OWNER, STRTDIST
c.	QUIET	DBLEVEL, DBLVLSQR, AGE, SEX, EDUCLVL, INCOME, YRSRES, OWNER, STRTDIST, HEALTH
d.	NOISPROB	DBLEVEL, DBLVLSQR, AGE, SEX, EDUCLVL, INCOME, YRSRES, OWNER, STRTDIST, HEALTH, QUIET
e.	URBPROB	DBLEVEL, DBLVLSQR, AGE, SEX, EDUCLVL, INCOME, YRSRES, OWNER, STRTDIST, HEALTH QUIET, NOISPROB
f.	PUBSERV	DBLEVEL, DBLVLSQR, AGE, SEX, EDUCLVL, INCOME, YRSRES, OWNER, STRTDIST, HEALTH, QUIET, NOISPROB, URBPROB
g.	EVALAREA	DBLEVEL, DBLVLSQR, AGE, SEX, EDUCLVL, INCOME, YRSRES, OWNER, STRTDIST, HEALTH, QUIET, URBPROB, PUBSERV
h.	ACTIVITY	DBLEVEL, DBLVLSQR, AGE, SEX, EDUCLVL, INCOME, YRSRES, OWNER, STRTDIST, HEALTH, QUIET, NOISPROB, URBPROB, PUBSERV, EVALAREA

	Dependent Variable	Independent Variable
i.	HLTHPROB	DBLEVEL, DBLVLSQR, AGE, SEX, EDUCLVL, INCOME, YRSRES, OWNER, STRTDIST, HEALTH, QUIET, NOISPROB, URBPROB, PUBSERV, EVALAREA, ACTIVITY
j.	ANNOY	DBLEVEL, DBLVLSQR, AGE, SEX, EDUCLVL, INCOME, YRSRES, OWNER, STRTDIST, HEALTH, QUIET, NOISPROB, URBPROB, PUBSERV, EVALAREA, ACTIVITY, HLTHPROB
k.	PREVENT	DBLEVEL, DBLVLSQR, AGE, SEX, EDUCLVL, INCOME, YRSRES, OWNER, STRTDIST, HEALTH, QUIET, NOISPROB, URBPROB, PUBSERV, EVALAREA, ACTIVITY, HLTHPROB, ANNOY, TRAFFIC to COMINDUS
l.	COMPLNT	DBLEVEL, DBLVLSQR, AGE, SEX, EDUCLVL, INCOME, YRSRES, OWNER, STRTDIST, HEALTH, QUIET, NOISPROB, URBPROB, PUBSERV, EVALAREA, ACTIVITY, HLTHPROB, ANNOY, TRAFFIC to COMINDUS, PREVENT
m.	SUPPORT	DBLEVEL, DBLVLSQR, AGE, SEX, EDUCLVL, INCOME, YRSRES, OWNER, STRTDIST, HEALTH, QUIET, NOISPROB, URBPROB, PUBSERV, EVALAREA, ACTIVITY, HLTHPROB, ANNOY, TRAFFIC to COMINDUS, PREVENT, COMPLNT

4. Correlation Matrix

a. All variables used in regression analysis.

Group 13: Characteristics of the Survey

1. Distributions:

   a. Day of Interview Completion (CMPDAY)
   b. Number of Calls to Make Contact (CALLS)
   c. Number of Adults on List (QA3A)
   d. Respondent Number on List (QA3B)
   e. Time of Interview in Minutes (TIME)